



*Ahmednagar Jilha Maratha Vidya Prasarak Samaj's*

# **New Arts, Commerce and Science College, Parner**

Tal. Parner, Dist. Ahmednagar - 414 302 (Maharashtra)



4<sup>th</sup> Cycle

## **Assesment and Accreditation**





### **Criterion-3**

### **Research, Innovations and Extension**

**KI :3.3- Research Publication and Awards**

**QnM - 3.3.1**

**Number of research papers published per teacher in the Journals notified on UGC care list 2017-18 to 2021-22**

 <p>NAAC 'A' Grade Best College Award by SPPU Pune</p>	<b>Ahmednagar Jilha Maratha Vidya Prasarak Samaj's</b> <b>New Arts, Commerce &amp; Science College</b>	
	• Parner, Dist.- A.nagar, Maharashtra Pin - 414302 • Office (02488) 221537/35	
Affiliated ID. No. PU/AN/ASC/019/1977    College Code No. 121 Email- nascp@college2013@gmail.com nascpar@rediffmail.com Website : www.newartsparner.com	<b>Principal Dr. Rangnath Aher</b> M.Sc., Ph.D., F.H.A.S., F.I.S.S.T. Mob. 9422754080	
Ref. No. NAC&S	Date : 24/11/2022	
<b><u>DECLARATION</u></b>		
<p>This is to declare that the information, reports, true copies of the supporting documents, numerical data, etc. submitted/presented in this file is verified by Internal Quality Assurance Cell (IQAC) and is correct as per the records. This declaration is for the purpose of NAAC accreditation of HEI for 4<sup>th</sup> Cycle period 2017-18 to 2021-22.</p>		
<p>Date: 24/11/2022 Place: Parner</p>		
 <b>Prof. (Dr.) D. R. Thube</b> IQAC Coordinator <b>IQAC COORDINATOR</b> New Art's, Commerce & Science College Parner, Dist. Ahmednagar		 <b>Dr. R. K. Aher</b> IQAC Chairman and Principal <b>PRINCIPAL</b> New Arts, Commerce & Science College Parner, Tal. Parner, Dist. Ahmednagar

# Table of Contents

<b>List of the Research Articles .....</b>	<b>5</b>
<b>A. 2021-22 .....</b>	<b>5</b>
<b>B. 2020-21 .....</b>	<b>14</b>
<b>C. 2019-20 .....</b>	<b>19</b>
<b>D. 2018-19 .....</b>	<b>23</b>
<b>E. 2017-18 .....</b>	<b>33</b>
<b>Research articles .....</b>	<b>43</b>
<b>A. 2021-22 .....</b>	<b>43</b>
<b>B. 2020-21 .....</b>	<b>501</b>
<b>C. 2019-20 .....</b>	<b>705</b>
<b>D. 2018-19 .....</b>	<b>834</b>
<b>E. 2017-18 .....</b>	<b>1176</b>

3.3.1.1. Number of research papers in the Journals notified on UGC care during the last five years:

Year	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Number	67	59	22	31	58	237

## List of the Research Articles

## A. 2021-22

Sr. No	Title of Paper	Name of Author/s	Department	Name of Journal	Year of Publication	ISSN Number	Is it listed in UGC care list? (Yes/No/-)	Link of Research Paper/ Journal Website
1.	Identity Crisis in <i>Henrik Ibsen's A Doll's House</i> with Feminist Perspective	P. P. Bharate	English	Langlit	2021	ISSN 0248-7143	Yes	<a href="https://www.lanlit.org/">https://www.lanlit.org/</a>
2.	Development in Natural Attractions Centers in the Country	R. E. Najan	Geography	Sustainable Development Goals: Initiatives, Execution and Challenges Impact	2021	2230-9578	Yes	<a href="https://drive.google.com/file/d/1po7oUqFMEpvO-yZxPCfxEu84WPVaACD5/view?usp=sharing">https://drive.google.com/file/d/1po7oUqFMEpvO-yZxPCfxEu84WPVaACD5/view?usp=sharing</a>
3.	The Role of Farm ponds in Agricultural Development: A Case Study of Wadule Village in Parner tehsil of Ahmednagar District (M.S).	D.S. Ghungarde	Geography	Applied Ecology and Environmental Science online. Science and Education Publishing	2021	2230-9578	Yes	<a href="https://drive.google.com/file/d/1c6C_rT6XC3NS_YNQyFyTS3vXooVWyJqn/view?usp=sharing">https://drive.google.com/file/d/1c6C_rT6XC3NS_YNQyFyTS3vXooVWyJqn/view?usp=sharing</a>
4.	The Role of Farm ponds in Agricultural Development: A Case Study of Nivadunge Village in Pathardi tehsil of Ahmednagar District (M.S).	D.S. Ghungarde	Geography	Wesleyan Journal of Research	2021	DOI:10.12691/aees-9-8-2	Yes	<a href="https://drive.google.com/file/d/1IjQy1AVCCDIVD4nRQglcX5-AICt4kPKw/view?usp=sharing">https://drive.google.com/file/d/1IjQy1AVCCDIVD4nRQglcX5-AICt4kPKw/view?usp=sharing</a>
5.	A Geographical Analysis of Change in	D.S. Ghungarde	Geography	Peer Reviewed Internatio	2021	0975-1386	Yes	<a href="https://drive.google.com/file">https://drive.google.com/file</a>

	Cropping Pattern: A Case Study of Farm pond Holding Farmers in Ahmednagar District (M.S)			nal Research Journal of Geography				<a href="https://drive.google.com/file/d/1urb7lcD9OVbbYQq0aUFfkuQmnUo2IG8W/view?usp=sharing">/d/1urb7lcD9OVbbYQq0aUFfkuQmnUo2IG8W/view?usp=sharing</a>
6.	Impact of Farm Ponds on Changing Cropping Pattern: A Case Study of Wadule Village in Parner tehsil of Ahmednagar	D.S. Ghungarde	Geography	Wesleyan Journal of Research	2021	0971-6785.	Yes	<a href="https://drive.google.com/file/d/1_q0DqZLEw3IsxXl5S_OCrHFbuY3UHJ-B/view?usp=sharing">https://drive.google.com/file/d/1_q0DqZLEw3IsxXl5S_OCrHFbuY3UHJ-B/view?usp=sharing</a>
7.	“Watershed & Streams Delineation Using Q-Gis And Dem; A Geographical Analysis Of Upper Godavari Basin (M.S., India)”	D.S. Ghungarde	Geography	Wesleyan Journal of Research	2021	0975-1386,	Yes	<a href="https://drive.google.com/file/d/1soXEzQ_0cAgA8lnwfAiLKTxsF9ZZFdiQ/view?usp=sharing">https://drive.google.com/file/d/1soXEzQ_0cAgA8lnwfAiLKTxsF9ZZFdiQ/view?usp=sharing</a>
8.	Tehsil wise Literacy Differentials in Ahmednagar District (1981-2011)	J. D. Mhaske	Geography	Wesleyan Journal of Research,	2021	0975-1386	Yes	<a href="https://drive.google.com/file/d/151TzTgdxnSRpMZefk4S12phbZ-GGB9BI/view?usp=sharing">https://drive.google.com/file/d/151TzTgdxnSRpMZefk4S12phbZ-GGB9BI/view?usp=sharing</a>
9.	A Temporal Changes In Kukadi Canal Irrigated Area A Study In Parner Tahasil” Ahmednagar (MH)	S. S. Aher	Geography	Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,	2021	2230-9578	Yes	<a href="https://drive.google.com/file/d/1V2McW654HqN7VQH A7cpjgZxvM9XwydVG/view?usp=sharing">https://drive.google.com/file/d/1V2McW654HqN7VQH A7cpjgZxvM9XwydVG/view?usp=sharing</a>

10.	A geographical study of irrigation pattern in parner tahsil Ahmednagar (MH)”	S. S. Aher	Geography	International Research Journal of Humanities and Interdisciplinary Studies (IRJHIS)	2021	2582-8568	Yes	<a href="https://drive.google.com/file/d/1iwLhWnaAYSwhLAFV62PBybbyPIXPJH8r/view?usp=sharing">https://drive.google.com/file/d/1iwLhWnaAYSwhLAFV62PBybbyPIXPJH8r/view?usp=sharing</a>
11.	Role of media in strengthening the Indian democracy	V. S. Dhanashetti	Political Science	Journal of Modern Thamizh Research	2021	2321-984X	Yes	<a href="https://drive.google.com/file/d/1rkZp0PYeq68CvA_eWEmqHhtVGCSGoW6-/view?usp=sharing">https://drive.google.com/file/d/1rkZp0PYeq68CvA_eWEmqHhtVGCSGoW6-/view?usp=sharing</a>
12.	The Impact of COVID-19 on Indian Economy	A.V. Ghorpade	Economics	International Journal of Advanced and innovative research	2021	ISSN-2394-7780	-	<a href="https://drive.google.com/file/d/1Y13e_CIKnO_QOOnaFif2hjoF1wLM-PC8/view?usp=sharing">https://drive.google.com/file/d/1Y13e_CIKnO_QOOnaFif2hjoF1wLM-PC8/view?usp=sharing</a>
13.	Road Transport Priority of Indian Society	Y. M. Waghare	Commerce	IDEAL	2021	ISSN-2319-359X	Yes	<a href="https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ">https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ</a>
14.	A Study of Competitive Wine Tourism Destination in Maharashtra state	B. D. Bhalerao	Commerce	Indian Journal of Current Trends in Management Science	2021	ISSN-0976-1845	Yes	<a href="https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ">https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ</a>
15.	A Comparative Study of Online Shopping in India.	Y. M. Waghare	Commerce	Modern Thamizh Research	2021	ISSN-2391-984X	Yes	<a href="https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ">https://drive.google.com/drive/folders/1bkBc7dKEmr0Wh3mUglrbBVB6UElAsjgJ</a>
16.	New Trends in academic Libraries	B. B. Shelke	Library	Wesleyan Journal	2021	0975-1380	Yes	<a href="https://drive.google.com/file/d/1rfkSeo4vcQRACEkoS9YFEbSvWHB_6tMK/view?usp=sharing">https://drive.google.com/file/d/1rfkSeo4vcQRACEkoS9YFEbSvWHB_6tMK/view?usp=sharing</a>
17.	Solid Plastic - Polymer Electrolyte for Rechargeable	S. L. Kadam, R. B. Kharade, M. A.	Physics	Wesleyan Journal of Research	2021	ISSN-0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>

	Lithium Ion Battery	Yewale, R. B. Bhise						
18.	Effect of Spent Wash on the Physico-Chemical Properties of Soil and Early Seedling Growth in Fenugreek( <i>Trigonella Foenum Graecum</i> )	S. D. Kulkarni, V. P. Dhawale, S. K. Aher, S. J. Zadage	Physics	Wesleyan Journal of Research	2021	ISSN; 0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
19.	Low-Density Teos-based Silica Aerogels Prepared at Supercritical Drying Using Ethanol as the Preparative Solvent	N. A. Pawar, N. B. Chaure, S. M. Rathod	Physics	Wesleyan Journal of Research	2021	ISSN-0975-1386	Yes	<a href="https://drive.google.com/file/d/1DP3c-Tiyo71STsKvIyKdzelqgoWOIqiu/view?usp=sharing">https://drive.google.com/file/d/1DP3c-Tiyo71STsKvIyKdzelqgoWOIqiu/view?usp=sharing</a>
20.	Biochemical alteration in healthy and affected leaves of sorghum due to <i>Sphacelotheca reiliana</i>	R. K. Aher	Botany	Wesleyan Jr of research. 14(26):45-48	2021	0975-1386	YES	<a href="https://drive.google.com/drive/folders/1HTHKWmpDIgOICDTvQDxeno2R2YdLJgK5">https://drive.google.com/drive/folders/1HTHKWmpDIgOICDTvQDxeno2R2YdLJgK5</a>
21.	Investigation of Biocomponents Over Groundnut Crop Fields at Ahmednagar	S. K. Aher, V. P. Dhawale	Botany	Journal of Modern Thamizh Research	2021	2321-984X	YES	<a href="https://drive.google.com/file/d/1PvTJAmf_Px A5HwxBEv6frX6XDgGOfMLy/view?usp=sharing">https://drive.google.com/file/d/1PvTJAmf_Px A5HwxBEv6frX6XDgGOfMLy/view?usp=sharing</a>
22.	Performance of Soybean Mutants for Yield and Yield Components	V. R. Deshmukh, M. P. Meshram, R. N. Deshmukh	Botany	Journal of Soils and Crops	2021	0971-2836	-	<a href="https://www.journalofsoilsandcrops.com/Download/jun2021issue/23.pdf">https://www.journalofsoilsandcrops.com/Download/jun2021issue/23.pdf</a>
23.	<i>Tagetes patula</i> linn., a fungicidal, ornamental species of asteraceae family	S. D, Kadlag, S.N. Varpe V.D. Gadakh & R.N. Deshmukh	Botany	Wesleyan Jr of research	2021	0975-1386	YES	<a href="https://drive.google.com/file/d/1OY7IEfLwK8YpEqVi0syrnHaf7Hv9fdRR/view">https://drive.google.com/file/d/1OY7IEfLwK8YpEqVi0syrnHaf7Hv9fdRR/view</a>
24.	Recent Studies on Physiological Traits to Improve	K. S. Sawant & R. N.	Botany	Wesleyan Jr of research	2021	0975-1386	YES	<a href="https://drive.google.com/file/d/1hyW9eouC6X">https://drive.google.com/file/d/1hyW9eouC6X</a>



	Drought Tolerance in Wheat.	Deshmukh						<a href="https://drive.google.com/file/d/1YMza8YA_OI_Loi4thNCOqr/view">tYMza8YA_OI_Loi4thNCOqr/view</a>
25.	Impact of PEG-6000 Induced Water Stress on Seed Germination Parameters of Wheat Cultivars.	R. N. Deshmukh, T.S. Thopate, K.S. Sawant, A. Bhalerao & S. D. Kadlag,	Botany	Wesleyan Jr of research	2021	0975-1386	YES	<a href="https://drive.google.com/file/d/1qCFZul-wdLm5G3OyL-sf-LMbPAcqCjUq/view">https://drive.google.com/file/d/1qCFZul-wdLm5G3OyL-sf-LMbPAcqCjUq/view</a>
26.	Morphological Responses of Wheat ( <i>Triticum aestivum</i> L.) to Mycorrhiza and Water Stress conditions at anthesis stage.	S. L. Khapke and R. K. Aher	Botany	Wesleyan Jr of research	2021	0975-1386	YES	<a href="https://drive.google.com/file/d/17kxMA_Bzku6TRmR-Dgtr0d2bwB6wqEgF/view">https://drive.google.com/file/d/17kxMA_Bzku6TRmR-Dgtr0d2bwB6wqEgF/view</a>
27.	Screening of mycoflora on allium cepa l. From different localities of Parner tehsil maharashtra	R. M. Shaikh, R. K. Aher and D. Sherkar	Botany	Wesleyan Jr of research	2021	0975-1386	YES	<a href="https://drive.google.com/drive/folders/1Qg-II8Wdc0rxTGpI0BWcqFKuf2XUsLkn">https://drive.google.com/drive/folders/1Qg-II8Wdc0rxTGpI0BWcqFKuf2XUsLkn</a>
28.	Study of Dysteria Brasilensis (Free living marine ciliate) from Guhagar beach, Ratnagiri, Maharashtra,	V. S. Bandar & S. R. Wagh,	Zoology	Wesleyan Jr. of Research	2021	ISSN : 0975-1386	YES	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
29.	Conarete parneri: A new species of Gall midge (Diptera: Cecidomyiidae) from India.	S. R. Wagh,	Zoology	Wesleyan Jr. of Research	2021	ISSN : 0975-1386	YES	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
30.	Diversity And Distribution Of Freshwater Sponges In India: A Review	G.G. Wakchoure, A.D. Harkal And M.S. Aher	Zoology	Wesleyan Journal of Research Vol.14 (26).	2021	ISSN : 0975-1386	YES	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
31.	Daliton ka aarthik jeewan – Zini zini bini chadariya	H. Y. Gaikwad	Hindi	Akshara	2021	2582-5429	Yes	
32.	Structural, magnetic, and electrical	R. S. Diggikar	Chemistry	Journal of Materials Science:	2021	1573-482X	Yes	<a href="https://link.springer.com/article/10.1007/s108">https://link.springer.com/article/10.1007/s108</a>

	properties of Mn-substituted magnesium chromate spinel structure			<i>Materials in Electronic s</i>				<a href="https://link.springer.com/article/10.1007/s10854-021-05386-8">54-021-05386-8</a> <a href="https://link.springer.com/article/10.1007/s10854-021-05386-8">https://link.springer.com/article/10.1007/s10854-021-05386-8</a>
33.	Weddings-Challenges To Indian Perspective An Overview Through Scientific Research	R. S. Diggikar D. R. Thube	Chemistry	J. Modern Thamiz	2021	2321-984X	Yes	<a href="https://portal.issn.org/resource/ISSN/2321-984X">https://portal.issn.org/resource/ISSN/2321-984X</a>
34.	A Phosphor - Tio <sub>2</sub> Nanocomposite as a Visible Light Photo-catalyst: Synthesis and Characterization	D. R. Thube R. S. Diggikar S. L. Kadam B. B. Kale	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
35.	Synthesis of Chalcones Containing Quinoxalines acts as Synthons for Range of Heterocycles	D. R. Thube S. R. Shrimandikar	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
36.	Synthesis and Characterization of Y <sub>2</sub> O <sub>3</sub> Powders by Homogenous Co-precipitation Method	D. R. Thube S. R. Kale	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
37.	Synthesis and Characterization of Some New Thiazolyl Schiff Base-Metal Complexes	D. R. Thube V.P. Landage, H.N. Akolkar, B.K. Karale	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
38.	Synthesis, Characterization of novel rhodamine 6G capped gold nano-particles and sensing of reactive Oxygen species	R. S. Diggikar	Chemistry	Wesleyan J. Res.	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
39.	Knoevenagel condensation	T.S. Thopate	Chemistry	Wesleyan J.	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>

	catalyzed by triethanolamine	C. D. Bhenki S. S. Karhale V. B. Helvi		Research				
40.	Boronsulphonic acid-catalyzed an efficient synthesis and antibacterial study of N-substituted phenyl maleimides	T.S. Thopate C. D. Bhenki R. N. Deshmukh S. S. Karhale	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
41.	An Assessment of Tourism Potential: A Case Study of Parner Tehsil, Ahmednagar	S. M. Kale M. R. Erande	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
42.	Analysis Of Water Quality Using Physico-Chemical Characters, Lower Terna Reservoir, Near Makhani, Dist. Osmanabad, Maharashtra, India	S. M. Kale S. S. Patil S. R. Kshirsagar	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
43.	Detection of elements and fertilizer management during crop season	S. M. Kale A. K. Meher	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
44.	E-Banking Services In India	S. M. Kale G. R. Walunj	Chemistry	Modern Thamizh Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
45.	Geomorphic assessment of the dev river basin in parner tehsil dist. Ahmednagar, maharashtra: using geographical information system	S. M. Kale N. S. Padalkar K. C. Mohite J. B. Kolpe	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
46.	Human Right and Heath Policy	S. M. kale S. B.	Chemistry	Modern Thamizh	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>

		Shinde		Research				
47.	Nutrient Analysis Of Soil Samples In Parner Tahsil From Various Zones	S. M. Kale A. K. Meher	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
48.	Eco-Friendly Approach To Synthesis Of 2, 3-Diphenyl Quinoxaline Using Lignin@So3h As A Novel, Efficient And Reusable Heterogeneous Catalyst	B.S Narsale, A.G. Gadhave, D. R. Thube	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
49.	Green Approach Towards The Synthesis Of Novel Schiff's Bases	A. J. Dhole D. R. Thube	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
50.	Analysis of calcium (Ca) in chocolates by volumetric and flame photometric methods	P. N. Daule S. D. Mhaske P. P. Zaware D. R. Thube	Chemistry	Wesleyan J. Research	2021	0975-1386	Yes	<a href="http://www.wesleyanjournal.in/">http://www.wesleyanjournal.in/</a>
51.	One pot approach of novel xanthan perchloric acid catalyst in synthesis of bis(indolyl)methane derivatives via greener perspective	B.S Narsale, A.G. Gadhave, K. S. Raut D. R. Thube	Chemistry	<i>Polycyclic Aromatic Compounds</i>	2022	1040-6638	Yes	<a href="https://doi.org/10.1080/10406638.2022.2108075">https://doi.org/10.1080/10406638.2022.2108075</a>
52.	Estimation of particle size and micro strain in Eu doped Yttrium oxide nanoparticle synthesized by homogenous coprecipitation method	D. R. Thube S. R. Kale	Chemistry	Journal of Emerging Technologies and Innovative Research	2022	2349-5162	Yes	<a href="https://www.jetir.org/">https://www.jetir.org/</a>
53.	Design, Synthesis And Characterization Of Novel Fluorinated	S G Kundlikar, P J Jojar, M S Tarade, Y R Thorat,	Chemistry	Indian J. Chem	2022	0975-0983	Yes	<a href="http://nopr.niscair.res.in/handle/123456789/60">http://nopr.niscair.res.in/handle/123456789/60</a>

	Styryl Chromones	D R Thube, B K Karale, H N Akolkar S D Mhaske						
54.	Effects of COVID-19 on selected sectors of Indian Economy	A.V. Ghorpade	Economics	Bengal past and present	2022	ISSN-0005-8807	Yes	<a href="http://www.iaraedu.com">www.iaraedu.com</a>
55.	Covid-19 Prediction and Detection Using Deep Learning	S. Zarekar	Department of BBA-CA	IJAEMA	2022	0886-936747	Yes	<a href="https://drive.google.com/file/d/1mKRA2XBaelbd7MPfnzPONGX7oT88u6m9/view?usp=sharing">https://drive.google.com/file/d/1mKRA2XBaelbd7MPfnzPONGX7oT88u6m9/view?usp=sharing</a>
56.	Nita fajali aur dushyantkumar ki hindi gazalo me samajik vimarsh	H. Y. Gaikwad	Hindi	Vidyavarta	2018	2319-9318	Yes	<a href="http://www.vidyavarta.com">www.vidyavarta.com</a>
57.	1980 Nanterchya Sriyanche Kaviteche Samajshastriya Mulyamapan	H.S.Shelke	Marathi	Vidyavarta	2021	2319-9318	Yes	<a href="http://www.vidyavarta.com">www.vidyavarta.com</a>
58.	Gramin Sahitya Samelane: Swarup ani Udeshe	N.B.Udar	Marathi	Vidyavarta	2021	2319-9318	Yes	<a href="http://www.vidyavarta.com">www.vidyavarta.com</a>

## B. 2020-21

Sr. No.	Title of Paper	Name of Author/s	Department	Name of Journal	Year of Publication	ISSN Number	Is it listed in UGC care list? (Yes/No/-)	Link of Research Paper/ Journal Website
1.	A Scope of Maharashtra State Road Transport Corporation in Ahmednagar District.	Y. M. Waghare	Commerce	International Multidisciplinary Quarterly Research Journal	2020	ISSN-2277-5730	Yes	<a href="https://drive.google.com/drive/folders/156he4ObOs0cS0tDoejEBmGmaDR8YxhsX">https://drive.google.com/drive/folders/156he4ObOs0cS0tDoejEBmGmaDR8YxhsX</a>
2.	The Spiritual Centers (Sansthans) & the Opportunity in the service sector in and around it .	B. D. Bhalerao	Commerce	International Multidisciplinary Half Yearly Research Journal	2020	ISSN-2278-8158	Yes	<a href="https://drive.google.com/drive/folders/156he4ObOs0cS0tDoejEBmGmaDR8YxhsX">https://drive.google.com/drive/folders/156he4ObOs0cS0tDoejEBmGmaDR8YxhsX</a>
3.	Electrochemical Synthesis of CuS Thin Film for Supercapacitor Application	S. L. Kadam	Physics	Macromolecular Symposia	2020	ISSN: 1022-1360	Yes	<a href="http://www.ms.journal.de">www.ms.journal.de</a> <a href="https://doi.org/10.1002/masy.201900209">https://doi.org/10.1002/masy.201900209</a>
4.	Mycorrhizal efficacy on chemical composition of the <i>Tejates erecta</i> , L (Marigold).	R. K. Aher.	Botany	International Journal of Researches in Biosciences, Agriculture and Technology. Vol.V III(2):. 6-7.	2020	2347517X	-	<a href="https://drive.google.com/file/d/1CTD68FhB5jkrbqXoiRUIK mUMQOV_R ZIA/view">https://drive.google.com/file/d/1CTD68FhB5jkrbqXoiRUIK mUMQOV_R ZIA/view</a>
5.	Effect of <i>Glomus fasciculatum</i> on biochemical composition of <i>Catharanthus roseus</i> . 2020.	R. K. Aher.	Botany	Samriddhi: A journal of Physical Science, Engi. and Technology. Vol.12(2) :1-3.	2020	2229-7111	YES	<a href="https://smsjournals.com/index.php/SAMRIDHI/article/view/1966">https://smsjournals.com/index.php/SAMRIDHI/article/view/1966</a>

6.	Phytodiversity Studies of Shri Mulikadevi Mahavidyalaya Nighoj, Dist. Ahmednagar (MS),	S. K. Aher, A. A. Adsul, P. D. Shelke, S. R. Lanke	Botany	Int J Recent Sci Res.	2020	2321-984X	-	<a href="http://dx.doi.org/10.24327/ijrsr.2020.1104.5272">http://dx.doi.org/10.24327/ijrsr.2020.1104.5272</a>
7.	Estimation and evaluation of chlorophyll content and chlorophyll stability index of some antiallergenic medicinal plants of Parner tehsil.	G.Kaka de S. L. Khapke	Botany	I J R B A T	2020	2347-517X	-	<a href="https://drive.google.com/file/d/1bsDA-GKDFWdF0hLqwRxpFElan4KaxV9F/view">https://drive.google.com/file/d/1bsDA-GKDFWdF0hLqwRxpFElan4KaxV9F/view</a>
8.	Character Association and Path Analysis Studies in Soybean Mutant Progenies	V. R. Deshmukh, M. P. Meshram, C. Mane, R. N. Deshmukh	Botany	Journal of Soils and Crops	2020	0971-2836	-	<a href="https://www.journalofsoilsandcrops.com/Download/dec2020issue/25.pdf">https://www.journalofsoilsandcrops.com/Download/dec2020issue/25.pdf</a>
9.	Eco- Friendly Synthesis Of New Thiazole Anchored N <sup>2</sup> - Benzylidene Carbohydrazide Derivatives	D. R. Thube V.P. Landage, H.N. Akolkar, B. K. Karale	Chemistry	<i>International Multidisciplinary Multilingual Research</i>	2020	2582-9866	Yes	<a href="https://www.scimagojr.com/journalsearch.php?q=14000155855&amp;tip=sid">https://www.scimagojr.com/journalsearch.php?q=14000155855&amp;tip=sid</a>
10.	Lokjagrutichi Chalwal Aani Muknayaak	H. S. Shelke	Marathi	Maharashtra Sahitya Patrika, Pune	2021	2456-656X	Yes	<a href="https://www.masapapune.org/files/ugd/2ed2e7_0071f835baa345ef8c72e09dc1d5a7b2.pdf">https://www.masapapune.org/files/ugd/2ed2e7_0071f835baa345ef8c72e09dc1d5a7b2.pdf</a>
11.	Prakashan Sanstha va Sahitya Vyavhar	N. B. Udar	Marathi	Maharashtra Sahitya Patrika, Pune	2021	2456-656X	Yes	<a href="https://www.masapapune.org/files/ugd/2ed2e7_0071f835baa345ef8c72e09dc1d5a7b2.pdf">https://www.masapapune.org/files/ugd/2ed2e7_0071f835baa345ef8c72e09dc1d5a7b2.pdf</a>
12.	Marathitil Prayogik Natak	H. S. Shelke	Marathi	Akhar Wagamaya	2021	2229-4929	Yes	<a href="https://drive.google.com/file/d/1Pz7w0MBZ05aRrPyoHfb706S4Ge28D6">https://drive.google.com/file/d/1Pz7w0MBZ05aRrPyoHfb706S4Ge28D6</a>

								<a href="#">1J/view?usp=sharing</a>
13.	Lekhak Va Sahitya Vyavhar	N. B. Udar	Marathi	Maha rashta Sahitya Patrika, Pune	2021	2456-656X	Yes	<a href="https://www.masapapune.org/files/ugd/2ed2e7_1d9cae9b5c2a468abc63f3282a4550f2.pdf">https://www.masapapune.org/files/ugd/2ed2e7_1d9cae9b5c2a468abc63f3282a4550f2.pdf</a>
14.	दलितो का सामाजिक जीवन- अनारो उपन्यास के संदर्भ में	H. Y. Gaikwad	Hindi	अक्षरा	2021	9788195070534	-	<a href="https://drive.google.com/file/d/138y9e1YrMh-edCzJtZIKJ8wpAgQmrJaL/view?usp=sharing">https://drive.google.com/file/d/138y9e1YrMh-edCzJtZIKJ8wpAgQmrJaL/view?usp=sharing</a>
15.	The voice of the underclass as reflected in Amitav Ghosh's <i>The Hungry Tide</i>	A. V. More	English	Langlit	2021	ISSN 0248-7143	Yes	<a href="https://www.langlit.org/">https://www.langlit.org/</a>
16.	Influence of Colonialism on the Native African Cultural Heritage in <i>Chinua Achebe's Things Fall Apart</i>	A. B. Chindhe	English	Langlit	2021	ISSN 0248-7143	Yes	<a href="https://www.langlit.org/">https://www.langlit.org/</a>
17.	Delineation of Childhood in the selected poems of <i>Rabindranath Tagore</i>	V. G. Salve	English	Langlit	2021	ISSN 0248-7143	Yes	<a href="https://www.langlit.org/">https://www.langlit.org/</a>
18.	Utilization of Chemical Fertilizers in Agricultural Zone of Maharashtra State	R. E. Najan	Geography	Akshar Wangmay (UGC-Care Listed International Research Journal	2021	2229-4929	YES	<a href="https://drive.google.com/file/d/1uVKt_VXx_8cTmdKCINdG8DoI7pLHA7u7/view?usp=sharing">https://drive.google.com/file/d/1uVKt_VXx_8cTmdKCINdG8DoI7pLHA7u7/view?usp=sharing</a>
19.	Morphometric Analysis in Sina River Basin-A Geographical Study	R. E. Najan	Geography	Akshar Wangmay (UGC-Care Listed International Research Journal	2021	2229-4929	YES	<a href="https://drive.google.com/file/d/1gHW1kIBOk2ug85tuY2HUTff8UizgePn/view?usp=sharing">https://drive.google.com/file/d/1gHW1kIBOk2ug85tuY2HUTff8UizgePn/view?usp=sharing</a>
20.	Global Climate	R. E.	Geo	Internatio	2021	2229-	YES	<a href="https://drive.g">https://drive.g</a>



	Change & Agricultural Technologies: A Geographical Perspective	Najan	graphy	nal Journal of Researches in Biosciences, Agriculture and Technology		4929 Issue-II.3.		<a href="https://drive.google.com/file/d/1YXZSNcTUjUDhCmFmdVuhGNSw7dpjRxve/view?usp=sharing">https://drive.google.com/file/d/1YXZSNcTUjUDhCmFmdVuhGNSw7dpjRxve/view?usp=sharing</a>
21.	Environmental Analysis of Climatic Elements of Ahmednagar District (MS)	D. S. Ghungarde	Geo graphy	Akshar Wangmay	2021	2229-4929	YES	<a href="https://drive.google.com/file/d/1sJ12ToX8BMk6JrtLA AOBb_j-vhR6sdVL/view?usp=sharing">https://drive.google.com/file/d/1sJ12ToX8BMk6JrtLA AOBb_j-vhR6sdVL/view?usp=sharing</a>
22.	Impact Analysis of 'Jalukta Shivar' Scheme: A Case Study of Chas Village in Ahmednagar District	D. S. Ghungarde	Geo graphy	Shodh Sarita	2021	2348-2397	YES	<a href="https://drive.google.com/file/d/1hgEDDvbHjT7ujA_jCoYVsH-CuQHg83IP/view?usp=sharing">https://drive.google.com/file/d/1hgEDDvbHjT7ujA_jCoYVsH-CuQHg83IP/view?usp=sharing</a>
23.	Environmental Analysis of Changing Land Use And Cropping Pattern: A Case Study Of Ahmednagar District (M.S.)	A. V. Thokal	Geo graphy	Akshar Wangmay	2021	2229-4929	Yes	<a href="https://drive.google.com/file/d/10a3MZAV3Zej8hbpztPranfZRFA6N-Y-z/view?usp=sharing">https://drive.google.com/file/d/10a3MZAV3Zej8hbpztPranfZRFA6N-Y-z/view?usp=sharing</a>
24.	Changing Land Use:A Environmental Analysis of Parner Tahsil in Ahmednagar District (M.S.)	J. D. Mhaske	Geo graphy	Akshar Wangmay	2021	2229-4929	Yes	<a href="https://drive.google.com/file/d/15FPpafRkbG6E9xmfhg_w-Rwqq6ygegVS/view?usp=sharing">https://drive.google.com/file/d/15FPpafRkbG6E9xmfhg_w-Rwqq6ygegVS/view?usp=sharing</a>
25.	Corona A Biological Disaster:A Geographical Analysis	J. D. Mhaske	Geo graphy	Shodh Sarita	2021	2348-2397	Yes	<a href="https://drive.google.com/file/d/115ZvbyUDifFvtCYpFYYoe_lHyR6UvJZ/view?usp=sharing">https://drive.google.com/file/d/115ZvbyUDifFvtCYpFYYoe_lHyR6UvJZ/view?usp=sharing</a>
26.	A study of Information need	B. B. Shelke	Library	Modern Thamiz	2021	2321-984X	Yes	<a href="https://drive.google.com/file">https://drive.google.com/file</a>

	of computer science Student in New Arts College, Parner			Research Journal				<a href="https://doi.org/10.13KQN5xXs6r6pyTi-ZVEgqPZvocTi6jDf/view?usp=sharing">e/d/13KQN5xXs6r6pyTi-ZVEgqPZvocTi6jDf/view?usp=sharing</a>
27.	Synthesis of MnS <sub>2</sub> Thin Films by Chemical Route: Physicochemical properties	S. L. Kadam, R. B. Kharade	Physics	Scientific Research in Science and Technology	2021	2395-6011	Yes	<a href="http://www.ijrst.com">www.ijrst.com</a>
28.	Challenges for India: Sustainable Development Goals,	S. R. Wagh, S. S. Thube	Zoology	Jr. of Modern Thamizh Research	2021	(ISSN: 2321:984X). 36.	Yes	<a href="http://www.rajapublication.com">www.rajapublication.com</a>
29.	Development and growth of rural economy in Akole and Baramati Tehsil (M.H.)	S. R. Wagh, V. C. Kadam	Zoology	Jr. of Modern Thamizh Research	2021	(ISSN: 2321:984X). 37.	Yes	<a href="http://www.rajapublication.com">www.rajapublication.com</a>
30.	Studies on antibacterial activity of Aegle Marmelos mediated Y203 nanoparticles	D. R. Thube S. R. Kale, V. S. Garule, K. R. Jagtap	Chemistry	Journal of Emerging Technologies and Innovative Research	2021	2349-5162	Yes	<a href="https://www.jetir.org/">https://www.jetir.org/</a>
31.	New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes with 6-chloro-5-7-dimethyl-4oxo-4H-chromene-3-carbaldehydes and its heteroleptic complexes with quinoline-8 ol: synthesis, characterization and antimicrobial activity	D. R. Thube, N. H. Kolhe, S.S. Jadhav,	Chemistry	<i>Res Chem Intermedia</i>	2021	459-481	Yes	<a href="https://www.springer.com/journal/11164">https://www.springer.com/journal/11164</a>

## C. 2019-20

Sr. No.	Title of Paper	Name of Author/s	Department	Name of Journal	Year of Publication	ISSN Number	Is it listed in UGC care list? (Yes/No/-)	Link of Research Paper/ Journal Website
1.	A Geographical Study of rainfall Distribution in Ahmednagar District, State of Maharashtra	D. S. Ghungarde	Geography	Intrnational Journals of Researches in Biosciences, Agriculture and Technology	2019	2347 - 5178	Yes	<a href="https://drive.google.com/file/d/1ysmDkCQY3qUI8fP3B7UhhIXVEROFnet/view?usp=sharing">https://drive.google.com/file/d/1ysmDkCQY3qUI8fP3B7UhhIXVEROFnet/view?usp=sharing</a>
2.	Geographical Study of Crop Diversification pattern in Ahmednagar District 2000-01 to 2015-16(M.S.)	D. S. Ghungarde	Geography	Maharashtra Bhugol Shashtr Sanshodhan Patrika	2019	0971 - 6785	-	<a href="https://drive.google.com/file/d/1an5dCCAAG693ZzhmEfEMxf96wNpkExm/view?usp=sharing">https://drive.google.com/file/d/1an5dCCAAG693ZzhmEfEMxf96wNpkExm/view?usp=sharing</a>
3.	Methods of Cashless Transactions	D. P. Sontakke	Economics	Ayushi I.I.R. JOURNAL Dec.2019 Page No. 40-41	2019	ISSN - 2349 - 638x	-	<a href="https://drive.google.com/file/d/1BrZ1rGPGfdQzoejsW48QF1UpDrmixIgA/view?usp=sharing">https://drive.google.com/file/d/1BrZ1rGPGfdQzoejsW48QF1UpDrmixIgA/view?usp=sharing</a>
4.	Challenges of Indian Agriculture Sector	D. P. Sontakke	Economics	Ajanta Dec-2019 Page No-22-26	2019	ISSN - 2277 - 5730	-	<a href="https://drive.google.com/file/d/14TPkwTMP2i3QE2RnIFdV91MaKh5KAGGI/view?usp=sharing">https://drive.google.com/file/d/14TPkwTMP2i3QE2RnIFdV91MaKh5KAGGI/view?usp=sharing</a>
5.	Phase change under heat treatment during synthesis of alpha Al <sub>2</sub> O <sub>3</sub> Nanoparticles by sol Gel method	V. P. Dhawale	Physics	Scientific Research & Review	2019	ISSN 2279 - 0543	-	<a href="http://www.ijssr.org">www.ijssr.org</a> doi Prfix:10.37794
6.	Phytotoxicity and stimulatory impact of Silver Nanoparticles on seeding	V. P. Dhawale	Physics	Environment and Ecology	2019	ISSN 0970 - 1113	-	<a href="http://www.environmentandecology.com">www.environmentandecology.com</a>

	growth of moth mean							
7.	Environmental Monitoring of Other Bioparticles in the Air Spora Over Groundnut Fields	S. K. Aher	Botany	International Journal of Research and Analytical Reviews	2019	149 X-151 X	-	<a href="https://drive.google.com/file/d/1VJkVoGQjZnmna8ORwsShaVHduTLXKYEI/view?usp=sharing">https://drive.google.com/file/d/1VJkVoGQjZnmna8ORwsShaVHduTLXKYEI/view?usp=sharing</a>
8.	Response of wheat ( <i>triticum aestivum</i> L.) to water stress in relation to the RWC, MSI and Lipid Peroxidation	S. L. Khapke	Botany	IJRAR	2019	2348 - 1269	-	<a href="https://drive.google.com/file/d/1RreOV-5jggYkf8uh74QUR9tmwPLOR3-z/view">https://drive.google.com/file/d/1RreOV-5jggYkf8uh74QUR9tmwPLOR3-z/view</a>
9.	Phytochemical Changes in Wheat ( <i>Triticum aestivum</i> L.) by Arbuscular Mycorrhizal Fungi Under Water Stress Conditions	S. L. Khapke	Botany	IJRAR	2019	2349 - 5138	-	<a href="https://drive.google.com/file/d/18dyr-GrVr0wm7BE6mgodPbreo4kRMKPD/view">https://drive.google.com/file/d/18dyr-GrVr0wm7BE6mgodPbreo4kRMKPD/view</a>
10.	Influence of bath temperature on microstructure and NH <sub>3</sub> sensing properties of chemically synthesized CdO thin films	M. A. Yewale	B. Voc. (R.E.)	Materials Science-Poland, 37(1), 2019, pp. 25-32	2019	DOI: 10.2478/msp-2019-0002	Yes	<a href="http://www.materialsscience.pwr.wroc.pl/">http://www.materialsscience.pwr.wroc.pl/</a>
11.	Kashtachi Bhakari	H. S. Shelke	Marathi	Tifan	2020	2231 - 573 X	Yes	<a href="https://drive.google.com/file/d/15RCfmXIs-RE_meuIFpop92aw5VWVcZJv/view?usp=sharing">https://drive.google.com/file/d/15RCfmXIs-RE_meuIFpop92aw5VWVcZJv/view?usp=sharing</a>
12.	Cinema and Literature: equally extraordinary works of art	P. P. Bharate	English	Langlit	2020	ISSN 2349 - 5189	Yes	<a href="https://www.langlit.org/">https://www.langlit.org/</a>
13.	The Element of Indianness and Role of	V. G. Salve	English	Langlit	2020	ISSN 2349 -	Yes	<a href="https://www.langlit.org/">https://www.langlit.org/</a>

	Women in Indian Society					5189		
14.	Analysis of Sustainable Agricultural Development in Ahmednagar District of Maharashtra (India )	R. E. Najan	Geography	Scopus.com/source.uri Waffan – Und Kostumkunde Journal	2020	0042 - 9945 Vol- XI,	YES	<a href="https://drive.google.com/file/d/1mlgNx-pZdmBR2o7xaysRp9jG4d2w6T7c/view?usp=sharing">https://drive.google.com/file/d/1mlgNx-pZdmBR2o7xaysRp9jG4d2w6T7c/view?usp=sharing</a>
15.	Agriculture Productivity	D. P. Sontakke	Economics	Excels International Journal of Social & Humanities Jan 2020 Page no.106	2020	ISSN 2277 - 7539	-	<a href="https://drive.google.com/file/d/1CESgniXhasz9yPLM8nrrE2JiauJWstOY/view?usp=sharing">https://drive.google.com/file/d/1CESgniXhasz9yPLM8nrrE2JiauJWstOY/view?usp=sharing</a>
16.	Impact of Govt. policies on State Transport Service in Maharashtra	Y. M. Waghere	Commerce	International Interdisciplinary Conference on Sustainability and Innovation in Higher Education, Commerce, Management and Science	2020	ISSN - 2394 - 3114	Yes	<a href="https://drive.google.com/drive/folders/1Qiv1FZw1_lm8hBbUc3BFrVqjTm1hB1sS">https://drive.google.com/drive/folders/1Qiv1FZw1_lm8hBbUc3BFrVqjTm1hB1sS</a>
17.	Recent Trends in E-Commerce	T. A. Galbote	Commerce	Journal of Information and Computational Science Volume-10, Issue-II Feb. 2020	2020	ISSN - 1548 - 7741	Yes	<a href="https://drive.google.com/file/d/1CrraPTw-aCfXel-8L6caX_Av6hQNI/Lb/view?pli=1">https://drive.google.com/file/d/1CrraPTw-aCfXel-8L6caX_Av6hQNI/Lb/view?pli=1</a>
18.	The role of IT in research	B. B. Shelke	Library	Shodh Sanchar Bulletin	2020	2229 - 3620	Yes	<a href="https://drive.google.com/file/d/1goYuBiDL7IAgRnMJ7J-CnAifIJQpnYjZ/view?usp=sharing">https://drive.google.com/file/d/1goYuBiDL7IAgRnMJ7J-CnAifIJQpnYjZ/view?usp=sharing</a>
19.	Preparation & Performance of CuS thin films in Non-Aqueous Medium as	S.L. Kadam	Physics	Engineering Research & Technology	2020	ISSN 2278 - 0181 PHY	Yes	<a href="http://www.ijert.org">www.ijert.org</a>

	Supercapacitor Electrode Materials.					SICS		
20.	Impact of aluminum oxide nanoparticles, silver nanoparticles and their Nano composites on Vigna radiata Seedling Growth	V. P. Dhawale	Physics	Chemistry and Environment	2020	ISSN 0972 - 0626	Yes	<a href="https://worldresearchersassociations.com">https://worldresearchersassociations.com</a>
21.	Green Synthesis and Characterization of Y <sub>2</sub> O <sub>3</sub> Nano particles	D. R. Thube S. R. Kale	Chemistry	<i>International journal of Scientific Research and Development</i>	2020	2455 - 2631	Yes	<a href="https://www.worldwidejournals.com/international-journal-of-scientific-">https://www.worldwidejournals.com/international-journal-of-scientific-</a>
22.	Synthesis of New Thiazole Anchored N'-Benzylidene Carbohydrazide and 1,3,4-Oxadiazole Derivatives by Conventional and Microwave Irradiation Methods	D. R. Thube V.P. Landage, H.N. Akolkar, B. K. Karale	Chemistry	<i>Indian Journal of Heterocyclic Chemistry</i>	2020	0971 - 1627	Yes	<a href="https://connectjournals.com/ijhc">https://connectjournals.com/ijhc</a>

## D. 2018-19

Sr. No.	Title of Paper	Name of Author/s	Department	Name of Journal	Year of Publication	ISSN Number	Is it listed in UGC care list? (Yes/No/-)	Link of Research Paper/ Journal Website
1.	Samkalin Hindi Gazal Rajnitik Vimarsh	V. S. Raut	Hindi	Vidyawarta	2018	23199318	-	<a href="https://www.vidyawarta.com/02">https://www.vidyawarta.com/02</a>
2.	Paryavaran Chetana ke pariprekshya me Sumitranandan Pant ka Kavya	V. S. Raut	Hindi	Vidyawarta	2018	23199318	-	<a href="https://www.vidyawarta.com/02">https://www.vidyawarta.com/02</a>
3.	Nirgun Sampraday aur Sant Namdev	V. S. Raut	Hindi	Vidyawarta	2018	23199318	-	<a href="https://www.vidyawarta.com/02">https://www.vidyawarta.com/02</a>
4.	Samkalin Hindi Gazal: Samajik Chetana	S. S. Arde	Hindi	Vidyawarta	2018	23199318	-	<a href="https://drive.google.com/file/d/1-Wmx9o14WCOyTcY6r4SrZxILN0RJsGj0/view?usp=drivesdk">https://drive.google.com/file/d/1-Wmx9o14WCOyTcY6r4SrZxILN0RJsGj0/view?usp=drivesdk</a>
5.	Samkalin Hindi Gazal: Rajnitik Eav Samajik Bodh	P. S. Tanpure	Hindi	Vidyawarta	2018	23199318	-	<a href="https://drive.google.com/file/d/1-VToyn6OREQNmmB5Tf2ZQkApVhI6QKB1/view?usp=drivesdk">https://drive.google.com/file/d/1-VToyn6OREQNmmB5Tf2ZQkApVhI6QKB1/view?usp=drivesdk</a>
6.	Environmental Pollution and Health Problems	Gaikwad S. M.	Physical Education	Aarant Multidisciplinary Int. Edu. Research Journal	2018	2278-5655	Yes	<a href="https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_lAxxrP">https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_lAxxrP</a>

7.	Use of ICT in Physical Education & Sports	Gaikwad S. M.	Physical Education	Int. Research Journal of Multidisciplinary studies.	2018	2455-8499	Yes	<a href="https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_IAXxrP">https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_IAXxrP</a>
8.	Temporal Changes of Cropping Pattern in Ahmednagar District	R. E. Najan	Geography	Research Journey	2018	2348-7143	YES	<a href="https://drive.google.com/file/d/1S_aot0o3TNVlySyYRp17QDnyhVs8Tk2rF/view?usp=sharing">https://drive.google.com/file/d/1S_aot0o3TNVlySyYRp17QDnyhVs8Tk2rF/view?usp=sharing</a>
9.	Present Tourism Scenario & New Technology Models for Development of Buddhist Tourism in India	R. E. Najan	Geography	AJANTA (UGC Approved Sr.no. 40776)	2018	2277-5730	YES	<a href="https://drive.google.com/file/d/14_wxd5RA-kTs_5OmeFubnuVYF_mj8Zv1a/view?usp=sharing">https://drive.google.com/file/d/14_wxd5RA-kTs_5OmeFubnuVYF_mj8Zv1a/view?usp=sharing</a>
10.	Com. Datta Deshmuykhanche Shetkari v kamgar Chalvalitil Yogadan	V. S. Dhanashetti	Political Science	Research Journey Special Issue - 79, Page No. 54-57	2018	2348-7143	-	<a href="https://drive.google.com/file/d/1OFKmyb8vRJIsVTECKmZj-AIvaN_2JZ66/view?usp=sharing">https://drive.google.com/file/d/1OFKmyb8vRJIsVTECKmZj-AIvaN_2JZ66/view?usp=sharing</a>
11.	Jilha udyogkendrac haya sudharit karja yojnanchi ahmednagar jilhyatil bhumika	D. P. Sontakke	Economics	GENIUS Vol.VI ISSUE II Feb-July 2018 Page no 1-4	2018	ISSN-2279-0489	-	<a href="https://drive.google.com/file/d/1Tss8JFCgyiyQO-gI7kCDLbkxn6M7KmsK/view?usp=sharing">https://drive.google.com/file/d/1Tss8JFCgyiyQO-gI7kCDLbkxn6M7KmsK/view?usp=sharing</a>
12.	New Banking Product	A.V. Ghorpade	Economics	Research Journey Special ISSUE 87 Page no 45-46	2018	ISSN-2348-7143	-	<a href="https://drive.google.com/file/d/1KHK_U0aUE9gjsd1j2cBBiZITKogyWLCq/view?usp=sharing">https://drive.google.com/file/d/1KHK_U0aUE9gjsd1j2cBBiZITKogyWLCq/view?usp=sharing</a>



								<a href="#">ing</a>
13.	Phase changes under heat treatment during synthesis of Alpha-Al <sub>2</sub> O <sub>3</sub> by Sol Gel method	V. P. Dhawle	Physics	International Journal of Scientific Research and Reveiws	2018	ISSN NO. 2279-0543	-	<a href="http://www.ijssr.org">www.ijssr.org</a> doi Prfix:10.37794
14.	Synthesis and Characterization of SiO <sub>2</sub> Nanoparticles	S. L. Kadam	Physics	International Research Journal Of Multidisciplinary Studies	2018	ISSN 2454-8499	-	<a href="http://www.ijrms.in/">http://www.ijrms.in/</a>
15.	Soil Analysis and its correlation with VAM. International Research Journal of Multidisciplinary Studies. Iv(I): 173-176	R K Aher	Botany	International Research Journal of Multidisciplinary Studies	2018	2455-8499	-	<a href="https://drive.google.com/file/d/1JdEP2hZgcIKffGMuvai-k-UZNjGITUyb/view">https://drive.google.com/file/d/1JdEP2hZgcIKffGMuvai-k-UZNjGITUyb/view</a>
16.	Germination studies in four cultivars of gram under PEG-6000 induced water stress.	R. N. Deshmukh	Botany	Inter. Res. Jr. of Multi. Studies	2018	2454-8499	-	<a href="https://drive.google.com/file/d/1CcdhAebQYHjgzswd4_FxgnrXtIDAz-s/view?usp=sharing">https://drive.google.com/file/d/1CcdhAebQYHjgzswd4_FxgnrXtIDAz-s/view?usp=sharing</a>
17.	Screening of drought tolerant wheat varieties using different indices	K. S. Sawant, R. N. Deshmukh	Botany	Inter. Res. Jr. of Multi. Studies	2018	2454-8499	-	<a href="https://drive.google.com/file/d/1aMUuTa8Ki5kW98jxXAeUbnFK91XfTlWt/view?usp=sharing">https://drive.google.com/file/d/1aMUuTa8Ki5kW98jxXAeUbnFK91XfTlWt/view?usp=sharing</a>
18.	Diversity of AM (Arbuscular Mycorrhizal) fungi in rhizospheric soil of wheat	S. L. Khapke	Botany	I J R B A T	2018	2347-517X	-	<a href="https://drive.google.com/file/d/1iYkiMfpdeWV9reF3QNSpXqXrXxtrbk0z/view">https://drive.google.com/file/d/1iYkiMfpdeWV9reF3QNSpXqXrXxtrbk0z/view</a>

	fields of Parner tehsil. )							
19.	Mycorrhizal influence on RWC, MSI and Lipid Peroxidation in wheat ( <i>triticum aestivum</i> L.)	S. L. Khapke	Botany	Inter. Res. Jr. of Multidisciplinary Stud.	2018	2455-8499	-	<a href="https://drive.google.com/file/d/1e1R7NXwEUahv oz6Av6JqEbuFwBpo7QkH/view">https://drive.google.com/file/d/1e1R7NXwEUahv oz6Av6JqEbuFwBpo7QkH/view</a>
20.	Characterization of wheat ( <i>Triticum aestivum</i> L.) under water stress conditions.	S. L. Khapke	Botany	AMIER J	2018	2278-5655	-	<a href="https://drive.google.com/file/d/1Qnjdl5cX5M86IzjuUZ-N0BM-IUIRltRc/view?usp=sharing">https://drive.google.com/file/d/1Qnjdl5cX5M86IzjuUZ-N0BM-IUIRltRc/view?usp=sharing</a>
21.	Diversity of family malvaceae from parner tehsil of ahmednagar district, maharashtra (India).	M. A. Jadhav, T. S. Chikane	Botany	International Research Journal of Multidisciplinary Studies	2018	2454-8499	-	<a href="https://drive.google.com/file/d/1q9FC hjWfqSy4OgPjAzot4kcT1gnEvjSF/view">https://drive.google.com/file/d/1q9FC hjWfqSy4OgPjAzot4kcT1gnEvjSF/view</a>
22.	Study of Growth and Yield of Fenugreek ( <i>Trigonella foenum-graecum</i> L.) in Hydroponic System.	M. A. Jadhav, B. A. Chaudhari	Botany	International Research Journal of Multidisciplinary Studies	2018	2454-8499	-	<a href="https://drive.google.com/file/d/1CFXdVPbdMxBsc0bHP1TbAYztYmtXloaW/view">https://drive.google.com/file/d/1CFXdVPbdMxBsc0bHP1TbAYztYmtXloaW/view</a>
23.	Tasar Culture: A sustainable low cost farm forestry for poverty alleviation endeavor for Kolhapur District of Western Maharashtra	S. R. Wagh,	Zoology	Aarhat Multidisciplinary Int. Edu. Re. Jr.	2018	(ISSN: 2278 – 5655). 32.	-	<a href="https://www.aarhat.com/journals/amierj/?page=home#">https://www.aarhat.com/journals/amierj/?page=home#</a>
24.	Sustainability of Soil Health and Organic Farming,	S. R. Wagh, S. S. Thube,	Zoology	Int. Re. Jr. of Multidisciplinary St.	2018	(ISSN Online: 2455 – 8499). 33.	-	<a href="https://ijms.ljol.info/#:~:text=International%20Jou">https://ijms.ljol.info/#:~:text=International%20Jou</a>

								<a href="#">rnal%20of%20Multidisciplinary%20Studies%20(IJMS)%20is%20published%20by%20the.academy%20of%20knowledge%20and%20wisdom.</a>
25.	Analysis and Management of e-waste from Parner region of Ahmednagar District, Maharashtra, India,	Wagh S.R. Lasure A. U.	Zoology	Int. Re. Jr. of Multidisc. St.	2018	(ISSN Online: 2455 – 8499). 34.	-	<a href="https://ijms.sjoi.info/#:~:text=International%20Journal%20of%20Multidisciplinary%20Studies%20(IJMS)%20is%20published%20by%20the.academy%20of%20knowledge%20and%20wisdom.">https://ijms.sjoi.info/#:~:text=International%20Journal%20of%20Multidisciplinary%20Studies%20(IJMS)%20is%20published%20by%20the.academy%20of%20knowledge%20and%20wisdom.</a>
26.	Assessment of Physico-chemical parameters from dams of Pathardi Tehsil of Ahmednagar District, Maharashtra, India,	S. R. Wagh, B. B. Tilekar	Zoology	Int. Re. Jr. of Multidisc. St.	2018	(ISSN Online: 2455 – 8499). 35.	-	<a href="https://ijms.sjoi.info/#:~:text=International%20Journal%20of%20Multidisciplinary%20Studies%20(IJMS)%20is%20published%20by%20the.academy%20of%20knowledge%20and%20wisdom.">https://ijms.sjoi.info/#:~:text=International%20Journal%20of%20Multidisciplinary%20Studies%20(IJMS)%20is%20published%20by%20the.academy%20of%20knowledge%20and%20wisdom.</a>
27.	Artificial Intelligence and Education	A. U. Lasure	Computer Science	International Journal of Research and Analytical Review	2018	ISSN 2349-5138	Yes	<a href="https://www.ijrar.org/?gclid=EAfAIQobChMIioXfwols-gIVgUcrCh0BsAliEAAyASAAEgK6gvD_BwE">https://www.ijrar.org/?gclid=EAfAIQobChMIioXfwols-gIVgUcrCh0BsAliEAAyASAAEgK6gvD_BwE</a>
28.	Novel supported TiO <sub>2</sub>	D. R. Thube	Chemistry	<i>J Nanomater</i>	2018	ISSN: 2324-8777	Yes	<a href="https://doi.org/10.4172/2157-7439-C8-088">10.4172/2157-7439-C8-088</a>

	nanocomposites: an efficient photocatalyst for water cleaning technology			<i>Mol Nanotechnology</i>				
29.	Electrochemical synthesis of Cu <sub>x</sub> Se <sub>1-x</sub> thin film for supercapacitor application	M. A. Yewale	B. Voc. (R.E.)	Journal of Alloys and Compounds	2018	<a href="https://doi.org/10.1016/j.jallcom.2018.04.208">https://doi.org/10.1016/j.jallcom.2018.04.208</a>	Yes	<a href="https://www.sciencedirect.com/science/article/abs/pii/S0925838818315317?via%3Dihub">https://www.sciencedirect.com/science/article/abs/pii/S0925838818315317?via%3Dihub</a>
30.	Antimicrobial efficacy of green synthesized iron oxide nanoparticles	M.A. Yewale	B. Voc. (R.E.)	Material Research Express Volume 5 Number 7	2018	-	Yes	<a href="https://iopscience.iop.org/journal/2053-1591">https://iopscience.iop.org/journal/2053-1591</a>
31.	Marathi Gramin Sahitya Va Samajjivan	H. S. Shelke	Marathi	Research Journey	2019	2348-7143	Yes	<a href="https://drive.google.com/file/d/1tpRoJGVmqHIKB-8afL7h6KVUTo8k5t7b/view?usp=sharing">https://drive.google.com/file/d/1tpRoJGVmqHIKB-8afL7h6KVUTo8k5t7b/view?usp=sharing</a>
32.	Vastunishtha Drushti Konatun Sant Charitramak Kadambariche Mulya mapan	H. S. Shelke	Marathi	Maharashtra Sahitya Patrika, Pune	2019	2456-656X	Yes	<a href="https://www.masapapune.org/files/ugd/2ed2e7ca99d2f282cc424685a7b77aa754a538.pdf">https://www.masapapune.org/files/ugd/2ed2e7ca99d2f282cc424685a7b77aa754a538.pdf</a>
33.	Impact of Globalisation on The Underclass Characters in Aravind Adiga's Last Man In Tower	A. V. More	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
34.	The Problems of Rural Undergraduate Students in	A. V. More	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>

	Mastering the English Speaking Skills							
35.	Quest For Identity in Jhumpa Lahiri's the Namesake	A. B. Chindhe	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
36.	Teaching of English As A Second Language in Indian Context	A.B. Chindhe	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
37.	Post Colonialism in Salman Rushdie's "Midnight's Children"	P. P. Bharate	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
38.	Teaching of English As A Second Language in Indian Context	P. P. Bharate	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
39.	Meaning and Explanation in Transgender Discrimination	P. P. Bharate	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
40.	Post-Colonial Study in Amitav Ghosh's the Shadow Lines	J. D. Dalavi	English	Research Journey	2019	ISSN 0248-7143	Yes	<a href="https://www.researchjourney.net/">https://www.researchjourney.net/</a>
41.	Mahatma Phule va Dr.Babasaheb Ambedkar Yanche Shree Udharache Karya	B. J. Kakade, A. T. Gandal	History	Ajanta Publication	2019	2277-5730	Yes	<a href="http://www.sjifactor.com">www.sjifactor.com</a>
42.	Palshi Gavatil wade va Mandire	B. J. Kakade, A. T. Gandal	History	Vidyavarta	2019	2319-9318	Yes	<a href="http://www.printingarea.blogspot.com">www.printingarea.blogspot.com</a>
43.	Change in Land use pattern in Ahmednagar District: A Geographical	D. S. Ghungarde, J. C. More	Geography	International Research Journal of Multidi	2019	2455-8499	YES	<a href="https://drive.google.com/file/d/1xI0TV82L3Bgt3GywIwb8vfFZ8YmQiW7K/view">https://drive.google.com/file/d/1xI0TV82L3Bgt3GywIwb8vfFZ8YmQiW7K/view</a>

	Analysis			disciplinary Studies				<a href="#">w?usp=sharing</a>
44.	Spatio-Temporal Analysis of Farm Pond in Ahmednagar District	D. S. Ghungarde, J. C. More	Geography	Ajanta	2019	2277-5730	YES	<a href="https://drive.google.com/file/d/1m0qFUMdkiCwcfXuBmFF-JKr3bc2BK6e0/view?usp=sharing">https://drive.google.com/file/d/1m0qFUMdkiCwcfXuBmFF-JKr3bc2BK6e0/view?usp=sharing</a>
45.	Water Crisis: A Case Study of Parner Town, Parner Tahsil, Dist. A'nagar	A. V. Thokal, J. D. Mhaske	Geography	Ajanta	2019	2277-5730	YES	<a href="https://drive.google.com/file/d/1c8BiuTDMYXbsGWNELubjKHnZm381sxUB/view?usp=sharing">https://drive.google.com/file/d/1c8BiuTDMYXbsGWNELubjKHnZm381sxUB/view?usp=sharing</a>
46.	Role of Micro Irrigation in Agricultural Development: A Case Study of Goregaon Village in Parner Tahsil, District Ahmednagar (M.S.)	A. V. Thokal, A. B. Aher	Geography	Ajanta	2019	2277-5730	YES	<a href="https://drive.google.com/file/d/1Vd4NEzB8P9vHxvWBdrxahC4eWZk9-8tQ/view?usp=sharing">https://drive.google.com/file/d/1Vd4NEzB8P9vHxvWBdrxahC4eWZk9-8tQ/view?usp=sharing</a>
47.	महाराष्ट्र दुष्काळ एक भौगोलिक विश्लेषण	J. D. Mhaske	Geography	Review of Research	2019	2249-894X	YES	<a href="https://drive.google.com/file/d/19Oawi-hWigaRBPcmW7zHsirqSk3_s_bP/view?usp=sharing">https://drive.google.com/file/d/19Oawi-hWigaRBPcmW7zHsirqSk3_s_bP/view?usp=sharing</a>
48.	Environmental Degradation : Causes & Consequence	S. S. Aher	Geography	Ajanta	2019	2277-5730	YES	<a href="https://drive.google.com/file/d/1zpqz_OHBxU0JB_Lz2PLIbUwxfnjvXOCq/view?usp=sharing">https://drive.google.com/file/d/1zpqz_OHBxU0JB_Lz2PLIbUwxfnjvXOCq/view?usp=sharing</a>
49.	Bharatiy	A. S.	Political	Research	2019	2348-7143	-	<a href="https://drive">https://drive.</a>

	Rashtravad	Fulari	l Scienc e	h Journey Special Issue - 165 (B)				<a href="https://drive.google.com/file/d/1KIGqSiO3iDo0hS SOY18Y--gWX1AvlJ1g/view?usp=sharing">google.com/ file/d/1KIGq SiO3iDo0hS SOY18Y-- gWX1AvlJ1 g/view?usp= sharing</a>
50.	A Study of relation between the bank and its depositor	Y. M. Waghere	Comm erce	Online Internat ional Interdis ciplinary Researc h Journal	2019	ISSN-2249-9598	Yes	<a href="http://www.oijrj.org/oijrj/jan2019-special-issue(04)/13.pdf">http://www. oijrj.org/oijrj /jan2019- special- issue(04)/13. pdf</a>
51.	Study of Institutional Financial Sources to Entrepreneurship	Y. M. Waghere	Comm erce	Indian Financia l Sector: Challen ges and Propect us.	2019	ISSN-2348-7143	Yes	<a href="https://drive.google.com/drive/folders/1nVMk6Y38OhigLQAVgllgeJe-CK0uP5RO">https://drive. google.com/ drive/folders /1nVMk6Y3 8OhigLQAV gllgeJe- CK0uP5RO</a>
52.	Synthesis and Characterization of Bismuth Ferrite Nanoparticle by Sol gel method	V. B. Sherkar	Physics	Journal of applied scie nce and comput ations	2019	ISSN NO. 1076-5131	-	<a href="http://www.jasc.com/gallery/110-january-2019.pdf">http://www.j - asc.com/gall ery/110- january- 2019.pdf</a>
53.	Synthesis and Characterization of alpha - Al <sub>2</sub> O <sub>3</sub> Nanoparticles and its application in decolourization of methyl Orange Azo dye in presence of UV light	V. P. Dhawle	Physics	Journal of Nano science and technol ogy	2019	ISSN NO. 2455-0191	-	<a href="http://www.jacsdirectory.com/jnst">http://www.j acsdirectory. com/jnst</a>  <a href="https://doi.org/10.30799/jnst.192.19050101">https://doi.or g/10.30799/j nst.192.1905 0101</a>
54.	Phytotoxicity and stimulated impact of nanoparticles and seedling growth of Moth Bean	V. P. Dhawle	Physics	Environ ment and ecology	2019	ISSN NO. 0970-0420	-	<a href="http://www.environmentandecology.com">www.enviro nmentandec ology.com</a>
55.	Synthesis and Antibacterial Screening of Novel	D. R. Thube, V. P. Landage,	Chemis try	<i>Oriental Journal of</i>	2019	0970-020 X	Yes	<a href="http://dx.doi.org/10.13005/ojc/350164">http://dx.doi. org/10.1300 5/ojc/350164</a>

	Thiazolyl Pyrazole and Benzoxazole	B. K. Karale		<i>Chemistry</i>				
56.	Synthesis, Characterization and Antibacterial Screening of some Thiazolyl chromones and Pyrazole	D. R. Thube, V. P. Landage, B. K. Karale	Chemistry	<i>Indian journal of Chemistry</i>	2019	0975-0983	Yes	<a href="https://www.ijrar.org/">https://www.ijrar.org/</a>
57.	Performance of Polyaniline Nanofibers (PANI NFs) as PANI NFs-Silver Nanocomposites (NCs) for Energy Storage and Antibacterial Applications	R. S. Diggikar S. P. Deshmukh T. S. Thopate S. R. Kshirsagar	Chemistry	<i>ACS Omega</i>	2019	--	Yes	10.1021/acs.omega.8b02834
58.	Review on the applications of internet and computers in chemical sciences	B. S. Narsale	Chemistry	<i>International Journal of Research and Analytical Reviews</i>	2019	2348-1269	Yes	<a href="http://www.ijrar.org/IJRAR1900058.pdf">http://www.ijrar.org/IJRAR1900058.pdf</a> <a href="http://ijrar.org/viewfull.php?&amp;p_id=IJRAR1900058">http://ijrar.org/viewfull.php?&amp;p_id=IJRAR1900058</a>
59.	Synthesis and Characterization of Some Benzofuran anchored Heterocycles	S. G. Kundlikar, B. K. Karale D. R. Thube H. N. Akolkar, S. D. Mhaske P. G. Rohokale	Chemistry	<i>International Journal of Research and Analytical Reviews</i>	2019	2348 –1269	Yes	<a href="https://www.ijrar.org/">https://www.ijrar.org/</a>



## E. 2017-18

Sr. No	Title of Paper	Name of Author/s	Department	Name of Journal	Year of Publication	ISSN Number	Is it listed in UGC care list? (Yes/No/-)	Link of Research Paper/ Journal Website
1.	Sadrud tesathi Yoga	V. S. Bhalshing	Marathi	Ajanta	2017	2277-5730	-	<a href="https://drive.google.com/file/d/17_TSP9kZAtQPohQOb9u1LmjWWfWiEziK/view?usp=sharing">https://drive.google.com/file/d/17_TSP9kZAtQPohQOb9u1LmjWWfWiEziK/view?usp=sharing</a>
2.	Gandhiwad Ek Vivechan	V. S. Raut	Hindi	Printing Area	2017	23945303	-	<a href="https://www.vidyawarta.com/03">https://www.vidyawarta.com/03</a>
3.	Nasir Sharma Ke Upanyaso ki Bhasha Shaili	V. S. Raut	Hindi	Vidyawarta	2017	23199318	-	<a href="https://www.vidyawarta.com/02">https://www.vidyawarta.com/02</a>
4.	Aadivasi Kavitaon me Paryavaran Chetana	V. S. Raut	Hindi	Vidyawarta	2017	2323199318	-	<a href="https://www.vidyawarta.com/02">https://www.vidyawarta.com/02</a>
5.	Gandivad Ki Prasangikata	V. S. Raut	Hindi	SPEIL-Darpan (NORWAY)	2017	08024448	-	<a href="https://drive.google.com/file/d/1_X6MO0-OrV67elKpGGEuLAOjRWYIHGOZ/view?usp=sharing">https://drive.google.com/file/d/1_X6MO0-OrV67elKpGGEuLAOjRWYIHGOZ/view?usp=sharing</a>
6.	Trends of Indian Agricultural Productivity	D.P. Sontakke	Economics	SRJIS Vol.6 ISSUE 34 Page no 573-577	2017	ISSN-2349-4766	-	<a href="https://drive.google.com/file/d/1UjGo8P9zZMVMmPig2acesUYcBjVKgo_p/view?usp=sharing">https://drive.google.com/file/d/1UjGo8P9zZMVMmPig2acesUYcBjVKgo_p/view?usp=sharing</a>
7.	Recent Trends in Banking Sectors	A.V. Ghorpade	Economics	SRJIS Vol.6 ISSUE 34 Page no 578-580	2017	ISSN-2349-4766	-	<a href="https://drive.google.com/file/d/1K6v0TIPPIEo0n_V-f3oGxdMrGn6V8ZIs/view?usp=sharing">https://drive.google.com/file/d/1K6v0TIPPIEo0n_V-f3oGxdMrGn6V8ZIs/view?usp=sharing</a>
8.	Role of Library Science in Environment	B. B. Shelke	Library	Flora and Founa	2017	0971-6920	Yes	<a href="https://drive.google.com/file/d/1emNcOVBPYLEzpxlg4y5M">https://drive.google.com/file/d/1emNcOVBPYLEzpxlg4y5M</a>

								<a href="https://drive.google.com/view?usp=sharing">TnDNrrGqoU-j/view?usp=sharing</a>
9.	Drugs, Doping & Sports Performance	Gaikwad S. M.	Physical Education	Flora and Fauna	2017	ISSN-0971-6920	Yes	<a href="https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_1AxxrP">https://drive.google.com/drive/folders/1_KHN6MPIXDCtVXEBZIIuzpRS8_1AxxrP</a>
10.	Effect of short term magnetic field on germination at growth on seeds of pea	A.V. Mancharkar A. S. Khade	Physics	Flora and Fauna	2017	0971-6920	-	<a href="http://www.floraandfauna.org.in">www.floraandfauna.org.in</a>
11.	Synthesis and characterization of aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ) nanoparticles and its application in Malachite Green azo dye decolorization	V. P. Dhawale, V.B. Khobragade, K. C. Mohite, S. D. Kulkarni	Physics	Flora and Fauna,	2017	ISSN:2456-9364	-	<a href="http://www.floraandfauna.org.in">www.floraandfauna.org.in</a>
12.	A Clean timeless renewable energy sources in Envi. Protection	V.P. Deore	Physics	Flora and Fauna	2017	0971-6920	-	<a href="http://www.floraandfauna.org.in">www.floraandfauna.org.in</a>
13.	Correlation Coefficient Of Bore Well Water Samples From Drought Prone Area Of Maharashtra India	V.P. Dhawale	Physics	European Journal of Biomedical AND Pharmaceutical sciences	2017	ISSN 2349-8870	-	<a href="http://www.ejbps.com/">http://www.ejbps.com/</a>
14.	Mycorrhizal fungal association in certain medicinal plants from Ahmednagar District, M S. Int. Res. Jr. of	R.K. Aher	Botany	Int. Res. Jr. of Biological Sciences	2017	0971-6920	-	<a href="https://drive.google.com/file/d/16DB0c30k_KNVQsoq9h_hGtBXCfp1HfAu/view?usp=sharing">https://drive.google.com/file/d/16DB0c30k_KNVQsoq9h_hGtBXCfp1HfAu/view?usp=sharing</a>

	Biological Sciences ( Flora and Fauna) 23(1) : 229-232							
15.	Marine ascomycetes fungi from Avicinnia marina of Goa.	R. K. Aher, J. B. Cholake	Botany	Int. Res. Jr . of Biological Sciences ( Flora and Fauna), 23(1): 171-173	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1NZxeDKmubdOwOaGXRb_DGNC0JSCpiqFD/view?usp=sharing">https://drive.google.com/file/d/1NZxeDKmubdOwOaGXRb_DGNC0JSCpiqFD/view?usp=sharing</a>
16.	Soil analysis for the cultivation of tomato from the selected localities of Parner Tehsil.	L. K. Dhumal, R. K. Aher	Botany	Int. Res. Jr . of Biological Sciences	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1JdEP2hZgcIKffGMuvai-k-UZNjGITUyb/view?usp=sharing">https://drive.google.com/file/d/1JdEP2hZgcIKffGMuvai-k-UZNjGITUyb/view?usp=sharing</a>
17.	Phytochemical analysis and evaluation of aerial part of the medicinal herb, <i>Caralluma adscendus</i> , Rox.	Ghogare P B and R K Aher	Botany	Int. Res. Jr . of Biological Science 23(1) : 276-280.	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1PAnDDXnqwvNooN_vkB-5t06FXr2c9Q28/view">https://drive.google.com/file/d/1PAnDDXnqwvNooN_vkB-5t06FXr2c9Q28/view</a>
18.	Ascomycetes from mangrove ecosystem of Wandoor-Andaman, India. Int. Jr. of Life Sciences. 5(4):599-605	Cholake J B and R K Aher	Botany	International Journal of Life Science	2017	26632-9425	-	<a href="https://oaji.net/articles/2017/736-1512498745.pdf">https://oaji.net/articles/2017/736-1512498745.pdf</a>
19.	Ecofriendly approach of arbuscular mycorrhizal fungi on the growth of Zea maize. Bionano Frontier, 10(1):. 210-212.	R K Aher	Botany	Bionano Frontier	2017	09744-0678	-	<a href="https://drive.google.com/file/d/1Q_Px_NSTKuUkpt1SYbbaQ3V1bf03j9-w/view">https://drive.google.com/file/d/1Q_Px_NSTKuUkpt1SYbbaQ3V1bf03j9-w/view</a>
20.	Influence of groundnut to seed inoculation with AMF.	R K Aher	Botany	Bionano Frontier	2017	09744-0678	-	<a href="https://drive.google.com/file/d/1N5gTR6DZbY0ZNFP5I8EgAwI0WtbatlWP/view">https://drive.google.com/file/d/1N5gTR6DZbY0ZNFP5I8EgAwI0WtbatlWP/view</a>

21.	To determine the sensitivity of wheat to water stress and changes in yield of wheat.	R K Aher	Botany	Bionano Frontier	2017	0974-0678 0678	-	<a href="https://drive.google.com/file/d/190KsKEQjneyh32_XryOVw2EAYhmNEsD/view">https://drive.google.com/file/d/190KsKEQjneyh32_XryOVw2EAYhmNEsD/view</a>
22.	The Underutilized Vegetables from Parner Tahsil of Maharashtra (India): A Review	S.K. Aher	Botany	Advances in Plant Sciences	2017	0970-3586	-	<a href="https://drive.google.com/file/d/1viIP98CxEAF7h88TUJW5smUrggYWQO/view?usp=sharing">https://drive.google.com/file/d/1viIP98CxEAF7h88TUJW5smUrggYWQO/view?usp=sharing</a>
23.	Aerobiological Studies With Special Reference to Ascospores Over Groundnut Field at Ahmednagar, Maharashtra.	S.K. Aher	Botany	Advances in Plant Sciences	2017	0970-3586	-	<a href="https://drive.google.com/file/d/1_XEbJVlj1GELuAotcGYQ9BNkfn_MaMwe/view?usp=sharing">https://drive.google.com/file/d/1_XEbJVlj1GELuAotcGYQ9BNkfn_MaMwe/view?usp=sharing</a>
24.	Study of Some Sacred Plants of Ahmednagar District, Maharashtra	S.K. Aher	Botany	International Journal of Current Research	2017	0975-833X	-	<a href="https://drive.google.com/file/d/1CZNVTSwhLphlwERkv91bJ9NaUNj9KD2k/view?usp=sharing">https://drive.google.com/file/d/1CZNVTSwhLphlwERkv91bJ9NaUNj9KD2k/view?usp=sharing</a>
25.	Medicinal Plants of Shri Mulikadevi College Campus Nighoj - A survey	S.K. Aher, A. A. Adsul	Botany	Flora and Fauna	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1Q1gWVhB2lNQF8OWBxG3-gtJqMnuvjOU/view?usp=sharing">https://drive.google.com/file/d/1Q1gWVhB2lNQF8OWBxG3-gtJqMnuvjOU/view?usp=sharing</a>
26.	Influence of water stress on protein profile on promising sorghum cultivars	R. N. Deshmukh	Botany	Science Spark	2017	2321-8045	-	<a href="http://oldsciparks.lbp.world/ArticlePDF/289.pdf">http://oldsciparks.lbp.world/ArticlePDF/289.pdf</a>
27.	Role of mineral content in sorghum cultivars under water stress.	R. N. Deshmukh	Botany	Flora and Fauna	2017	2454-8499	-	<a href="https://drive.google.com/file/d/1vDnE89AXYPYmPXdwPx9y7AKNMOXTbVIB/view?usp=sharing">https://drive.google.com/file/d/1vDnE89AXYPYmPXdwPx9y7AKNMOXTbVIB/view?usp=sharing</a>

28.	Enzymatic antioxidant defense mechanism of sorghum under water stress.	R. N. Deshmukh	Botany	Flora and Fauna	2017	2454-8499	-	<a href="https://drive.google.com/file/d/1GIgL2NnBycGqTl_awn842UxULJ3brqI6/view?usp=sharing">https://drive.google.com/file/d/1GIgL2NnBycGqTl_awn842UxULJ3brqI6/view?usp=sharing</a>
29.	Yield Components of wheat ( <i>Triticum aestivum</i> L.) under AMF and water stress conditions	S. L. Khapke	Botany	Flora and Fauna	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1BOhpY4IX_OQaXgjA73dX_MAFLfOlgoRn/view">https://drive.google.com/file/d/1BOhpY4IX_OQaXgjA73dX_MAFLfOlgoRn/view</a>
30.	Ameliorative effect of am fungi on wheat ( <i>triticum aestivum</i> l.) Under water stress conditions.	S. L. Khapke	Botany	Flora and Fauna	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1rgxf2s_A4vtbgP8yHCnfLho6dNGhqxr/view">https://drive.google.com/file/d/1rgxf2s_A4vtbgP8yHCnfLho6dNGhqxr/view</a>
31.	Impact of arbuscular mycorrhizal fungi on yield components and biochemical changes in wheat ( <i>triticum aestivum</i> )	S. L. Khapke	Botany	Flora and Fauna	2017	0971-6920	-	<a href="https://drive.google.com/file/d/1BbtVdvjntHAUC23qbhtocbmYzslzDQ4-/view">https://drive.google.com/file/d/1BbtVdvjntHAUC23qbhtocbmYzslzDQ4-/view</a>
32.	A Record of Parvirostrum retilatam Fuhrmann 1908 from the intestine of Partridge Prancolinus pondicerianus	S. N. Pokale	Zoology	Flora and Fauna	2017	ISSN 0971-6920	-	<a href="https://journalseker.researchbib.com/view/issn/0971-6920">https://journalseker.researchbib.com/view/issn/0971-6920</a>
33.	Role of Agriculture market structure in rural development,	S. R. Wagh, S. S. Thube	Zoology	Nat. J. on Challenges before rural dev. In India,	2017	(ISSN: 2250 – 0383) 29.	-	<a href="https://drive.google.com/file/d/11r0wLv2dylhufxOLj_34D1F4PUAexSjY/view?usp=sharing">https://drive.google.com/file/d/11r0wLv2dylhufxOLj_34D1F4PUAexSjY/view?usp=sharing</a>

34.	Organic Farming: A sustainable step in agriculture sector,	S. R. Wagh	Zoology	Vision Research Journal for Life Sciences,	2017	(ISSN: 2348 – 5817) 30.	-	<a href="https://drive.google.com/file/d/1mVFT16sJD7KjoWWUdqoNmi-1vGJm9JCJ/view?usp=sharing">https://drive.google.com/file/d/1mVFT16sJD7KjoWWUdqoNmi-1vGJm9JCJ/view?usp=sharing</a>
35.	Entomofauna of Katalwedhe Lake of Parner Tahsil, District. Ahmednagar, (M.S.), India,	S. R. Wagh	Zoology	Flora and Fauna,	2017	(ISSN: 2456 – 9364) (Online) (ISSN: 0971 – 6920) (Print) 31.	-	<a href="http://floraandfauna.org.in/asp_file/home.aspx">http://floraandfauna.org.in/asp_file/home.aspx</a>
36.	Synthesis and Characterization of A Visible Light Photocatalyst	D. R. Thube Hojin Ryu	Chemistry	<i>International Research Journal</i>	2017	2202-2821	Yes	<a href="https://www.interesterejournals.org/">https://www.interesterejournals.org/</a>
37.	Synthesis of some fluorinated aurones and chromones	S. G. Kundlikar	Chemistry	<i>Indian Journal of Heterocyclic Chemistry</i>	2017	2456-4311	Yes	<a href="https://connectjournals.com/ijhc">https://connectjournals.com/ijhc</a>
38.	Synthesis of some multihalogenated pyrazolyl benzofurans and benzoxazoles	S. G. Kundlikar	Chemistry	<i>Indian Journal of Heterocyclic Chemistry</i>	2017	2456-4311	Yes	<a href="https://connectjournals.com/ijhc">https://connectjournals.com/ijhc</a>
39.	Multimedia and English language and literature teaching	A. Y. Mahankale	English	Literary Endeavour	2018	ISSN0976-299X	-	<a href="https://www.literaryendeavour.org/">https://www.literaryendeavour.org/</a>
40.	Pedagogy in Language and Literature: The use of Language laboratory as an effective tool	A. B. Chindhe	English	Literary Endeavour	2018	ISSN0976-299X	-	<a href="https://www.literaryendeavour.org/">https://www.literaryendeavour.org/</a>
41.	Land Use & Land Cover Classification in Central Part of Maharashtra Using IRS-P LISS-IV	R.E. Najan	Geography	Current Global Reviewer	2018	2319-8648	Yes	<a href="https://drive.google.com/file/d/1CfHSVEXQGrHs-lp0kUQNCPXEtCreIpA_/view?usp=sharing">https://drive.google.com/file/d/1CfHSVEXQGrHs-lp0kUQNCPXEtCreIpA_/view?usp=sharing</a>

	Image							
42.	Physical Impact of Tourism Development	R. E. Najan	Geography	Research Journey	2018	2348-7143	Yes	<a href="https://drive.google.com/file/d/1creK_9xhDISNsPate5yDpFCWokrVKwyF/view?usp=sharing">https://drive.google.com/file/d/1creK_9xhDISNsPate5yDpFCWokrVKwyF/view?usp=sharing</a>
43.	Brief Analysis of Work done on Temporal Changes in Agriculture Land Use Pattern in India from 1985-2010	R. E. Najan	Geography	International Journal of Multifaceted & Multilingual Studies	2018	2394-207x	Yes	<a href="https://drive.google.com/file/d/14Y12aTG15M_1cTQgluQ-WErgckGx_ZvV/view?usp=sharing">https://drive.google.com/file/d/14Y12aTG15M_1cTQgluQ-WErgckGx_ZvV/view?usp=sharing</a>
44.	The study of rain water harvesting system in New Arts, Com. & Sci. College Parner Dist- Ahmednagar (M.S.)	D. S. Ghungarde	Geography	Flora & Fauna	2018	0971-6920	Yes	<a href="https://drive.google.com/file/d/1JLkPvrPA PooCT80dmkJKL-iP_cEgOkfr/view?usp=sharing">https://drive.google.com/file/d/1JLkPvrPA PooCT80dmkJKL-iP_cEgOkfr/view?usp=sharing</a>
45.	Parner Talukyatil Koradvahu Sheticha Bhaugolik Aabhyas	J. D. Mhaske	Geography	Current Global Reviewer	2018	2319-8648	Yes	<a href="https://drive.google.com/file/d/1z68mTfL1LUxdcyvtayORzbAVVTtKm94N/view?usp=sharing">https://drive.google.com/file/d/1z68mTfL1LUxdcyvtayORzbAVVTtKm94N/view?usp=sharing</a>
46.	Geographical Analysis of Irrigation Resources: A Case Study of Ahmednagar District	A. V. Thokal	Geography	Shodhankan	2018	2250-0383	Yes	<a href="https://drive.google.com/file/d/1srXQP9LfdGx_C2H4P OGIduLgW9tDh77/view?usp=sharing">https://drive.google.com/file/d/1srXQP9LfdGx_C2H4P OGIduLgW9tDh77/view?usp=sharing</a>
47.	Geographical Analysis of Tribal Peoples of India	A. V. Thokal	Geography	Int. Research J. of Multidisciplinary Studies	2018	2454-8499	-	<a href="https://drive.google.com/file/d/1S7mzxDXf_rRphgh-80LmGBgfbPNsUD0Z/view?usp=sharing">https://drive.google.com/file/d/1S7mzxDXf_rRphgh-80LmGBgfbPNsUD0Z/view?usp=sharing</a>
48.	73 vya ghatanadurustiche Mahatva	A. S. Fulari	Political Science	Vidyawarta Special Issue Page	2018	2319 9318	-	<a href="https://drive.google.com/file/d/1O335TduWA">https://drive.google.com/file/d/1O335TduWA</a>

				no. 63				<a href="https://drive.google.com/file/d/1EVLG9qY2j2jmiH1WSvgwGydQ5bqEa4QN/view?usp=sharing">wPVONbZ_HR owlBWC6- EBzZP/view? usp=sharing</a>
49.	Agriculture Productivity in India	D.P. Sontakke	Economics	Printing Area Vol 01, Special Issue, Page no 126	2018	ISSN:239 45303	-	<a href="https://drive.google.com/file/d/1EVLG9qY2j2jmiH1WSvgwGydQ5bqEa4QN/view?usp=sharing">https://drive.google.com/file/d/1EVLG9qY2j2jmiH1WSvgwGydQ5bqEa4QN/view?usp=sharing</a>
50.	Recent Trends in Research Methodology	D.P. Sontakke	Economics	International Journal of Multifaceted & Multilingual Studies Vol V, Issue II	2018	ISSN:239 4-207X	-	<a href="https://drive.google.com/file/d/1kH-Oqc_e_x8WSB2JLyEMDOWMCK-Q5YPR/view?usp=sharing">https://drive.google.com/file/d/1kH-Oqc_e_x8WSB2JLyEMDOWMCK-Q5YPR/view?usp=sharing</a>
51.	Problems and Prospects of Agriculture Marketing goods	A.V. Ghorpade	Economics	Printing Area Vol 01, Special Issue, Page no 49-52	2018	ISSN 2394-5303	-	<a href="https://drive.google.com/file/d/1As9_Kdmr7YuR6yEzvkLOIRe7TMkaW4Nw/view?usp=sharing">https://drive.google.com/file/d/1As9_Kdmr7YuR6yEzvkLOIRe7TMkaW4Nw/view?usp=sharing</a>
52.	Working Women having Stress at Home and Work Place and its Management with Reference to Ahmednagar District Rural Area	S. S. Thube	BBA-CA	International Research Journal of Management Sociology & Humanities	2018	ISSN:227 7-9809	Yes	HTTPS://DOI.ORG/10.32804/I RJSMH
53.	Sustainability of Soil Health and Organic Farming	S. S. Thube	BBA-CA	International Research Journal Of Multidisciplinary Studies	2018	ISSN:245 5-8499	Yes	<a href="http://www.irjms.in">www.irjms.in</a>
54.	The Use of ICT in Physical Education	R. A. Shinde, S. S. Thube	BBA-CA	An International Multidisciplinary Quarterly Research Journal, Ajanta	2018	ISSN 2277-5730	Yes	<a href="http://www.sjifactor.com">www.sjifactor.com</a>
55.	Application	B. B.	Library	Research	2018	2348-7173	Yes	<a href="https://drive.google.com/">https://drive.google.com/</a>



	of ICT in Academic Libraries	Shelke		Journey				<a href="https://drive.google.com/file/d/1GqxT98n_YzCUPjjftxGwTwN9V10BnHa/view?usp=sharing">https://drive.google.com/file/d/1GqxT98n_YzCUPjjftxGwTwN9V10BnHa/view?usp=sharing</a>
56.	Use of ICT in modern Libraries	B. B. Shelke	Library	IJMMS	2018	2394-207X	Yes	<a href="https://drive.google.com/file/d/1MsVKR1g9EVqV3NPQymb29qDpQOBqKIs0/view?usp=sharing">https://drive.google.com/file/d/1MsVKR1g9EVqV3NPQymb29qDpQOBqKIs0/view?usp=sharing</a>
57.	Synthesis and Characterization of Bismuth Ferrite by Chemical Route	A. V. Mancharkar V. B. Sherkar	Physics	Journal of applied science and engineering	2018	ISSN 2322-0015	Yes	<a href="http://www.irjse.in/">http://www.irjse.in/</a>
58.	Effect of short term magnetic field on germination at growth of the plants	A.V. Mancharkar A. S. Khade	Physics	Journal of applied science and engineering	2018	2322-0015	Yes	<a href="http://www.irjse.in/">http://www.irjse.in/</a>
59.	Synthesis and characterization of aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ) nanoparticles and its application in azo dye decolourisation	V. P. Dhawale, V. B. Khobragade, K.C. Mohite, S. D. Kulkarni	Physics	International Journal of Environmental Chemistry	2018	ISSN: 2456-5245	-	<a href="http://www.sciencepublishinggroup.com/ijec">http://www.sciencepublishinggroup.com/ijec</a> doi: 10.11648/j.ijec.20180201.13
60.	Dielectric behaviour, Resistivity and thermoelectric power of multiferroic composite	S.L.Kadam	Physics	Journal of applied science and engineering	2018	2322-0015	Yes	<a href="http://www.irjse.in">www.irjse.in</a>
61.	A new species of <i>Davainea domesticusae</i> N. SP. Blanchard, 1891 ( <i>Davainea</i> , 1860) from <i>Gallus domesticus</i>	S. N. Pokale	Zoology	IJBAT	2018	ISSN 2347-517X	-	<a href="https://ijrbat.in/">https://ijrbat.in/</a>

62.	Synthesis and Characterization of Some New Thiadiazole, Triazole, and Thiazole Derivatives	D. R. Thube V.P. Landage, B. K. Karale	Chemistry	<i>Indian Journal of Heterocyclic Chemistry</i>	2018	0971-1627	Yes	<a href="https://connectjournals.com/ijhc">https://connectjournals.com/ijhc</a>
63.	Synthesis and Characterization of Gd doped Y2O3 Phosphor Material	D. R. Thube S. R. Kale	Chemistry	<i>Int. Journal of Eng. &amp; Res.</i>	2018	2322-0015	Yes	<a href="https://www.irjse.in/">https://www.irjse.in/</a>
64.	A Short Synthesis of Sesquiterpene Ar-himachalene <i>Cedrus Deodara</i> by Heck Reaction	T. S. Thopate	Chemistry	<i>J. Mountain Research</i>	2018	0974-3030	Yes	<a href="http://www.sharadpauri.com">www.sharadpauri.com</a>
65.	Silica sulfuric acid an efficient reusable solid acid catalyst for Synthesis of N-substituted phenyl maleimide	T. S. Thopate C. D. Bhenki	Chemistry	<i>Indo Asian Research Reporter</i>	2018	2454 - 3306	Yes	<a href="http://www.irasg.com">www.irasg.com</a>
66.	Characterization of nanomaterials at ordinary laboratories	R.S. Diggikar, T. S. Thopate	Chemistry	<i>Int. Res. J. multi. Res. &amp; Study</i>	2018	2454-8499	Yes	<a href="http://www.irjms.in">www.irjms.in</a>
67.	Personality of and international Coach: Suresh Gujrati: A Case Study	S.M.Gaikwad	Physical Education	<i>Ajanta Int. Res. J. multi. Res.</i>	2018	2277-5530	Yes	<a href="http://www.sjifactor.com">www.sjifactor.com</a>

## Research articles

A. 2021-22

### 1. Identity Crisis in Henrik Ibsen's *A Doll's House* with Feminist Perspective

	IMPACT FACTOR – 5.61	<b>LangLit</b>	ISSN 2349-5189	
<i>An International Peer-Reviewed Open Access Journal</i>				
<b>IDENTITY CRISIS IN HENRIK IBSEN'S <i>A DOLL'S HOUSE</i> WITH FEMINIST PERSPECTIVE</b>				
<b>DR. BHARATE PRANJALI PANDURANG</b> New Arts, Commerce and Science College, Parner.				
<b>ABSTRACT</b>				
<p><i>The main issue on which the drama A Doll's House is written. It is the issue of women. Its subject is of women's status in the society and their treatment by men, the lack of true love and respect for a wife by a husband, and the lack of justice and dignity in the treatment of women in the society itself. A Doll's House is a blooming field for feminist criticism. Feminist critics have seen Ibsen as a social realist, a, revolutionary thinker, and a benefactor of the suppressed, repressed and oppressed women of the nineteenth century Norway and Europe. Indeed, the play concerns a woman's right to individual freedom and the ways in which marriage, especially marriage in stiflingly conventional provincial Norwegian society frustrates and thwarts the individuality of a woman who has all the potentials that her husband has. Nora, like most women of our contemporary society, has all the inherent talents for developing into a successful member of the society, as much as her husband or any man. In fact, her critical mind, sense of justice, readiness to change, absence of hypocrisy and narrow-mindedness in relation to what is called tradition, and such other positive qualities would help her to make more progress and contribute to the development of her personality, her family and her society: if she is to get the opportunities and regard of her silly husband. In discussion of A Doll's House as a feminist play, or simply as a play about women, it is necessary to rethink. When asked about his intention in the play, A Doll's House, Ibsen claimed that the play was not a 'feminist' play; it was a 'humanist' play. What Ibsen meant was that the theme of this play was the need of every individual, whether man or woman, to find out the kind of person he or she really is and to strive to become that person. Ibsen meant that it was not about women only: his suggestion was that it is about justice to humanity in general. It means that we look at the problem from a higher parlance of human concern. He saw that an injustice was done to women, and he wrote about it. This is to say that the play is about injustice first and then about women. It could be about injustice upon old men or children or the poor people. The play's concern is more humanitarian than feminist. Ibsen was humanist writer, than feminist; indeed, he saw no reason why one should be 'feminist' when he is already humanist.</i></p>				
<p>Ibsen's refusal to limit the play's meaning to being 'feminist' does not change the emotional and psychological effect of the play on the audiences and the readers. It is a woman's predicament with which the play deals; it is the disillusionment of a wife that is the subject of the play; it is the drastic step taken by a-wife with which the play ends; it is the woman in the</p>				
<b>Vol. 8 Issue 1</b>		<b>256</b>		<b>August, 2021</b>
Website: <a href="http://www.langlit.org">www.langlit.org</a>		Contact No.: +91-9890290602		
Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI				



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

play who wins our maximum sympathy. Whatever may have been Ibsen's intentions, the effect of the play is to arouse in us a great deal of sympathy for the cause of women.

In discussion of *A Doll's House* as a feminist play, or simply as a play about women, it is necessary to rethink. When asked about his intention in the play, *A Doll's House*, Ibsen claimed that the play was not a 'feminist' play; it was a 'humanist' play. What Ibsen meant was that the theme of this play was the need of every individual, whether man or woman, to find out the kind of person he or she really is and to strive to become that person. Ibsen meant that it was not about women only: his suggestion was that it is about justice to humanity in general. It means that we look at the problem from a higher parlance of human concern. He saw that an injustice was done to women, and he wrote about it. This is to say that the play is about injustice first and then about women. It could be about injustice upon old men or children or the poor people. The play's concern is more humanitarian than feminist. Ibsen was humanist writer, than feminist; indeed, he saw no reason why one should be 'feminist' when he is already humanist.

Thus, the play seeks to expose the injustice upon women, which was inherent in the culture and attitude of the male-dominated society of the late nineteenth century Norway. It is basically a demand for justice, and whether we call it justice to humanity or justice to women, it is firstly and specifically justice to women indirectly, justice to humanity.

Most modern readers like to call *A Doll's House*, a feminist play, because of many reasons. This is not to say that Ibsen was an arrant feminist, nor to say that the play is only about women, because it deals primarily with the desire of a woman to establish her identity and dignity in the society. It is about the disillusionment of a wife about how she has been dominated and how her basic right, her right to be someone, has been ruthlessly destroyed in the name of love by her husband.

The drama is about the real and a burning social issue of a revolution that had become essential for the society to progress. Not a small matter, the very title of the play is about the woman in it, and that title also emphatically suggests the treatment of her as if she was a lifeless doll. She has a house and now needs to search for a home, on her own.

The slamming of the door bears paramount significance in the play. Nora, the protagonist of Ibsen's much discussed play *A Doll's House* is a developing character. In the earlier half of the play we see her as a submissive wife and a dutiful mother. As she knows her husband more she becomes aware of her own position and more self-conscious.

All her life she has lived according to her husband's will with no sense of self. Her patronizing and domineering husband is a representative of the patriarchal society. Her slamming the door at the end of the play is thematically significant because it symbolically stands for Nora's revolt against her husband and by extension a slap in the face of patriarchy.

Nora was dominated and controlled by her father before marriage and afterwards her husband was the agency for dominating her. Helmer never treated her as equal. He treated like doll in his hand. He treated her as his chattel. She existed for her husband. However, she had always expected that her husband would come to her aid when she will be in trouble. She had been waiting for miracles to happen in the Krogstad's case too. She had the fear that the villain

**Vol. 8 Issue 1****257****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

would expose everything and their family would be undone. Contrary to her expectation, her husband behaved like a hypocrite concerned more with morality and a notion of social prestige not with his wife's welfare and care. He came out in his true colors. Nora realized that her husband didn't see her as an individual, but only as a wife and mother. She knew what her husband was like. She wanted to dissolve her ties with him by abandoning him and the children. She thought her duty towards herself was above her duty as a mother and wife. Her status as a non - entity was a product of the functioning of patriarchy. She wanted to educate herself and establish her own identity. Slamming the door is the explosion of her energies against patriarchy. It's a challenge to patriarchy. It's a bold act of revolt against male domination. The crux of the whole play hinges on this single incident. It is an individual's search for freedom.

It signifies that a lady who realizes the necessity to cultivate her full identity must be ready to sacrifice even an atom of care and concern for her children and husband. Motherly duty, the instinct of motherhood, and unconditional love for her husband are the real obstacles on the path to cultivate an identity for those ladies who are rebellious. To slam the door is to turn a deaf ear to the call of motherly duty. Maternal privilege blocks the progressive march towards the formation of identity. A lady in whom a feminist awakening has come must battle against the fascinating call of motherhood to slam the door is tantamount to discarding maternal and family role. To slam the door means to decide to rise above the temptation of baser impulses like feelings and affections. To slam the door is to slam the metaphoric door of love, sentiment and affection. To slam the door is to prepare to open the new door of identity and individuality. To slam the door means to encourage the conscious women that women should partake of active revolt against male dictatorship. The actual significance of the slamming of the door lies in the presentation of the fact that even such an ignorant and submissive wife Nora go to the violent level of launching an active revolt against male domination and dictatorship. Its metaphoric significance emerges from the fact that the slamming of the door stands for the optimistic emergence of a new revolution that is called feminism.

The title of A Doll's House is symbolically significant as well as highly suggestive of the message. Ibsen seems to have intended to convey through the play. There are two important aspects of the play, which the title directly points one is the doll and second is the house. The doll represents Nora the central character, and the house stands for the house of Helmer where Nora lives.

We read the play carefully and understand it critically; we feel that the word doll has been used in the title in a rather ironic manner. Doll signifies passivity, beauty, and the basically feminine nature which is seen in Nora when we look at her from outside. Indeed, from the viewpoint of Helmer, who is basically a traditionally possessive husband, Nora the doll is something like an inanimate object with which he can play and enjoy. As Nora says at the end of the play, she had been her father's doll until her marriage and she has been Helmer's doll for eight long years since her marriage. The word 'doll' suits Nora if we look at her with the traditional or uncritical eye, as Helmer or Mrs. Linde would look, or rather as they would like Nora to be. The reality is however that Nora has all the potential of being a real human being, seeking identity and dignity, and conscious of all the limitations imposed by her husband and his society's traditions. Nora is not a real doll but an apparent one. She is

**Vol. 8 Issue 1****258****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

subservient; she is designed as per the demand and desires of Helmer, who would like to think that he makes her what he wants her to be; she is also perfect and unchanging, insentient and easy to handle like lifeless dolls, that is, in the eyes of Mr. Helmer. Her opinions and interests are fully determined and controlled by him. She is his doll, like she was her father's doll till marriage, Helmer possesses her, basically and almost only for fun. Nora has herself explained the fun that her husband obtained while their playhouse.

*"...But our home has never been anything but a playroom, I've been your doll-wife, just as I used to be Papa's doll-child. And the children have been my dolls. I used to think it was fun when you came in and played with me, just as they think it's fun when I go in and play games with them. That's all our marriage has been...."*

Another ironic indication in the use of the word dolls is that the house does not belong to the doll. Nor is it made or maintained for her. The house, not home, is Mr. Torvald Helmer's. In one sense, he possesses the house, along with the doll! The house, therefore, seems to belong to the doll; but actually it is her cage. We say that the cover of a book belongs to it, or that it is the book's cover. It is only in that sense that the house belongs to the doll. Thus, Nora is the doll, and the house is a cage or 'case' for her. Indeed, the theme of the play suggests that her house (or home, or family) is a limitation on her freedom and prospects of life.

The word house also has symbolic suggestions and thematically significant connotations. House, as contrasted to home, means 'a structure or shelter to live in', unlike home which means 'a house where one's family lives and one gets love and care'. Home is an emotively charged word, whereas "house" is not. So, in the case of the title of this play, the word 'house' as the connotation of 'just a place to live in', a shelter, 'a lifeless thing', and so on. Indeed, for Nora, the house of Helmer has never been a home; it has been a house. As we see her in the beginning, Nora is mainly satisfied with her living place, her house; so, it is her 'home' indeed. But, as she finds out later, it has been a house, a cage; she has been living there as a plaything until her expectation of an act of, sacrifice by her husband, or what she calls "miracle", fails to happen. When she is disillusioned about her place and value, her dignity and respect from her husband, she realizes that her husband has been treating her like a child treats its doll. She has the feeling of that home which has been like the doll's house. That is the meaning of the title. The title is thus very appropriate and is also indicative of the theme of the play.

**REFERENCES:**

1. Ibsen, Henrik (trans McLeish). *A Doll's House*, Nick Hern Books, London, 1994
2. Unwin, Stephen. *Ibsen's A Doll's House (Page to Stage Study Guide)* Nick Hern Books, London, 1997
3. William L. Urban. "Parallels in A Doll's House." *Festschrift in Honor of Charles Speel*. Ed. by Thomas J. Sienkewicz and James E. Betts. Monmouth College, Monmouth, Illinois, 1997.
4. External links
5. Wikisource has original text related to this article:
6. *A Doll's House* Norwegian Wikisource has original text related to this article: Et dukkehjem
7. *A Doll's House* at the Internet Movie Database
8. *A Doll's House: A Study Guide*

**Vol. 8 Issue 1****259****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI

2. Development in Natural Attractions Centers in the Country

Peer reviewed Journal		Impact Factor: 7.265	ISSN-2230-9578
<p><b>Journal of Research and Development</b></p> <p><i>A Multidisciplinary International Level Referred Journal</i></p> <p>June 2021 Volume-11 Issue-15</p> <p><b>Sustainable Development Goals: Initiatives, Execution and Challenges</b></p>			
<p><b>Chief Editor</b> Dr. R. V. Bhole 'Ravichandram' Survey No-101/1, Plot No-23, Mundada Nagar, Jalgaon (M.S.)</p>	<p><b>Guest Editor</b> Dr. Prof. H. B. Rathod Principal Gramin (ACS) Mahavidyalaya, Vasantnagar (Kotgyal), Tal. Mukhed</p>		
<p><b>Executive Editors</b> Dr. V. T. Naik Mr. B. C. Rathod</p>			
<p><b>Co-Editors</b> Dr. D. K. Kendre Mr. S. A. Jewale Dr. U. D. Padamwar</p>			
<p><b>Address</b> 'Ravichandram' Survey No-101/1, Plot, No-23, Mundada Nagar, Jalgaon (M.S.) 425102</p>			
			

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1June-2021, Volume-11, Issue-15,  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

## **Journal of Research and Development**

*A Multidisciplinary International Level Referred and Peer Reviewed Journal*

*1 June-2021 Volume-11 Issue-15*

*On*

*Sustainable Development Goals: Initiatives, Execution and  
Challenges*

### **Chief Editor**

Dr. R. V. Bhole

'Ravichandram' Survey No-101/1, Plot, No-23,  
Mundada Nagar, Jalgaon (M.S.) 425102

### **Guest Editor**

Dr. Prof. H. B. Rathod

Principal

Gramin (ACS) Mahavidyalaya, Vasantnagar (Kotgyal), Tal. Mukhed

### **Executive Editors**

Dr. V. T. Naik

Mr. B. C. Rathod

### **Co- Editors**

Dr. D. K. Kendre

Mr. S. A. Jewale

Dr. U. D. Padamwar

### **Editorial Board**

Mr. Thorve A. B.	Prof. Zarnapalwad S. S.	Prof. Kalyan G. S.	Dr. Kshirsagar S. G.
Shri. Detha S. K.	Shri. Kalimath S. K.	Shri. Babarao S.	Mr. Kankute S R.
Prof. Shinde P. A.	Prof. Patwar S. K.	Sow. Itkapalle A. P.	Dr. Gore S. Y.
Shri. Mathpati G. H.	Shri. Patil S. S.	Mr. Naik N. U	

Published by- Principal, Dr. Prof. H. B. Rathod, Gramin (ACS) Mahavidyalaya, Vasantnagar (Kotgyal), Tal. Mukhed

The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.

© All rights reserved with the Editors



*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1June-2021, Volume-11, Issue-15,  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

CONTENTS		
Sr. No.	Paper Title	Page No.
1	Role of MSME in Sustainable development <b>Dr. Satish Laxmanrao Kundalwar</b>	1-2
2	The Economic Impacts of Tourism <b>Dr. Ashok Shamrao Patil</b>	3-4
3	To Study Of Population In Parbhani City <b>Dr.B.T.Patil</b>	5-7
4	Role of the Teachers and parents in value education of India <b>Mr. Sanjay Daulatrao Bagul</b>	8-11
5	Sustainable Development-Factors and Aims <b>Dr. A.P.Barve</b>	12-14
6	'Oppression' as a Social Issue in Mahasweta Devi's <i>Draupadi</i> <b>Dr. G.Ramana Reddy</b>	15-17
7	Rainfall Variability In Akola District A Geographical Study <b>Dr. Sunil Ramrao Rapanwad, Mahananda Linguram Dinde</b>	18-20
8	Ground Water Level at Selected Areas in Amravati City <b>Shri Gopal Bhalavi</b>	21-23
9	A Study of Cropping Pattern in Jalna District (MS) <b>Mr. Pramod Deshmukh</b>	24-27
10	Role of Kharif crop weeds in human health <b>Anjali B. Shinde</b>	28-31
11	Role of Meaningful Data in Life of Agriculturist: Case Study form Ahmednagar District of Maharashtra <b>Dr. Ganesh K. Chavhan , Dr. Prakash N. Salve, Dr. Raghunath E. Najan</b>	32-37
12	"Talukawise Male And Female Percentage Of Literacy In Osmanabad District (1981-2001): A Geographical Analysis" <b>Mr.Rajaram D.Davankar</b>	38-40
13	Contribution of Literature in Social Development <b>Gangadhar P. Aaklod, Dr. Umakant D. Padamwar</b>	41-42
14	Gender Sensitization for Sustainable Development <b>Dr. Shaikh M. A. Raheman</b>	43-45
15	Cropping Pattern In Gangakhed Taluka: A Geographical Study <b>Dr. S. H. Kolpe</b>	46-49
16	"Effect of weed bio resources on Growth Development of Cash Crop Sugarcane" <b>Prakash N. Gholap</b>	50-53
17	Landuse Pattern in Solapur District: A Geographical analysis <b>Dr. Dnyanoba Gorakh Shinde</b>	54-56
18	Gender Equality Audit: An Analysis of 'Yuvakbharati' Textbooks of Maharashtra State Bureau of Textbook Production and Curriculum Research-Pune <b>Dr. Samrat Ashok Jadhav</b>	57-61
19	Empowerment Of Women In India <b>Dr. Mahesh L. Dharmapurikar</b>	62-65
20	Online Education in India – qualities and challenges: A study <b>Mr. Rahul Ramakantrao Kulkarni, Dr..Zampalwad S S, Birajdar S P</b>	66-68
21	Literature is the Mirror of Human Life <b>Smt. Poonam Prakashrao Mane</b>	69-70
22	A Comparative Study Between The College Students' Participation In Sports Before Covid-19 Outbreak And During The Outbreak. <b>Sk Rasid Mahammad</b>	71-74
23	Library Services provided during COVID-19 Pandemic to Competitive Exam, Aspirants: A Survey <b>Mr. Guldagad Kiran Dhondiram</b>	75-76
24	Creative Problem-Solving <b>Shri. Raju Laxman Kokare, Shri.Abhijeet Balaso Giri</b>	77-78
25	A Study on Growth of E-Banking in India- An Year Analysis <b>Jayalaxshmi VA</b>	79-85
26	Laser And Their Applications <b>Sanjay Awadhane , Devidas Kendre</b>	86-89
27	Importance Of Environmental Science & Studies <b>Dr. R.D. Khakre</b>	90-92
28	B. R. Ambedkar's Work for Women and Child Workers – A Study <b>Dr. Prashant M. Puranik</b>	93-95
29	Customer Perception Towards E Banking-An Innovative Platform <b>Rotte Sai Akash</b>	96-99
30	The Study Of Crop Diversification Region Of Pune District. (M.H.) <b>Shashikant Raghunath Memane, DR. Dhanushwar Ramesh Shyamrao</b>	100-103

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1June-2021, Volume-11, Issue-15.  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

31	Importance of Yoga in Maintaining Good Health <b>Khedkar Vishnu Tatyaba</b>	104-106
32	Effect of Gender and Residence on Academic Achievements of Post Graduate Mathematics Students <b>K. L. Bondar, N. H. Kulkarni, A. P. Gingine</b>	107-110
33	S.D.Gs, and C.S.R - The Potential Partners in Indian 2030 vision <b>Dr. Sindhu Varghese</b>	111-113
34	Spatio-Temporal Variations Of Rural And Urban Sex Ratio In Chandrapur District : A Geographical Perspectives <b>Dr. Godawari A. Gaurkar</b>	114-115
35	"Talukwise Decadal Variation Of Rural Dependency Ratio In Parbhani District :(1991-2011)" <b>Dr. Bhagwan P. Shendge</b>	116-118
36	Growth And Changes Of Sex Ratio And Literacy In Satara District <b>Dr. Rathod Sunil Dhondiram</b>	119-122
37	Green Libraries in India <b>Mrs. Asha Chandrashok Jirage</b>	123-126
38	Sustainable Development <b>Dr. Chandrasekhar C. Konkai</b>	127-131
39	Sustainable Development: Basic Legal Aspects <b>Dr. Suresh G. Santani</b>	132-134
40	Financial Inclusion and the Role of Self-Help-Groups for Sustainable Rural Development in Rural Assam, North East India <b>Dr. Diganta Kr. Das</b>	135-137
41	Challenges in Attaining Sustainable Development Goals in India <b>Ramakant Kasture</b>	138-140
42	Challenges in Good Health and Well Being <b>Dr. Aparna Ashtaputre-Sisode</b>	141-142
43	The Sustainable Development Goal And Challenge <b>Dr. Lt. Abasaheb Dhondiba Jadhav</b>	143-145
44	Decent Work & Economic Growth <b>DR. Bajarang Narayan Jadhav</b>	146-149
45	Sustainable Development through Language Learning <b>Dr. Shailendra K. Bansode</b>	150-151
46	Circlewise Population Distribution of Rural Settlements in Shrigonda Tahsil: A Geographical Analysis <b>Dr. Vijay J. Dalvi, Dr. Nitin T. Deshmukh</b>	152-155
47	Violence against Girls and Women due to Socio-Economic Factors: Ahmednagar District. <b>Dr. Prakash N. Salve, Dr. Shailendra K. Bansode, Dr. G. K. Chavhan</b>	156-158
48	Development in Natural Attractions Centers in the Country <b>Dr. Raghunath E. Najan, Dr. Ganesh K. Chavhan, Dr. B. G. Rashinkar</b>	159-161
49	The Role of Sustainable City and Community: A Case of Burma <b>Dr. Shyam Pundlikrao Patil</b>	162-168
50	Women's Empowerment :A Review <b>Shilpa Namdevrao Shendge</b>	169-172
51	Impact of Groundwater Salinisation on Sugarcane Production in Middle Pravara Basin (MS) <b>Dr. Sopan. N. Shingote</b>	173-174
52	A Way Ahead: The Future Role of Information Technology In The Improvement of Indian Farmers' Economical Condition <b>Dr. Akabarsaheb Babulal Nadaf</b>	175-177
53	Studies of Calotropis Procera L. Leaf Extract on Linear Growth of Colletorichum Capsici Causing Spot of Tumeric <b>Dr. M. S. Pentewar</b>	178-179
54	The Role of Literature in Social Development <b>Ravindra Hanmantrao Sagar</b>	180-182

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1 June-2021, Volume-11, Issue-17  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

### **Development in Natural Attractions Centers in the Country** **Dr. Raghunath E. Najan<sup>1</sup> Dr. Ganesh K. Chavhan<sup>2</sup> Dr. B. G. Rashinkar**

<sup>1</sup>New Arts, Commerce & Science, College, Parner  
<sup>2</sup>K. J. Somaiya College of Arts, Commerce & Science, Kopergaon  
<sup>3</sup>Aabasaheb Kakade College, Bodhegaon, Dist- A. Nagar

#### **Abstract:**

The post second world war period saw an unprecedented growth in international tourism. Tourism, unlike other development options such as manufacturing, mining, forestry etc was widely perceived to be a clean and renewable industry. Because it drew upon 'free' natural, historical, social and cultural resources it was thought to be less capital intensive in its requirements for development. This paper is based on the secondary data related to the natural tourism development and its future prospectus in India.

*Key words: Natural Tourism, Tourism Industry, Tourism Centres.*

#### **Introduction:**

The India has a large treasure of natural beauty, archaeological and architectural monuments. In addition, there are many hill resorts, beach resorts, mountains and rivers etc. The northern part of India is famous for its hills, plains, rivers, and monuments etc- the Himalayas, Kashmir Valley, the Ganges. The southern region has many temples, beaches, hill resorts, cultural heritage etc. Places like Chennai, Madurai, Bangalore and Thiruvananthapuram are important centers of tourism in South India. The eastern region has tourist attraction like the Gir Forest, pilgrim centers like Konarak and industrial centers like Kolkata.

There are colorful tribal life-styles of the North Eastern States of Nagaland, Mizoram, Tripura and Manipur with their folk culture is also worth mention. In the central Indian states of Orissa and Madhya Pradesh, tribal village life has resulted in a variety of artistically executed handicrafts. India's mountains provide opportunities for mountaineering and trekking. Beaches provide lazy sun bathing as well as wind surfing and snorkeling and its jungles provide shooting wildlife. India's natural beauty and its geographic location can be compared with that of any other country in the world and its rich heritage makes it unique in the world.

#### **Objective:**

1. To define Tourism Development in India
2. To view of natural tourism centers in country.
3. To understand the Condition of Tourism development and Future of Natural Tourist Centers in India.

#### **Tourism Development in India:**

In India the emergence of alternative tourism promotes natural and cultural events and others. Few promising alternative tourism paths include green tourism, ecotourism, eco cultural tourism, heritage tourism etc. Ecotourism developed in India in 1970s and 1980s. Ecotourism was globally identified as a means of achieving twin goals of bio diversity conservation and sustainable development. Both short-term goals and long term goals can be achieved without sacrificing one's own interests. Sustainable tourism and nature tourism are umbrella concepts that include ecotourism.

India, the land of varied geography offers several tourist destinations that not just de-stress but also rejuvenate people. There are several ways to enjoy Mother Nature in the most pristine way. The few places like the Himalayan region, Kerala, the North-East India, Andaman and Nicobar Islands and the Lakshadweep Islands are some of the places where you can enjoy the treasured wealth of the Mother Nature. The return on investment in tourism from the point of view of employment generation is much higher compared to agriculture and manufacturing sector. The following table reveals this:-

Contribution of Different Economic Sectors to the Employment

<b>Various Sectors</b>	<b>Percentage of Job Opportunity</b>
Agriculture	44.7
Manufacturing	12.6
Mining & quarrying	206
Railway	0.9
Other transports	13.8
Tourism	47.5

Source: Central Statistical Organization (CSO) Enterprise, Ministry of Tourism, Government of India.

Table shows the contribution of different sectors to employment in 2010. Comparing to other sectors the tourism sector contributes 47.5% to employment. Agriculture is the second one. It contributes

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1 June-2021, Volume-11, Issue-17  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

44.7%. Other major sectors are manufacturing, mining and quarrying, railways and other transports. Railways contribute only 0.9% to jobs.

#### **Outcome of Natural Tourism in India:**

India is one of the 12-mega bio-diverse countries of the world and has a rich cultural heritage too. It has a vast potential for ecotourism that needs to be tapped for healthy conservation and preservation of nature and bringing about economic benefits to the local communities. Ecotourism in India has developed recently, for the concept itself is a relatively new one. India has spectacularly attractive natural and cultural tourist attractions. India offers enormous diversity in topography, natural resources and climate. There are land-locked mountainous regions, lush valleys and plains, white sandy beaches and islands. Central India has numerous wildlife sanctuaries with countless varieties of flora and fauna.

The most significant feature of the ecotourism industry in India is its capacity to generate large-scale employment opportunities, particularly in remote and underdeveloped area. It offers enormous potential for utilizing natural resources like landscapes, mountains, bio-diversity areas, rivers etc for the benefit of people.

As a concept ecotourism has gained momentum recently in India, but as a way of life Indians has practiced ecotourism since times immemorial by their traditional approach to nature and rich cultural heritage. The immense popularity of ecotourism in India stems from the fact that people are becoming increasingly conscious of the environmental hazards and the importance of the existence of diverse flora and fauna. The ecological diversity of India is arguably the most varied in the world. Ecotourism does not disturb or modify the actual biodiversity of India; it only popularizes the secluded parts of India.

There are numerous botanical and zoological gardens in India, which are working towards the enhancement of the ecosystem. There are severe punishments for poachers, hunters and illegal traders of animals and trees. There are several animal and plant rights organization, which fight for the rights of the animals and plants. Numerous organizations and NGOs are coming forward to provide environmental education to common people at the grass root level.

Ecotourism in India is gradually qualifying for attention of the tourists, the government and entrepreneurs for obvious reasons. India has enough potential in ecotourism to cater to the interests of the tourists. Ecotourism industry is one of the leading employment generating sectors of India and it generates directly or indirectly approximately 3.8% employment out of the total employment generation every year in India.

India is full of topographical variations with amazing scenic beauty. Mountainous ranges of Himalayas, golden beaches, impenetrable forests and plenty of water bodies along with rich blend of culture provokes people across the world to tour India. Ecotourism is the best way to enjoy the nature's charisma without harming it and for the admiration of nature's marvels.

#### **Potential of tourism industry in India:**

**To increase foreign exchange:** - Ecotourism is one of the important industries that earn foreign exchange for a country without actually exporting any material goods. The income from ecotourism has tended to increase at a higher rate than merchandise export in a number of countries.

**To help in the development of infrastructure facilities:** - Development and improvement of infrastructure facilities are another important benefit offered by the ecotourism industry. A variety of secondary industries may be promoted which may not serve the needs of ecotourism. Thus, indirectly; tourist expenditure may be responsible for stimulating other economic activities of a country.

**To help in balanced regional development:** - Tourism development greatly benefits underdeveloped regions of a country. These economically backward regions mostly have places of high scenic beauty which if developed for the tourism industry, will help to bring a lot of prosperity to the local people.

**To help in generating employment:** - Tourism industry is highly labour intensive service industry that generates employment for highly skilled, semiskilled and unskilled labour in sectors like hotels, restaurants, travel agencies, tourism offices, shops etc.

**To help in maintaining peace and understanding:** - Tourism plays an important role in promoting international goodwill. It creates awareness and appreciation of other countries culture and nature.

#### **Conclusion:**

In the words of Mark Twain, 'India is a fabulous world of spend our and rags, the one country under the sun with an imperishable interest, the one land that all men desire to see'. The diversity of wildlife in India is as rich as those of the flora and fauna found only in Africa. The great wealth of Indian

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 1 June-2021, Volume-11, Issue-17  
Sustainable Development Goals: Initiatives, Execution, & Challenges*

wildlife can be imagined with the sight of the majestic elephants, the dance of the peacock, the camel's stride, the roar of the lion are unparalleled acts of beauty. The vastness of the wildlife and wilderness in India is unparalleled in the world. This accounts for the immense opportunities for wildlife tourism in India. Ecotourism development has entered an exciting phase in North India. The Indian Ocean, Arabian Sea and the Bay of Bengal offer a very large coastline.


A fundamental requirement for ecotourism to be practiced is control on access to an area. Various hill stations or beaches therefore do not get categorized as ecotourism destinations because it is impossible to control access to them. National parks and wildlife sanctuaries are on the other hand most amenable to regulate access and thus most suitable as eco-tourist destinations. The Protected Area Network in the country therefore becomes the most logical starting point for development of ecotourism. Most eco tourists are from Europe, North America and Japan.

#### References

1. A.K. Bhatia, *Tourism Development - Principles and Practices*. Sterling Publishers Private Ltd., New Delhi (1995) PP 79-110.
2. Butler Richard, W. & Stephen, W. Boyd, *Tourism and the National Parks, Issues and Implications*. John Wiley and Sons Ltd., Singapore (2000) PP 58-70.
3. Chaturvedi Devesh, "Tourism in India: Ensuring Buoyancy and Sustainability". *Yojana*, Vol.13, No.8, May 2010, PP 16-18.
4. G. S. Rao, Shailesh Sikha, "Bollywood: A Tool for Promotion of Indian Tourism Industry". *South Asian Journal of Socio-Political Studies (SAJOSPS)*, Vol.37, No.1 (July-Dec 2005) PP 98-100.
5. Leela Shelly, *Tourism Development in India*. Arihant Publishers, Jaipur (1995) PP 120-186.

**3. The Role of Farm ponds in Agricultural Development: A Case Study of Wadule Village in Parner tehsil of Ahmednagar District (M.S).**

*Applied Ecology and Environmental Science*, 2021, Vol. 4, No. 4, 718-724  
 Available online at <http://dx.doi.org/10.24015/ajmvps.v4i4.442>  
 Published by Science and Extension Publishing  
 DOI:10.24015/ajmvps.v4i4.442



### The Role of Farm Ponds in Agricultural Development: A Case Study of Nivadunge Village in Pathardi Tehsil of Ahmednagar District (M.S.)

**Dattatraya Sheshrao Ghangroli<sup>1\*</sup>, Sarbajit Gopinath Wavale<sup>2\*</sup>**

<sup>1</sup>Department of Geography, New Arts, Commerce and Science College, Parner, Dist. - Ahmednagar  
<sup>2</sup>Department of Geography, Agri. Sci. Commerce and Pathardi (Hort.) Science College, Wadule, Dist. Ahmednagar  
 \*Corresponding author: [dghangroli@gmail.com](mailto:dghangroli@gmail.com), [sarbjitw@rediffmail.com](mailto:sarbjitw@rediffmail.com)

Received: Nov 17, 2021; Revised: July 24, 2022; Accepted: August 01, 2022

**Abstract** Farm ponds have been built all over the world to increase agricultural expansion. Sustainable solutions are increasingly being recognized as a viable option for addressing water-related issues. This is the first study to look at how ponds influence the adoption of water-saving irrigation practices. Sustainable rural development and the management of water, natural resources can benefit from the conservation advice and analytical rethinking. The current study examines agricultural improvement in Nivadunge village using farm ponds. The evolution of agriculture was tracked using a remote sensing method. This village is situated in a drought-prone region. The depth of black areas on soil is shallow than that of other soils. There are gravel and sandy soil types, and they store water in a lower zone. The type of research can help villages grow their agriculture in a holistic way.

**Keywords:** DTC, multi-faceted agricultural development, farm ponds, soil types etc.

**Cite This Article:** Dattatraya Sheshrao Ghangroli, and Sarbajit Gopinath Wavale, "The Role of Farm Ponds in Agricultural Development: A Case Study of Nivadunge Village in Pathardi Tehsil of Ahmednagar District (M.S.)", *Applied Ecology and Environmental Science*, vol. 4, no. 4 (2021) 718-724, doi:10.24015/ajmvps.v4i4.442.

718

*Applied Ecology and Environmental Science*

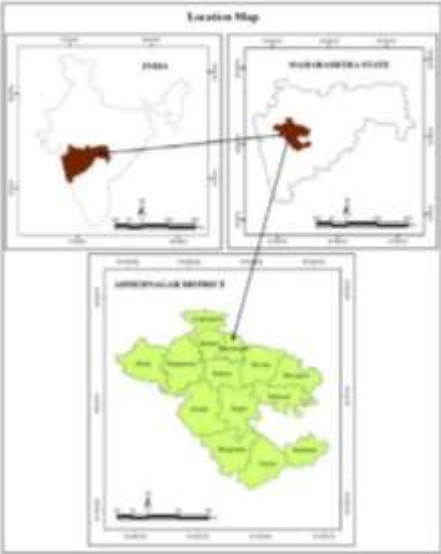




Figure 1. Location map of Nivadunge

#### 1. Introduction

The issues of Indian agriculture cannot be overlooked as more than 62% population is directly dependent on it [1]. Therefore, it is essential to understand the issues associated with farming activities and to provide specific suggestions. Both of these aspects have been studied by several geographers like [2, 3].

Ahmednagar district is known as the drought-prone region in Maharashtra (PC 1975). More importantly, rainfall is less than half of the potential requirement [4] that has resulted in crop failure since in three years according to the data provided by the IMD. There are various schemes to secure agriculture and to reduce [5] the frequency of crop failure in such regions. A farm pond is considered quite useful for conserving use of stored water in the event of a long dry [6] spell. The scarcity of drought has its long-term impact [7] as it does not allow the capital formation and hence farmers become vulnerable economically, financially as well as socio-politically [8]. What is the way out? It is possible to hold the stored water through the farm pond by stopping it, storing it, and using it for soil irrigation [9] when needed. Which can be used successfully in the event of failure or late arrival of monsoon? [10]. "Farm pond is an artificial deep-set structure with definite slope and size for collecting and storing surface runoff water for secure irrigation whenever needed" [11]. Agricultural development in any region is a multi-faceted [12] process. Irrigation plays a vital role [13] in Agriculture.

The fundamental goal of this research is to comprehend agricultural development through farm ponds and their impact on the socio-economic development of farm pond owners. This type of research is critical for agricultural planning at the village level in order to achieve holistic growth. The major goal is to collect surface run-off water through deep-set farm ponds built under the program for protection and conserving irrigation during critical crop stages [14] in order to increase agricultural yield and income for resource-poor drought farmers.

#### 2. Study Area

Nivadunge village is in the Pathardi tehsil of Maharashtra's Ahmednagar district (Figure 1). It is approximately 9 kilometers west of Pathardi, the tehsil town, and approximately 63 kilometers east of the district town. The village is located at the intersection of 19°15'37" latitude and 76°07'17" E longitude. The average elevation is approximately 752 meters above mean sea level. The village has a total land area of 2302.29 ha.

3. Database and Methodology

Data for this study was gathered from both primary and secondary sources. A village survey is conducted, and data is gathered through standardized questionnaires. For the purpose of selecting farmers in the chosen hamlet, a suitable simple procedure was used. A minimum of 5% (54 farmers) of the total farm pond holding farmers in the community have been selected for data collection. Related to agriculture and infrastructure, twelve agricultural development parameters [11] have been estimated for two scenarios, usually before and after the construction of a farm pond, and the difference between them has been determined. With the use of appropriate statistical tests, the acquired data from the field and offices was assembled, analyzed, and summarized. Changes in parameter values have been calculated, and analysis has been conducted.

4. Results and Discussion

4.1. Area and Land Use

The acreage and land use of Nivdange village is depicted in the pie graphic (Figure 2). The village's total geographical area (TGA) is 2382.25ha. The village's NSA is approximately 11.86 %. The field observations that led to this large amount of NSA are as follows: first, the Nivdange village is located in the Deccan trap, which has a modest slope [10]. As a result, the amount of land available for farming has increased. Second, the farmers of this hamlet have used techniques like CCT and

leveling to convert the majority of their wasteland into cultivable land [17]. The majority of the land is used for horticulture crops such as pomegranate, orange, and other citrus fruits.

4.2. Available Amenities for Agriculture

The (Table 1) depicts the various agricultural amenities accessible to the Nivdange village. Four milk collection centers are available in the village which collect milk from farmers and send it to Tugues and Pathard cooperative dairy plants. For irrigation purposes, the village has 730 wells and bore wells. A total number of 108 farm ponds have been constructed in this village by farmers. This village has 42 tractors for agricultural allied activities. In this hamlet, there are four milk collection facilities that gather milk from farmers and deliver it to the Tugues and Pathard cooperative dairy plants. The community contains 730 wells and bore wells for irrigation needs. Farmers in this village have built a total of 108 agricultural ponds. For agriculture and related tasks, the community possesses 42 tractors.

4.3. Agricultural Progress of Farmers with a Farm Pond

The second portion of the case study focuses on the agricultural growth of farm-pond holding farmers in Nivdange village. How effective are farm ponds for generating productive irrigation areas? Is there a way to improve farm pond water for something else? As a result, data is gathered through surveys and discussions with farmers.

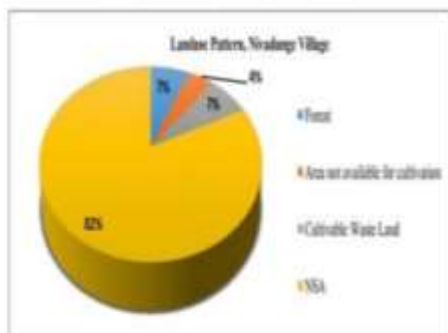


Figure 2. Land Use Pattern of Nivdange Village

Table 1. Available Amenities

Available Amenities	Agricultural Machines	Books and Society	MSU Dairy	Well and Bore well	Tractors	Farmpond
Tractor	2	21	4	730	42	108

(Source: based on State of the report 2017-18).

Table 2. Use of Farm Pond Water Resources

Total Number of Sample Farmpond	Water storage capacity (L/ha)	Area under productive Irrigation (ha)	Use of Farmpond by Farmer		
			Crops	Drinking purpose	Fish culture
10	42.10	70.2	10	10	10

(Source: Copied by researcher based on field visit).

Irrigation has progressive 70.2% of the land due to the farmers of Nivdange village's use of farm ponds, the majority of which are used for agriculture and fish farming, resulting in a rise in agricultural revenue.

4.4. Agricultural Development Variables

The Table 3 shows the twelve agricultural development indicators of farmers with farm ponds in Nivdange village.

Table 3. Agricultural Development Variables

Sr. No.	Agricultural Development Variables	Before FP	After FP	Change
1	% of NSA to TGA	49.8	82.0	32.2
2	Cropping intensity	122.4	152.8	30.4
3	Irrigation intensity	98.0	153.6	55.6
4	Number of farmpond per 100 ha of NSA	3.4	11	7.6
5	% of irrigated area by farmpond in NSA	3.4	70.8	67.4
6	% of the area under horticulture crops in NSA	24.8	80.2	55.4
7	% of the area under micro-irrigation in NSA	2.1	70.7	68.6
8	Use of land under crop per 100 ha of NSA	201	414	213
9	Number of tractor per 100 ha of NSA	8	11	3
10	Number of tractor per 100 ha of NSA	9	12	3
11	Number of tractor per 100 ha of NSA	1	12	11
12	Average annual income per farmer in rupees	8100	74100	66000

(Source: Copied by researcher based on field visit).

Before the construction of the farm-pond, the percentage of NSA to TGA was 49 %, but it is now 82.05 %, it indicates that the NSA has increased by 32.05 %. This is a crucial aspect to consider while making the agricultural development of farm-pond zones. Cropping intensity refers to the stage of agricultural land on multiple occasions during the course of a cropping year. The village's gross cropped area was 112.68 ha. Before the pond was built, but it increased to 186.29 ha. After the pond was built, Cropping intensity has changed by 30.34 % in volume. Before and after the farm-pond construction, the irrigation intensity was 98.04% and 153.61 %, respectively. The intensity of irrigation has increased by 54.57 %. Farm-pond density in Nivdange is 11 farm-ponds per 100 ha. of NSA built during the study period. The sample farm-pond holding farmers' percentage of irrigated land by farm-pond is 70.2%.

A farmer's economic development is mostly dependent on cash crops and fruit harvest. Before the building of the farm-pond, the Percentage of the area under horticulture crops in NSA was 24.85 %, but after the construction of the farm-pond, it grew to 80.25 %. It indicates that the amount of land planted with horticulture crops has increased by 38.5 %. The micro-irrigation approach has been proved to be successful in using water and increasing productivity. Before the farm-pond, the area under micro-irrigation in NSA was 2.15 %, but after the farm-pond, it climbed to 70.75 %. The percentage of area under micro-irrigation has increased by 37.67 % from NSA.

Fertilizers are important for crop productivity because they replenish soil fertility. The number of tractors of 10/ha or utilized per 100 acres of NSA was 28.5 before the farm-pond building and 43.60 times after. The pumping set is used to extract subsurface water [18], and lift it to a farm pond for irrigation. The farm-pond having farmers have 40 pumps before and 115 pumps after the construction of farm-pond per 100 ha. of NSA. Tractors

help to increase cropping intensity by enabling the farmer to save time and utilizing that time to grow an extra acre crop. The number of tractors per 100 ha. of NSA was 9 before and 12 after the farm-pond. Before the farm-pond construction, there were 15 tractors per 100 hectares of NSA of farmers who had a farm-pond, whereas there were 12 after the farm-pond construction. Before the construction of the farm-pond, the average annual income of farm-pond owning farmers in Nivdange village was 81,000 rupees, and after the construction of the farm-pond, that is 74,100 rupees. The increased cultivated area is fruit and cash crops is the main factor for an increase in average annual revenue. The pomegranate crop is another important crop in this village.

5. Conclusion

Farm ponds can help ease water constraints caused by various factors, including climate change [19]. This approach has the potential to increase the amount of water available for supplemental irrigation [20] while also increasing planted area and productivity, resulting in increased net crop yields [21]. In climate change scenarios, a farm pond responds to increased drought frequency, particularly mid-season, and food systems. Therefore, the legislation supports one pond per 2.8 ha of farmland, either on a farm-by-farm basis or as a community-shared resource. The challenges of putting farm pond technology into application on a large scale are also explained.

References

[1] Balakrishnan A. (2015). Drought risk: source of Agricultural Geophysics, week-4. Indian state of Agricultural Geophysics.  
 [2] Raju V.S. (2012). "Agriculture could be remarkably developed in the Pradesh." *India of the Press*. India.

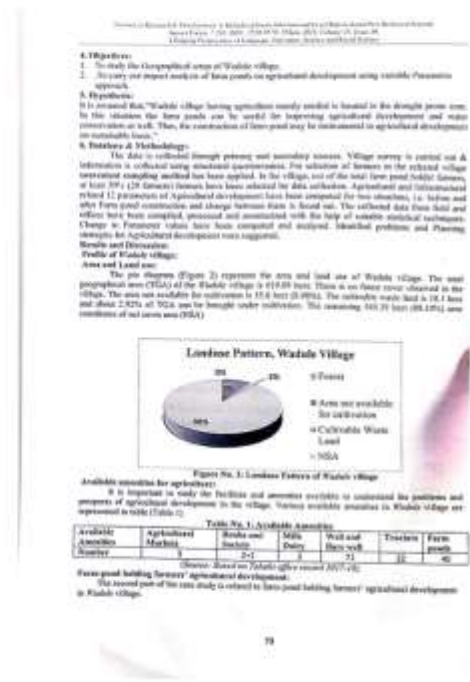
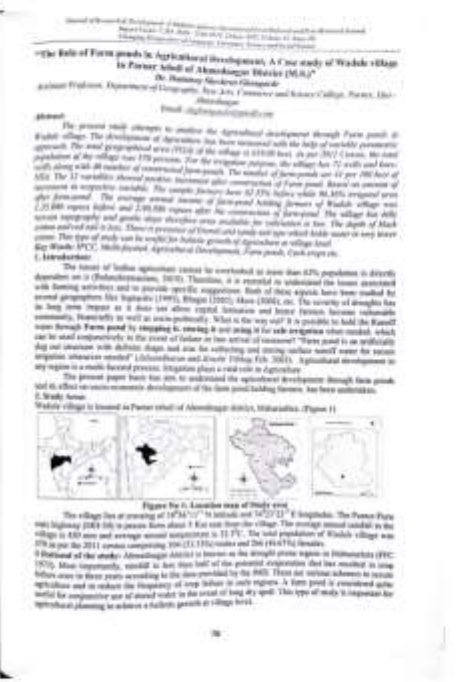
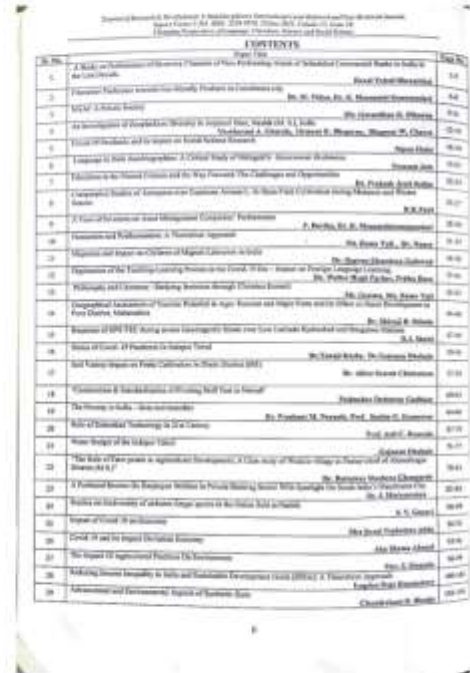
- Maharashtra". Unpublished Ph. D thesis submitted to University of Pune.
- [3] Saptarshi P.G. (1993). "Resource appraisal and planning strategy for the Drought prone area - A case study of Kajjat tehsil Dist. Ahmednagar, Maharashtra" Unpublished Ph.D. thesis submitted to University of Pune. Pp: 304 to 377.
- [4] Berlanam, M., & Steinhard, M. F. (2017). Climate change, natural disasters, and migration—a survey of the empirical evidence. *CEISifo Economic Studies*, 63(4), 353-385.
- [5] Thierfelder, C., & Wall, P. C. (2010). Investigating conservation agriculture (CA) systems in Zambia and Zimbabwe to mitigate future effects of climate change. *Journal of Crop Improvement*, 24(2), 113-121.
- [6] Vico, G., Tamburino, L., & Rigby, J. R. (2020). Designing on-farm irrigation ponds for high and stable yield for different climates and risk-coping attitudes. *Journal of Hydrology*, 594, 124634.
- [7] Mam, Y. T., Smith, M. S., Sparrow, A., Pithu, P. E., & Dube, O. P. (2014). A linked vulnerability and resilience framework for adaptation pathways in remote disadvantaged communities. *Global Environmental Change*, 28, 337-350.
- [8] Gwiriri, L. C., Bennett, J., Mapiye, C., & Bube, S. (2021). Emerging from Below? Understanding the Livelihood Trajectories of Smallholder Livestock Farmers in Eastern Cape Province, South Africa. *Land*, 10(2), 226.
- [9] Angelakis, A. N., Do Monte, M. M., Bonoux, L., & Asano, T. (1999). The status of wastewater reuse practice in the Mediterranean basin: need for guidelines. *Water research*, 33(10), 2201-2217.
- [10] Feng, M., Duan, Y., Wijffels, S., Hou, J. Y., Li, C., Wang, H., & Yu, W. (2020). Tracking air-sea exchange and upper-ocean variability in the Indonesian-Australian Basin during the onset of the 2018/19 Australian summer monsoon. *Bulletin of the American Meteorological Society*, 101(8), E1397-E1412.
- [11] Government of Maharashtra (2003). "Punat Shree Palar Harjyadashika, Jalsandharan and Krishi vibhag". Published by Dr. Sudhakar Goyal, Printed at Govt. Photozinko press, Pune. Pp: 245 to 254.
- [12] Wohlfart, C., Mack, H., Liu, G., & Kuenzer, C. (2017). Multi-faceted land cover and land use change analyses in the Yellow River Basin based on dense Landsat time series: Exemplary analysis in mining, agriculture, forest, and urban areas. *Applied Geography*, 83, 73-88.
- [13] Rao, R. N., & Sridhar, B. (2018, January). IoT based smart crop-field monitoring and automation irrigation system. In *2018 2nd International Conference on Innovative Systems and Control (ICISC)* (pp. 478-483). IEEE.
- [14] Kumar, A., Nayak, A. K., Saha, R. P., Sanghamitra, P., & Das, B. S. (2017). Effects of elevated CO<sub>2</sub> concentration on water productivity and antioxidant enzyme activities of rice (*Oryza sativa* L.) under water deficit stress. *Field Crops Research*, 212, 61-72.
- [15] Trakhschev, V. I., Kostyukova, E. I., Gromov, E. I., & Gerazimov, A. N. (2014). Comprehensive socio-ecological and economic assessment of the status and development of Southern Russia agricultural regions. *Life Science Journal*, 11(5), 478-482.
- [16] Sheth, H. C., Ray, J. S., Ray, R., Vanderkluysen, L., Mahoney, J. J., Kumar, A., & Jais, B. (2009). Geology and geochemistry of Pachmarhi dykes and sills, Satpura Gondwana Basin, central India: problems of dyke-sill-flow correlations in the Deccan Traps. *Contributions to Mineralogy and Petrology*, 158(3), 357.
- [17] Wawale Suresh, G., & Aher Anand, H. (2015). Land Use/Land Cover Mapping using Remote Sensing Data in Pravara River Basin, Akole, Maharashtra, India. *International Research Journal of Environment Science*, 4(9), 53-58.
- [18] Wawale, S. (2019). Application of geospatial techniques for gravity-based drinking water supply management. *Archivum Fotogrametrii, Kartografici i Teledetekci*, 31.
- [19] Ahmad, N., Thompson, S., & Glaser, M. (2019). Global aquaculture productivity, environmental sustainability, and climate change adaptability. *Environmental management*, 63(2), 159-172.
- [20] Oweis, T., & Hachum, A. (2006). Water harvesting and supplemental irrigation for improved water productivity of dry farming systems in West Asia and North Africa. *Agricultural water management*, 80(1-3), 57-73.
- [21] Kromdijk, J., Glascock, K., Lorenelli, L., Gibilly, S. T., Iwai, M., Niyogi, K. K., & Long, S. P. (2016). Improving photosynthesis and crop productivity by accelerating recovery from photoprotection. *Science*, 354(6314), 857-861.



© The Author(s) 2021. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).



### 4. The Role of Farm ponds in Agricultural Development: A Case Study of Nivadunge Village in Pathardi tehsil of Ahmednagar District (M.S).



**Farm-pond:**

To what extent farm ponds are useful to generate protective irrigation area? Are there any uses of farm pond water for another purpose? So, data is collected through questionnaire and dialogue with the farmers. The quantitative data is then obtained from the farmers and presented in the table (Table 2).

**Table No. 2: Use of Farm-Pond Water Resources**

Number of Sample Farm ponds	Water storage capacity (TCM)	Area under protective irrigation in hectare	Number of Farmers using Farm-pond water for...		
			Crops	Drinking purpose	Fish culture
20	104.32	32.87	20	13	09

(Source: Computed by researcher based on field work)

**Variables of agricultural development:**

The twelve variables of agricultural development of farm-pond having farmers in the Washle village are presented in table (Table 3).

**Table No. 3: Variables of Agricultural Development**

Sl. No.	Variables of agricultural development	Before FP	After FP	Change
1	% of NSA to TGA	68.25	81.45	+13.20
2	Cropping intensity	124.44	158.22	+33.78
3	Irrigation intensity	92.21	147.25	+55.04
4	Number of farm-ponds per 100 hect of NSA	N.A.	41	41
5	% of irrigated area by farm-ponds to NSA	N.A.	78.57	78.57
6	% of area under horticultural crops to NSA	9.46	68.41	+58.95
7	% of area under micro irrigation to NSA	18.38	41.20	+22.82
8	Use of fertilizers in ton per 100 hect of NSA	34.2	42.5	+8.30
9	Number of electric pumps per 100 hect of NSA	32	75	+43.00
10	Number of tractors per 100 hect of NSA	7	22	+15
11	Number of sprayers per 100 hect of NSA	20	36	+16
12	Average annual income per farmer in rupees	230000	290000	+60000

(Source: Computed by researcher based on field work)

- X1. Percentage of NSA to TGA: This is an important variable to understand the agricultural development of study region. The NSA has increased by 13.20%.
- X2. Cropping intensity: The cropping intensity refers to the use of agricultural land several times during a cropping year. The cropping intensity was 124.44% before while it increased to 158.22% after the farm-pond. The volume of change is 33.78%.
- X3. Irrigation intensity: The irrigation intensity was 92.21% before and 147.25% after the farm-pond construction. The irrigation intensity has increased by 55.04%.
- X4. Density of Farm-ponds per 100 hect of NSA: This is a crucial parameter which indicates the level of agricultural development on ground level. The density of farm-ponds in Washle is 41 farm-ponds per 100 hect of NSA which are constructed during study period.
- X5. Percentage of irrigated area by Farm-Pond in NSA: The % of irrigated area by farm-pond in the village is 78.57%.
- X6. Percentage of area under horticultural crops to NSA: Cash crops and fruit crops are majority responsible for economic development of farmers. The % of area under horticultural crops to NSA was only 9.46% before farm-pond which increased to 68.41% after the construction of farm-pond. It means that the area under horticultural crops has increased.
- X7. Percentage of area under Micro Irrigation to NSA: The micro irrigation method is found suitable for effective utilization of water and to increase the productivity. The volume of change is 41.20%.
- X8. Use of Fertilizers in Ton per 100 hect of NSA: The use of fertilizers plays a vital role in crop productivity by replenishing fertility of the soil. The amount of fertilizers used in ton per 100 hect of NSA was 34.20 before and 42.50 ton after the farm-pond construction.
- X9. Number of Electric Pumps per 100 hect of NSA: The farm-pond having farmers had 32 pumps before and 75 pumps after the construction of farm-pond per 100 hect of NSA.
- X10. Number of tractors per 100 hect of NSA: Tractors help to increase cropping intensity by enabling the farmers to save time and utilizing that time to grow an extra crop. The number of tractors per 100 hect of NSA was 7 before and 22 after the farm-pond.

X11. Number of sprayers per 100 hect of NSA: The number of sprayers per 100 hect of NSA in the village is 20 before while 36 after the farm-pond construction.

X12. Average annual income: The average annual income of farm-pond holding farmers of Washle village is 1,30,000 rupees before and 2,90,000 rupees after the construction of farm-pond. The major reason behind increase in avg. annual income is increased cropped area in fruit and cash crops. The extra crop is also a major crop which is taken in this village.

**Conclusion:**

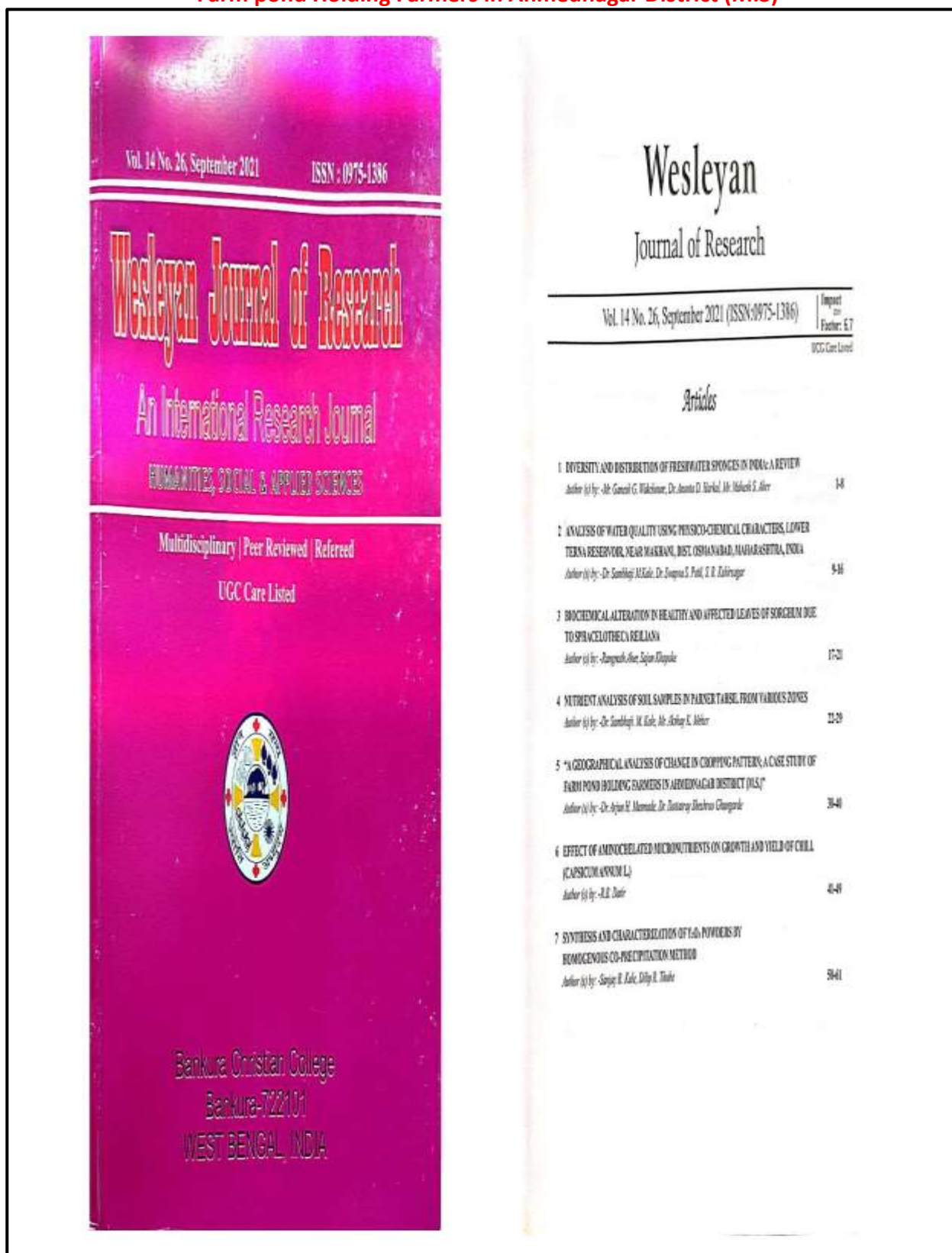
It is concluded that, "Washle village having agriculture mostly rainfed is located in the drought prone zone suffering from inadequate and ill distributed rainfall. In this situation, the farm ponds are found to be useful for improving agricultural development and water conservation as well. Thus, construction of farm pond is instrumental in agricultural development on sustainable basis. The farm-pond is water bank of farmers.

**Recommendation:** It is observed that the farm-pond is useful for secure and sustainable irrigation. Therefore, it is suggested to develop more farm-ponds in Ahmednagar district as well as in drought prone areas. This type of investigation can be useful to government for preparation of various action plans in drought prone districts. The present study can be useful to provide required remedies to overall development of remote rural agriculture.

**References:**

1. Balakrishnan A. (2018): *Spraying online course of Agricultural Geography*, week-11, Outline script of Agricultural Geography.
2. Bhargava P.S. (2002): "Agro-based model for sustainable development in the Parandhar Taluk of the Pune district, Maharashtra", Unpublished Ph.D thesis submitted to University of Pune.
3. Department of Agriculture, Parner taluk.
4. FFC (Fact Finding Committee) (1973): "Report of the Fact Finding Committee for survey of Scarcity areas, Maharashtra state, chapter VII, pp: 124 to 144".
5. Government of India (2011): *District Census Hand Book, Ahmednagar*.
6. Government of Maharashtra (2015): *District Social and Economic Profile-Ahmednagar*.
7. IPCC (2007): "Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation".
8. Government Office of Taluk, Gramsevak & Krishi Sahayak.
9. Sagarwani P.G. (1993): "Resource appraisal and planning strategy for the Drought prone area - A case study of Karjat taluk Dist. Ahmednagar, Maharashtra" Unpublished Ph.D. thesis submitted to University of Pune, pp: 204 to 217.

**5. A Geographical Analysis of Change in Cropping Pattern: A Case Study of Farm pond Holding Farmers in Ahmednagar District (M.S)**





**"A GEOGRAPHICAL ANALYSIS OF CHANGE IN CROPPING PATTERN; A CASE STUDY OF FARM POND HOLDING FARMERS IN AHMEDNAGAR DISTRICT (MS.)"**

**Dr. Arjun H. Misraole**

Tilakrao Jagtap Arts, Commerce and Science College, Khatke, Pune-3

Affiliated to Savitribai Phule Pune University

Email: [arjunmisraole@gmail.com](mailto:arjunmisraole@gmail.com)

**Dr. Dattatray Sheshrao Gaingade**

Assistant Professor, Department of Geography, New Arts, Commerce and Science College, Parner, Dis-

Ahmednagar, Affiliated to Savitribai Phule Pune University

Email: [dsheshrao@gmail.com](mailto:dsheshrao@gmail.com)

**Abstract:**

Recently, irrigation has become more essential and without it, most crops cannot be grown. Artificial irrigation became instrumental due to variability of monsoon and uneven distribution of rainfall. The Ahmednagar district mainly suffers from scarcity of water and lies in core zone of drought prone area. The farmers, especially small and marginal have limited resources to resolve the issue of scarcity of water. For such farmers, the concept of "Farm-pond" is quite useful. (Dr. D.S Gaingade)<sup>[1]</sup>. The present research examines the impact of Farm ponds on change in cropping pattern in Ahmednagar district. The present study made use of primary data. The primary data was obtained from relative 10% Farm pond holding farmers (90 Farmers) respondents using well-structured questionnaire using Random Sampling Technique. The quantitative information regarding the cropped area has been compiled using simple tabular analysis and percentage of area under each crop with respect to NSA is found out. Before and after farm-pond, the change in cropping pattern clearly indicates that some crop finding better profit such as fruits and cash crops has significantly increased due to newly created water resource such as farm-ponds. The ponds have not only affected the cropping pattern but also tendency of the farmer to choose commercial crops by compromising area under food crops.

**Keywords:** Irrigation, Farm pond, Cropping pattern, NSA etc.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dr. Dattatray Sheshrao Gaingade

**1. Introduction:**

Agricultural development depends mainly upon productivity of various crops. The factors affecting crop yield are mainly irrigation technology, storage and market facilities etc. Therefore, it is necessary to find out the usability and nature of such factors. The present study area mainly suffers from scarcity of water and lies in core zone of drought prone area. The canal irrigation may be feasible in the limited areas. Availability of ground water is low and most of the wells are deep and they dry up from April to July. Secondly long dry spells during monsoon has put forth the need of water supply to avoid wilting of crops.

Wali V.S. et al. (2019)<sup>[2]</sup> studied and analysed the cropping pattern prevailing in the Malprabha Project Command area and also compared the recommended cropping pattern with the actual practice and identify the deviation. Anonymous (1977)<sup>[3]</sup> reported that since water is the first limiting natural component for crop production in dry and semi-arid regions. In rain-fed agriculture only rain falls in a given area is utilized, thus the pond or catchment area is normally concentrated for the study of crop management, resource conservation and utilization. Shivacharya (2000)<sup>[4]</sup> studied and gave information about the success story of the ponds of the fields implemented under the project at Pimpriwar Tharwa in Avantipur district of Andhra Pradesh. The author found in the case study that, Productivity and Diversity of crops along with cultivation of perennial crops can be enhanced by adopting farm ponds for soil and water Conservation.

The farmers, especially small and marginal have limited resources to resolve the issue of scarcity of water. For such farmers, the concept of "Farm-pond" is quite useful. The present investigation aims at finding out key role of farm-ponds in agriculture such as cropping pattern. The study of cropping pattern is based on quantitative information regarding area strength of major crops grown in the district.

**2. Objective:**

The present research paper examines the impact of Farm ponds on change in cropping pattern of farm pond holding farmers in Ahmednagar district.

**3. Study Area:**

Ahmednagar district is selected as the study area in the state of Maharashtra. Ahmednagar district is situated to some extent in the upper Godavari valley and to some extent in the Bhima valley. It is between 18°10' to 20°00' North Latitude and 75°30' to 75°37' East Longitude (Figure 1). The district lies in the rain shadow zone of the western ghats. The distribution of the rainfall is very uneven and average annual rainfall received is 583.5 mm. About 75% of the annual rainfall is received during the southwest monsoon season.

**4. Material and Method:**

The present study made use of primary data. The primary data was obtained from Farm pond holding farmer respondents using well-structured questionnaire. During 2005 to 2015, there are total 9798 farm ponds

constructed in the district. Out of that, retrosive 10% sample farm pond holding farmers (800 farmers) were selected using Random sampling technique.

The details regarding area under different crops have been obtained from the farmers having farm-ponds before and after farm-pond construction. While collecting data, it was supported by field observation. This has improved validity of the data. The quantitative information regarding the cropped area has been compiled using simple tabular analysis as shown in the appendix (Appendix 1 to 3) in the appendix section of this paper. The summary of the same is depicted in the table (Table 1) and bar graph (Figure 2). The area of each crop has been converted into percentage to NSA. The change in area under each crop has also been calculated (Figure 3).

5. Result and Discussion:

The table (Table 1) and the figure (Figure 2) show that area under fruit crops has significantly increased due to farm-ponds. The newly created water body is being successfully used for protective irrigation. The field observations reveal that onco-irrigational techniques are applied especially for horticultural crops. The requirement of volume of water for such trees is very low as compared to sugarcane. However, the period of requirement of water for fruit crops is throughout the year. Therefore, water resource from the ponds may be considered as crucial factor for the crops like pomegranate, orange, mango, guava, lemon, etc. The next crop which showed small increment due to ponds is Onion. The ponds can easily fulfil water requirement of this crop, as it is a seasonal crop.

Vegetables and flowers are increased by 6.58 % in the district. This means that farmers have a tendency to grow cash crops on the basis of newly created water resources.

Among the grains, wheat (+3.49) is preferred mainly because it has better marketability compared with other foodgrain crops.

Before and after farm-pond, the change in cropping pattern clearly indicates, the changes that have taken place in agricultural development of the district. Some crops fetching better profit have shown increase in sown area. These crops are Wheat (+3.49%), Sugarcane (+1.58%), Cotton (+1.68%), Fruit crops (+9.25%), Onion (+7.19%), other vegetables and Flower (+6.58%). Obviously with limited land resource the farmers have reduced the area under the crops getting low income. These are Jowar (-12.46%), Bajra (-13.41%), Pulses (-2.01%), Oilseed (-1.45%) etc.

It must be noted here that, the reduction of area under oilseed, especially groundnut and pulses has important implication on environment. Such crops are necessary to maintain soil ecology. This point is well felt mainly due to the changing tendency of the farmers. The ponds have not only affected the cropping pattern but also tendency of the farmers to choose commercial crops by compromising area under food crops.

After the above discussion, it is suggested to construct more and more farm ponds in drought prone areas like Ahmednagar district to have sufficient protective irrigation. It is also suggested to implement Micro irrigation techniques like Drip irrigation, Sprinkler irrigation etc.

6. Conclusion:

It is concluded that, this type of study is important for future of agricultural planning to achieve a holistic growth. This will definitely be useful for planners, researchers and implementing agencies. Such studies can also exhibit a good example of utility of geographical studies for agricultural development.

7. References:

[1] Anonymous (1977): "Annual Report on International crop research institute for semi-arid and tropics on farm watershed research", Hyderabad.  
 [2] Dr. Ghangare D. S., Dr. J. C. More (2015): Impact of Farm ponds on Agriculture – A Case study of Parner tehsil, Peer reviewed International research journal of Geography, Maharashtra Bhogshastra Sanshodhan Patrika, Vol - 32 Issue 2  
 [3] Shivadrappa B. (2010): "Farm pond for Income and Livelihood security: A case study from Anantapur district of AP BIRD-AP", Experiences, Issues and Strategies Proceedings of National Workshop-cum-Brain Storming 21-22 April 2009 CRIDA, Pp. 149 to 153.  
 [4] Wai V. S., Poddar R., Mundnaran S. M., Yezaji B. S. (2019): A Research Article on "An Analysis of Cropping Pattern in Malprabha Project Command Area" published in International Journal of Agriculture sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 2, 2019, pp.-7739-7742.

Table 1: Area under Major crops of Farm pond holding farmers, Ahmednagar district

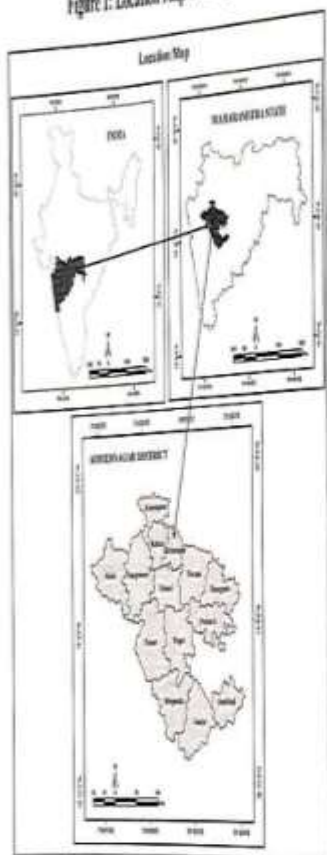
Sr. No.	Crops	Area under Major crops before and after farm-pond construction (in hect)				Volume of change in % of area
		Before Farm-pond		After Farm-pond		
		Cropped area (hect)	% to district	Cropped area (hect)	% to district	
1	Jowar	451.14	21.68	216.42	9.22	- 12.46
2	Bajra	366.05	17.59	98.07	4.18	- 13.41
3	Wheat	103.35	4.97	198.52	8.46	+ 3.49
4	Pulses	144.66	6.95	116.04	4.95	- 2.01
5	Oilseed	74.51	3.58	49.96	2.13	- 1.45
6	Sugarcane	98.43	4.73	148.16	6.31	+ 1.58
7	Cotton	37.75	1.81	81.99	3.49	+ 1.68
8	Fruit crops	327.66	15.75	586.53	25.00	+ 9.25
9	Onion	245.50	11.80	445.58	18.99	+ 7.19

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

10	Other Vegetables	123.93	5.96	234.61	10.00	+4.04
11	Flowers	51.38	2.47	117.55	5.01	+2.54
12	Fodder	36.12	1.74	40.76	1.74	N.C.
13	Rice	20.30	0.98	12.20	0.52	-0.46
Total Cropped Area		2080.76	100	2346.38	100	+6.95

(Source: Computed by researcher based on primary survey)

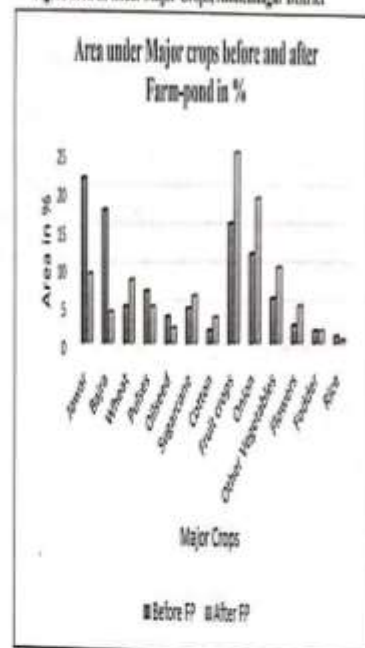
Figure 1: Location Map of Study Area



(Source: Prepared by researcher)

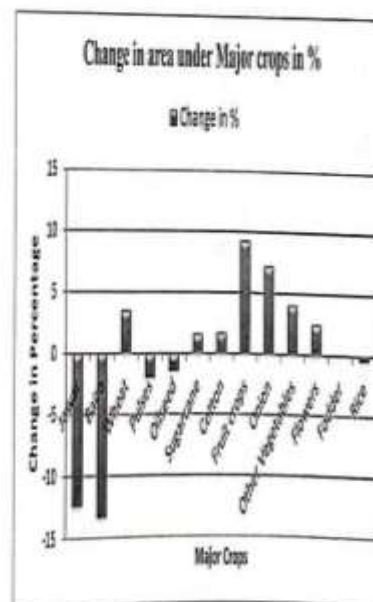
Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Figure 2: Area under Major Crops, Almednagar District



(Source: Prepared by researcher based on primary data)

Figure 3: Change in Area under Major crops, Almednagar District



(Source: Prepared by researcher based on primary data)

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

8. Appendix:

Appendix 1: Tehsilwise area under different crops before Farm ponds (Area in hect)

Tehsil	Area under different crop (Area in hect) Before Farm ponds													Total
	Jowar	Bajra	Wheat	Pulses	Oilseed	Sugarcane	Cotton/Fiber	Fruits	Ornamentals	Other Vegetables	Flower Crops	Fodder	Rice	
Ahle	0.00	59.69	13.63	10.30	6.67	17.40	0.00	38.40	18.60	16.80	5.41	10.20	20.30	225.40
Sangamner	23.94	80.40	15.32	12.60	7.50	10.14	17.00	46.60	31.40	20.20	6.00	2.60	0.00	276.50
Karjat	10.46	15.80	6.19	3.52	1.81	5.80	0.70	9.72	12.20	2.80	0.27	0.50	0.00	69.60
Rahuri	10.44	18.44	5.47	4.99	0.96	7.10	0.59	14.76	10.80	3.67	5.95	1.37	0.00	83.20
Shrirampur	0.30	5.70	4.00	2.70	2.07	5.50	0.00	6.00	7.24	2.80	0.00	0.74	0.00	46.65
Nevasa	11.09	10.20	2.80	5.65	1.08	14.19	0.61	19.20	7.20	3.56	0.00	0.62	0.00	76.35
Shevgaon	40.15	21.66	4.20	9.40	8.80	10.75	11.70	11.40	20.20	15.20	0.37	1.52	0.00	172.35
Puneri	40.22	72.95	2.46	11.72	3.94	6.43	0.30	56.20	28.40	7.60	4.41	0.99	0.00	230.62
Nagpur	76.16	26.61	8.11	25.33	14.25	0.86	0.89	24.60	13.80	14.20	1.06	3.63	0.00	220.25
Rahuri	9.42	10.90	10.70	3.60	1.22	7.60	0.34	13.20	9.51	8.00	1.00	3.82	0.00	79.40
Puneri	35.60	21.50	17.60	22.80	8.80	2.81	0.40	32.20	29.80	10.60	10.55	5.70	0.00	240.35
Shrigonda	39.18	4.04	5.20	7.35	2.62	5.70	0.02	22.30	20.20	6.40	2.10	1.20	0.00	117.40
Karjat	70.56	10.25	4.67	15.73	7.94	4.34	3.20	16.20	27.40	10.80	4.71	2.76	0.00	178.36
Jambhel	25.07	5.90	1.20	1.59	6.75	0.22	2.00	5.20	6.75	1.30	0.00	0.36	0.00	56.36

[36]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

District	451.14	366.83	183.35	144.66	745.1	98.43	37.75	327.66	245.50	123.93	51.38	36.12	20.30	2000.78
----------	--------	--------	--------	--------	-------	-------	-------	--------	--------	--------	-------	-------	-------	---------

(Source: Computed by researcher based on primary data)

Appendix 2: Tehsilwise area under different crops After Farm ponds (Area in hect)

Tehsil	Area under different crop (Area in hect) After Farm ponds													Total
	Jowar	Bajra	Wheat	Pulses	Oilseed	Sugarcane	Cotton/Fiber	Fruits	Ornamentals	Other Vegetables	Flower Crops	Fodder	Rice	
Ahle	0	10.20	19.45	17.51	11.10	21.00	0.00	65.64	41.42	38.80	10.20	8.85	12.20	254.35
Sangamner	10.75	25.40	22.40	5.50	4.33	12.67	5.54	102.80	42.80	49.95	12.00	7.38	0	321.50
Karjat	1.69	4.70	9.55	1.20	1.80	18.76	1.05	11.20	13.70	3.52	2.06	1.00	0	70.19
Rahuri	2.20	2.56	9.50	3.40	4.40	20.35	0.50	18.40	11.40	5.10	6.16	1.34	0	85.40
Shrirampur	4.44	1.40	8.15	1.20	3.22	9.20	0.80	7.00	6.20	3.20	0.18	1.10	0	48.09
Nevasa	2.80	1.10	9.12	4.40	0.50	19.20	6.80	20.00	8.40	4.02	0.40	1.76	0	78.50
Shevgaon	30.70	5.20	7.71	4.20	4.54	15.50	30.80	25.40	40.40	20.29	3.41	2.20	0	190.40
Puneri	20.80	14.80	19.48	8.10	4.73	5.80	20.50	102.56	56.81	11.22	8.35	1.20	0	275.35
Nagpur	28.17	5.38	14.25	22.24	2.20	1.60	0.20	66.20	33.90	32.21	32.18	1.50	0	240.83
Rahuri	2.96	5.60	15.20	4.80	3.34	7.08	1.20	15.85	11.00	9.20	1.80	4.40	0	82.43
Puneri	50.20	8.40	30.40	26.60	4.20	2.80	0.00	61.80	57.20	26.40	23.60	3.80	0	295.40
Shrigonda	19.11	1.60	9.55	4.10	0.00	8.50	0.00	49.99	29.35	10.91	7.09	2.40	0	142.60
Karjat	35.80	8.80	15.50	10.32	4.40	5.70	4.42	29.01	54.40	15.61	10.12	2.85	0	197.80

[37]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Jazikh ed	6.80	2.8	0.20	2.46	1.20	0.00	10.2	11.6	16.6	4.20	0.00	1.00	0	65.1
District	216	98	198	116	49.9	148.16	81.9	586	445	134.61	117	40.7	12	2346
	42	07	52	04	6		9	53	58		55	6	20	38

(Source: Computed by researcher based on primary data)

Appendix 3: Tehsilwise Area in percentage under cultivation Before, After and Volume of Change in various crops

Tehsil	Tehsilwise Area in percentage under cultivation Before, After and Volume of Change in various crops																	
	Jowar			Bajra			Wheat			Pulses			Oilseed		Sugarcane			
	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge			
Alak	0	0	0	26	4	-	6.0	7.6	1.60	8.1	8	-	2.9	4	7.7	8.2	0.54	
Sangamner	1.6	3.3	-	29	9	21.1	5.5	6.9	1.43	4.5	7	1	2.7	3	1.37	7	4	0.27
Kopergaon	15	2.4	-	22	6	16.0	0.9	11	4.68	5.0	7	1	2.6	5	0.04	5	73	18.6
Rahuri	12	2.5	-	22	3	19.1	6.5	11	4.64	6.0	9	3	0.0	1	5.08	8.5	23	15.3
Shirur	19	9.2	-	12	2	9.31	8.5	16	8.37	5.7	9	0	4.4	7	2.26	11	19	7.34
Nevase	14	3.5	-	13	1	11.9	4.7	11	6.90	6.5	9	1	1.4	6	0.78	18	24	5.88
Shevgaon	23	16	-	12	7	9.84	2.4	4.0	1.60	5.4	2	2	5.1	3	2.72	6.2	8.1	1.90
Pathardi	17	7.5	-	31	5	26.2	1.5	7.0	5.57	5.0	9	2	1.7	7	0.01	2.7	2.1	0.68

[38]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Nagar	34	11	-	12	2	-	3.6	5.9	2.26	11	2	-	6.4	0	0.3	0.6	0.28	
Rahuri	11	3.5	-	13	7	6.94	13	18	4.96	4.5	8	1.28	1.5	4	2.52	9.5	8.5	-
Parner	34	16	-	8.6	2	-	7.0	10	3.20	9.1	0	-	3.5	1	-	1.1	0.9	-
Singur	33	13	-	3.4	1	-	4.4	6.7	2.27	6.2	8	-	3.0	0	-	4.8	5.9	1.11
Kanjar	39	18	-	5.7	4	-	2.6	7.8	5.25	8.8	2	-	4.4	2	-	2.3	2.8	0.57
Jankhe	44	10	-	10	3	6.08	3	5.9	6	2	7	0.96	11	8	10.1	9	0	0.39
District	21	9.2	-	17	4	13.4	4.9	8.4	3.49	6.9	9	-	3.5	2	-	4.7	6.3	1.58

(Source: Computed by researcher based on primary data)

Tehsil	Tehsilwise Area in percentage under cultivation Before, After and Volume of Change in various crops																	
	Cotton/Fiber			Fruits Crops			Onion			Vegetables			Flowers Crops		Fodder Crops			
	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge	B.F	A.F	Chn Fge			
Alak	0	0	0.00	17	25	7.98	8.2	16	8.03	7.4	15	7.80	4	4.0	1.61	5	4	1.05
Sangamner	6	1.7	-	17	31	14.4	11	19	8.18	7.3	15	8.22	1	3.7	1.56	9	3	1.36
Kopergaon	1	1.4	0.46	13	15	1.99	17	19	1.99	4.0	5.0	0.99	3	2.9	2.55	7	4	0.71

[39]

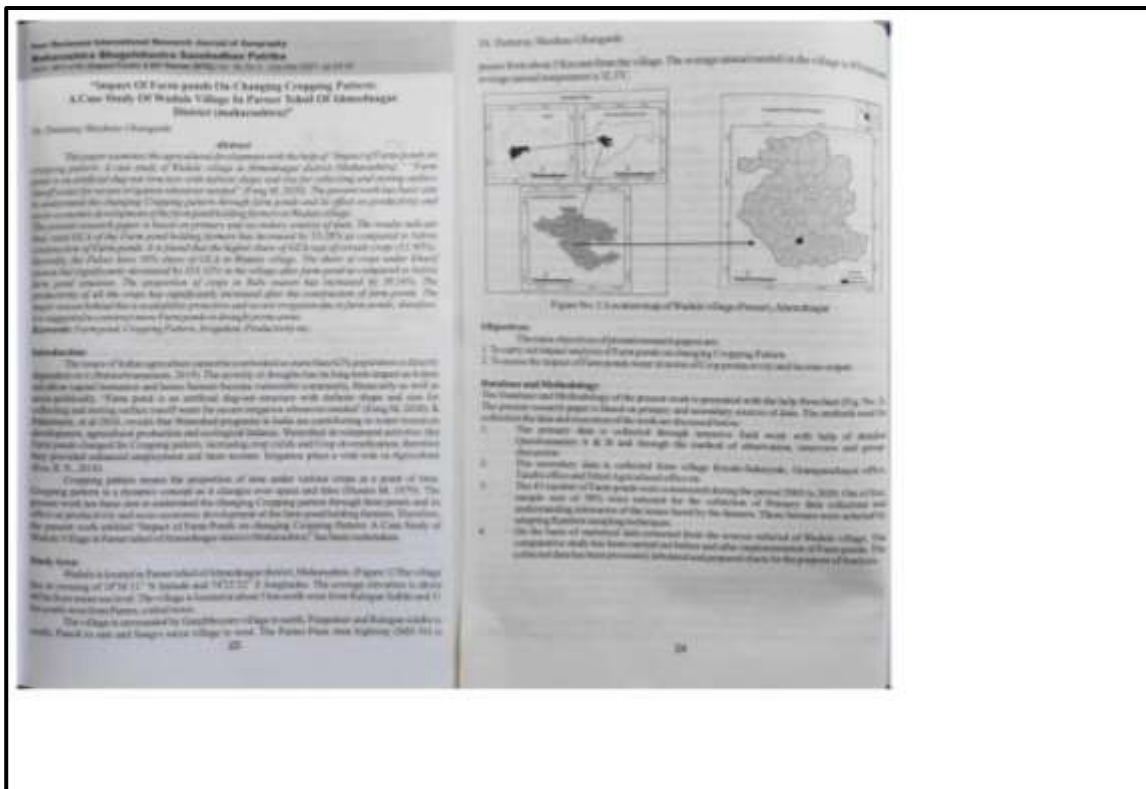


Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Rahat a	0. 7 1	0.5 9	- 0.12	17. 74	21. 55	3.80	12. 98	13. 35	0.37	4.4 1	5.9 7	1.56	7. 1 5	7.2 1	0.06	1. 6 5	1. 5 7	- 0.08
Shrira mpur	0. 0 0	1.6 6	1.66	14. 15	14. 56	0.41	15. 52	17. 05	1.53	6.0 0	6.6 5	0.65	0. 0 0	0.3 7	0.37	1. 5 9	2. 2 9	0.70
Newa sa	0. 8 0	8.6 6	7.86	25. 15	25. 48	0.33	9.4 3	10. 70	1.27	4.6 6	5.1 2	0.46	0. 0 0	0.5 1	0.51	0. 8 1	2. 2 4	1.43
Shevg aon	6. 7 9	16. 18	9.39	10. 68	13. 37	2.69	17. 52	21. 22	3.70	8.8 2	10. 66	1.84	0. 2 1	1.7 9	1.58	0. 8 8	1. 1 6	0.28
Pathar di	0. 1 3	7.4 5	7.32	25. 24	37. 61	12.3 7	8.8 5	20. 63	11.7 9	3.3 0	4.0 7	0.78	1. 9 1	3.0 3	1.12	0. 4 3	0. 4 4	0.01
Nagar	0. 0 4	0.0 8	0.04	11. 17	27. 58	16.4 1	6.2 7	14. 12	7.86	6.4 5	13. 42	6.97	4. 8 2	13. 41	8.59	1. 6 5	0. 6 2	- 1.03
Rahur i	0. 4 3	1.4 6	1.03	16. 73	19. 23	2.50	11. 98	13. 34	1.37	10. 08	11. 16	1.08	1. 2 6	2.1 8	0.92	4. 8 1	5. 3 4	0.53
Parne r	0. 1 6	0.0 0	- 0.16	12. 97	20. 92	7.96	12. 00	19. 36	7.36	4.2 7	8.9 4	4.67	4. 2 5	7.9 9	3.74	2. 3 0	1. 2 9	- 1.01
Shrig onda	0. 0 2	0.0 0	- 0.02	19. 00	35. 06	16.0 6	17. 21	20. 58	3.38	5.4 5	7.6 5	2.20	1. 7 9	4.9 7	3.18	1. 0 8	1. 6 8	0.58
Karjat	1. 7 9	2.2 4	0.45	9.0 8	14. 73	5.64	15. 36	27. 61	12.2 5	6.0 6	7.9 2	1.87	2. 6 4	5.1 4	2.50	1. 5 5	1. 4 5	- 0.10
Jamk hed	3. 5 5	15. 66	12.1 1	9.2 3	17. 85	8.62	11. 98	25. 48	13.5 0	2.3 1	6.4 5	4.14	0. 0 0	0.0 0	0.00	0. 6 7	1. 5 3	0.86
Distri ct	1. 8 1	3.4 9	1.68	15. 75	25. 00	9.25	11. 80	18. 99	7.19	5.9 6	10. 00	4.04	2. 4 7	5.0 1	2.54	1. 7 4	1. 7 4	0.00

(Source: Computed by researcher based on primary data)

6. Impact of Farm Ponds on Changing Cropping Pattern: A Case Study of Wadule Village in Parner tehsil of Ahmednagar



Dr. Damayee Sheshoo Ghugarkar

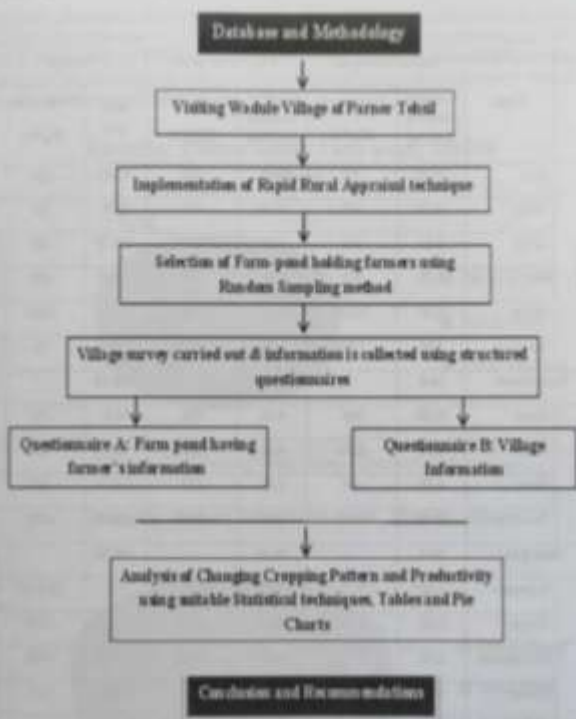


Figure No. 2: Flowchart for Database and Methodology

**Results and Discussion:**

The cropping pattern of farm-pond having farmers in Wadhwa village is given in table (Table 1) and pie diagram (Figure 3 A & B). It is represented in the form of percentage to gross cropped area. The productivity (kilogram per hect) before and after farm-pond construction has been considered to understand value addition.

Dr. Damayee Sheshoo Ghugarkar

Table No. 1: Cropping Pattern

Crops	Before Farm-pond		After Farm-pond		Change	
	Cropped Area (% to GCA)	Productivity (Kg/ha)	Cropped Area (% to GCA)	Productivity (Kg/ha)	Area (%)	Productivity (Kg/ha)
<b>Kharif</b>						
Bajra	24.50	700	6.00	800	-62.45	200
Mung	18.00	500	10.26	650	-9.68	150
Moong	2.80	500	0.30	600	-100.00	100
Jar	4.30	600	1.30	700	-51.45	100
Onion	0.80	10000	4.18	40000	+700	12000
Soyabean	3.60	1750	1.30	1800	-44.44	50
<b>Total Kharif</b>	<b>54.8</b>	-	<b>23.74</b>	-	<b>-311.33</b>	-
<b>Rabi</b>						
Jowar	72.80	800	8.08	900	-45.61	100
Wheat	4.60	1000	9.68	1200	+21.74	200
Gram	4.40	650	7.25	650	+141.45	200
Onion	1.80	10000	1.65	13000	+250.00	3000
<b>Total Rabi</b>	<b>83.6</b>	-	<b>28.45</b>	-	<b>+88.54</b>	-
<b>Annual</b>						
Sugarcane	2.00	110 (Ton)	1.57	130 (Ton)	+20	20 (Ton)
Mango	2.00	12000	7.31	15000	+460	3000
Pomegranate	2.40	12000	6.20	17000	+295.83	5000
Lemon	1.20	10000	11.86	13000	+408.11	3000
Custard apple	2.00	8000	8.48	9000	+100	3000
Guava	0.80	0	9.39	12000	+100	12000
<b>Total Fruits</b>	<b>9.8</b>	-	<b>43.24</b>	-	<b>+596.42</b>	-
Vegetables	0.40	13000	1.04	16000	+300	3000
Fodder	1.00	42000	1.96	60000	+50.00	18000
<b>Total Annual</b>	<b>12</b>	-	<b>47.81</b>	-	<b>+318.67</b>	-
<b>Gross Cropped Area (GCA)</b>	<b>100</b>	-	<b>100</b>	-	<b>+53.28</b>	-

(Source: Computed by researcher based on field work)  
The gross cropped area before farm-pond was 50 hect which has increased to 76.64 hect after the

Dr. Dattaraj Sheshrao Ghogade

construction of farm-pond. The total GCA has increased by 33.20% as compared to before. As per results, it is found that the higher share of GCA was by cereals crops (51.80%). Secondly, the Pulses have 30% share of GCA. This is to say that before farm-pond construction about 83.80% area is occupied by cereals and pulses crops. The significant proportion (19.51%) of the same has been diverted towards fruits and cash crops after construction of farm-pond.

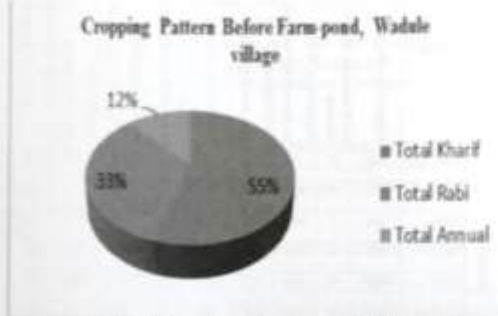


Figure No. 3A: Cropping Pattern Before Farm-pond, Wadale village.

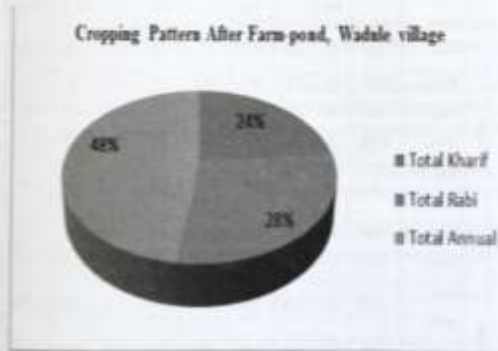


Figure No. 3B: Cropping Pattern After Farm-pond, Wadale village.

The share of crops under Kharif season has significantly decreased by 33.33% in the village after farm-pond as compared to before Farm-pond. The proportion of crops in rabi season has increased by 38.54%. This is due to the reason that, the area under cereal crops of these farmers has decreased by 28.67%. The area under pulses has also decreased by 1.66%.

The overall increment in area under fruits crops is 590.42%. Therefore, a huge amount (6 times) of area under cash crops and fruit crops has increased after construction of farm-pond. It is also noted that there is reduction in area under the Kharif season and farmers started preferring perennial

Dr. Dattaraj Sheshrao Ghogade

crops like fruit and cash crops. The productivity of all the crops has significantly increased after construction of farm-ponds. The major reason behind this is available protective and secure irrigation for farm-ponds.

Table No. 2: Net Production and Income Output

Season	Crops	Before Farm-pond				After Farm-pond				
		Productivity (kg/ha)	Net Production (In Quintal)	Price/Quintal (In Rupees Per Quintal)	Total Income (In Lakh Rupees)	Productivity (kg/ha)	Net Production (Quintal)	Price/Quintal (In Rupees Per Quintal)	Total Income (In Lakh Rupees)	Change in Income (In Lakh Rupees)
Kharif	Rice	700	66	784	3.67	900	41	1411	5.19	4.08
	Wheat	500	47	286.2	1.33	450	35	409.5	1.33	1.38
	Pigeon	500	7	6000	0.23	400	3	10000	0.09	0.21
	Soy	400	13	1817	0.24	700	7	4261	0.28	0.34
	Green	11000	132	468	0.62	40000	1440	1540	56.56	55.36
	Groundnut	1750	32	1500	0.47	1800	18	3000	0.54	0.27
<b>Total Kharif</b>	-	<b>328</b>	-	<b>3.35</b>	-	<b>1582</b>	-	<b>31.71</b>	<b>30.38</b>	
Rabi	Wheat	800	91	1349	1.23	900	56	1066	1.09	0.14
	Wheat	1000	29	1289	0.27	1200	49	1019	0.41	1.34
	Green	450	10	1360	0.23	450	35	5219	1.83	1.93
	Green	10000	80	7.80	0.42	13000	384	1300	12.74	12.52
	<b>Total Rabi</b>	-	<b>298</b>	-	<b>2.34</b>	-	<b>348</b>	-	<b>17.24</b>	<b>15.08</b>
Annual	Sugarcane	110000	1100	200	2.20	130000	1160	300	4.68	2.48
	Mango	12000	120	500	0.66	15000	140	8000	75.00	75.00
	Pomegranate	12000	144	2500	1.00	17000	168	6000	48.45	48.45
	Guava	10000	100	1000	1.00	15000	150	2100	24.82	23.27
	Custard	4000	0	500	0.00	8000	540	2000	11.70	11.97
	Guava	0	0	800	0.00	11000	864	1500	12.96	12.96

(Source: Computed by researcher based on field work) The cash value of crops according to an farm prices prevailing in the district are used and presented in table (Table 2). It is clear from the information gathered in the field study that productivity of all crops has positively changed as per crop pattern adopted by farmers after construction of farm-ponds.

Dr. Dattatray Sheshrao Ghungarde

ponds in the village. The total cropped income of sample 20 farmers is about 2 Crore and 49 lakhs. Out of this, in kharif season; they earned about 39 lakhs, in rabi season; 17 lakhs while through fruit crops; they have earned 1 Crore 73 lakhs.

**Conclusion:**

Therefore, it is concluded that, the farmers of Wadule village have compromised the area under seasonal crops in kharif and rabi season to prefer annual crops like fruits and cash crops. The significant proportion (19.51%) of the cereals and Pulses has been diverted towards fruits and cash crops after construction of farm-pond. The productivity of all the crops has significantly increased after the construction of farm-ponds. The major reasons behind this are available protective and secure irrigation due to farm-ponds, Secondly, the availability of fertile soil for cultivation and thirdly, there is availability of Agricultural Market centres.

**Recommendations:**

It is observed that the Farm pond is useful for secured and sustainable irrigation; therefore, it is suggested to construct more Farm ponds in drought prone areas. It is observed from the field survey that farmers use groundwater to recharge the farm pond; It is suggested that farmers should use excess water/runoff from rainwater to store water in Farm pond.

**References:**

1. Balasubramanian A. (2019): Swayam online course of Agricultural Geography, Week-I, Outline script of Agricultural Geography.
2. Feng, M., Duan, Y., Wijffels, S., Hsu, J. Y., Li, C., Wang, H. & Yu, W. (2020): Tracking air-sea exchange and upper-ocean variability in the Indonesian-Australian Basin during the onset of the 2018/19 Australian summer monsoon. *Bulletin of the American Meteorological Society*, 101(8), E1397-E1412.
3. Government of Maharashtra (2003): "Panlot Shrtta Vikas Margdarshika, Jalsandharan and Krushi vibhag". Published by Dr. Sudhirkumar Goyal, Printed at Govt. Photozinko press, Pune. Pp: 245 to 254.
4. K, Palanisami et. Al. (2010): Research Paper on "Evaluation of Watershed Development programs in India using the economic surplus method" published in Proceedings of National Workshop cum Brain storming "Rainwater Harversting and Reuse through Farm ponds" CRIDA Hyderabad & ICRIAT Andhrapradesh, India, Pp: 45 to 59.
5. Rao, R. N., & Sridhar, B. (2018, January): IoT based smart crop field monitoring and automation irrigation system. In 2018 2nd International Conference on Inventive Systems and Control (ICISC) (pp. 478-483). IEEE.
6. Husain, M. (1979): 'Agricultural Geography', Inter-India publications, New Delhi, Pp. 77-79.
7. Patil R.B, Patil A.B, Shinde S. (2012): Research Paper on "Impact of Water Percolation Tank on Changing Cropping Pattern: A Case Study of Rampur Village, Tal.-Jath Dist: Sangli, (Maharashtra)." Published in Online International Interdisciplinary Research Journal, (Bi-Monthly), ISSN2249-9598, Volume-II, Issue-VI, Nov-Dec 2012, Pp: 94 to 103.
8. Ghungarde D.S. (2021): A Ph. D. thesis on "The Role of Farm ponds in Agricultural development of Ahmednagar District (M.S., India).
9. Dhavale G.M and More J.C (2017): "Assessment of cropping pattern and water resources utilization: A case study of Shrigonda tehsil, Ahmednagar" Peer reviewed international research journal of Geography. (MBP-vol-34, No. 2, June-Dec 2017), Maharashtra Bhugolshastra Sanshodhan Patrika, Pp: 9-14.

\* Dr. Dattatray Sheshrao Ghungarde  
Assistant Professor, Department of Geography,  
New Arts, Commerce and Science College,  
Parner, Dist - Ahmednagar

## 7. "Watershed & Streams Delineation Using Q-Gis And Dem; A Geographical Analysis Of Upper Godavari Basin (M.S., India)"



Wesleyan Journal of Research, Vol.14 No.11 (November 2021)

ISSN – 0975-1386  
Research article: (Geography)

### "WATERSHED & STREAMS DELINEATION USING Q-GIS AND DEM; A GEOGRAPHICAL ANALYSIS OF UPPER GODAVARI BASIN (M.S., INDIA)"

**Dr. Dattatray Sheshrao Ghungarde**

Assistant Professor, Department of Geography, New Arts, Commerce and Science College, Parner, Dist – Ahmednagar, Email: [dsghungarde@gmail.com](mailto:dsghungarde@gmail.com)

**Mr. Shubham Dattatray Ghungarde**

UG Student, Department of Civil Engineering, Sinhgad College of Engineering, Vadgaon bk., Pune, Email: [shubhamghungarde@gmail.com](mailto:shubhamghungarde@gmail.com)

#### 1. Abstract:

Inappropriate management of landuse activities in catchment area leads to droughts & floods when we look at the phenomenon from a water resource perspective. Reducing the impact and implement Integrated and Sustainable Watershed Management is the key to achieve goal of Economical and Environmental balance. Manual extraction of watershed characteristics such as drainage network and watershed boundary using Toposheets is a tedious and time consuming process. Geographical Information systems (GIS) with Digital Elevation model (DEM) can be used for the computation of various watershed characteristics effectively and efficiently.

The purpose of the present study is to delineate the boundary and streams of Upper Godavari basin with outlet point at Jayakwadi dam, Maharashtra. An open source Q-GIS software with latest version 3.18 is applied for the study. The 7-step procedure is applied consisting of downloading, mosaic and reprojecting DEM tiles, filling sinks / artificial depressions, flow routing and delineation of watershed boundary. The Flow accumulation method is used for delineation of streams using r.stream.extract tool provided in Q-GIS 3.18 Toolbox. The results show that the Upper Godavari watershed having area of 22,104 Sq. Km contributes water to outlet point at Jayakwadi dam. The delineated watershed boundary has total length of 1298 Km. The results are presented with the help of tables and maps. Google earth pro is used to visually inspect end boundaries.

**Keywords: Watershed Delineation, GIS, DEM, Flow accumulation**

#### Article History

\* Received: 09/11/2021; Accepted: 29/11/2021

Corresponding author: Dr. Dattatray Sheshrao Ghungarde

#### 2. Introduction:

The recent seasons in year 2020-21 have shown the effects of climate change in the form of extreme precipitation & weather patterns specifically in western hilly areas of Maharashtra. Extremities in weather conditions cause droughts & floods when we look at the phenomenon from a water resource perspective. When

[6]

increasing populations, growing urban & industrial areas are taken into account, it is obvious that above water related problems will be of utmost significance throughout the next decades.

Therefore, Implementation of Integrated and Sustainable Watershed Management is the key to achieve Economic and Environmental balance. Manual extraction of watershed characteristics such as drainage network and watershed boundary using Toposheets is a tedious and time consuming process. Geographical Information systems (GIS) with Digital Elevation model (DEM) can be used for the computation of various watershed characteristics effectively and efficiently. The purpose of the present study is to delineate the boundary and streams of Upper Godavari basin with outlet point at Jayakwadi dam, Maharashtra using Q-GIS 3.18.

### 3. Objectives:

The present study is based on following objectives;

- i. To Delineate the Upper Godavari watershed and inclusive Streams using GIS techniques.
- ii. To Find out Area and Perimeter of Watershed using Attribute table in Q-GIS 3.18.

### 4. Material & Methods:

The present study is based on Secondary data. Watershed analysis using GIS requires Digital Elevation Models (DEM) data and raster data operations to delineate watersheds and to derive features such as streams, stream network, catchment areas, basin etc. The Digital Elevation Model tiles (DEM) with 30 m resolution are downloaded from [www.earthdata.nasa.gov](http://www.earthdata.nasa.gov) using Shutter Radar Topography Mission (SRTM) plugin.

The Rivers / Streams are extracted using Flow Accumulation Method. When delineating watersheds or defining stream networks, we proceed through a series of steps. These steps are presented using the flow chart (Figure 1). The softwares used to carry out present study are Q-GIS 3.18 & Google Earth Pro.

### 5. Results & Discussion:

The study is carried out using series of steps and the obtained results are discussed below;

#### Step-I: Start Q-GIS 3.18:

The QGIS is a user friendly Open Source Geographic Information System (GIS). In the present study, the latest version Q-GIS 3.18 is used for numerous purposes.

#### Step-II: Download DEM Tiles:

The first input required for watershed analysis is DEM. Digital Elevation Models (DEMs) are a type of raster GIS layer. In a DEM, each cell of raster GIS layer has a value corresponding to its elevation (z-values at regularly spaced intervals). DEM data files contain the elevation of the terrain over a specified area, usually at a fixed grid interval over the "Bare Earth". To perform various functions, Q-GIS provides number of Plugins which requires number of input parameters.

In the present study, The Digital Elevation Model tiles (DEM) with 30 m resolution are downloaded from [www.earthdata.nasa.gov](http://www.earthdata.nasa.gov) using **Shutter Radar Topography Mission (SRTM) plugin**. To cover the considered study area upto full extent, total six DEM tiles were required. The un-necessary files covering other regions such as Arabian Sea etc., were removed. The DEM tile is made up of smaller pixels each of size 30 x 30 meter with varying elevation (z). These downloaded six tiles with Q-GIS interface are shown in the picture (Figure 2).

**Step-III: Mosaic DEM Tiles:**

The present step is devoted to merge all the six DEM tiles into a single DEM tile. This step is performed using **Build Virtual Raster tool** by using Raster menu provided in Q-GIS toolbar. The resulted single DEM tile is presented in picture (Figure 3).

**Step-IV: Reproject DEM Tiles:**

This step involves setting up appropriate Coordinate Reference System (CRS) for the present project. Whenever any new project is created in the software, Q-GIS assigns a default CRS as World Geodetic System 1984 (WGS 84). The World Geodetic System 1984 (WGS 84) is a datum featuring coordinates that change with time. **WGS 84** is defined and maintained by the United States National Geospatial-Intelligence Agency (NGA). It is consistent, to about 1cm, with the International Terrestrial Reference Frame (ITRF).<sup>(6)</sup>

The Universal Transverse Mercator (UTM) is a map projection system for assigning coordinates to locations on the surface of the Earth. The earth is divided into total 60 UTM zones including both North and South hemispheres. The considered study area falls in **WGS 84 – UTM zone 43 N with Authority ID ESPG 32643**. This zone is shown using pink strip in the picture (Figure 4).

It is important that the UTM zone of downloaded DEM tiles and the Project should have Same Coordinate Reference System. Therefore, the DEM tiles are reprojected to WGS 84 – UTM zone 43 N in which our study area comes.

**Step-V: Subset DEM Tiles:**

This step involves cropping the whole DEM tile to a smaller extent by using Raster menu to avoid longer calculation time in further steps.

**Step-VI: Fill Sinks / Artificial depressions:**

There may be presence of any Sinks or Artificial depressions where water can accumulate such as Mines etc. Therefore, the Sinks in a surface raster should be filled to remove small imperfections in the data. A DEM or elevation raster is void of depressions. A depression is a cell or cells in an elevation raster that are surrounded by higher elevation values, and thus represents an area of internal drainage.

Although some depressions are real, such as quarries or glaciated potholes, may be imperfection in the DEM. Therefore, depression must be removed to avoid error in delineation of Streams / Rivers. The DEM is filled using **r.fill.dir tool**. The resulted Filled DEM is shown in picture (Figure 5).

**Step-VII: Estimation of Flow Accumulation & Flow Direction:**

A flow direction raster shows the direction in which water will flow out of each cell of a filled elevation raster. A widely used method for deriving flow direction is the Flow accumulation method. Therefore, the Rivers are extracted using **Flow Accumulation Method**.

It is understood in the earlier Step-I that, the DEM tile is made up of smaller pixels each of size 30 x 30 meter with varying elevation (z). In Flow Accumulation Method, the Q-GIS applies unit precipitation over each cell of the DEM. According to the elevation of surrounding cells, precipitation start to flow and accumulate from one cell to nearby cells and follows the stream link towards the outlet. This is phenomenon of Flow accumulation.



*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

The obtained Flow Accumulation pattern is given in picture (Figure 6). This phenomenon can be understood in detail using a sample example shown in figure (Figure 7) and explained in the next step.

**Step-VIII: Deriving Channels / Streams:**

This step is further extension of Flow Accumulation method. The Flow Accumulation layer is used as input to derive the Channels / Streams in the Upper Godavari Catchment area. The figure (Figure 7) shows sample example of Flow Accumulation method to derive Channel / Streams. There are two green boxes containing smaller cells having certain size and elevation (z). As explained earlier, the Q-GIS applies unit precipitation over each cell of the DEM. According to the elevation of surrounding cells, precipitation start to flow and accumulate from one cell to nearby cells and follows the stream link towards the outlet. The numbers in each cell (for eg., 1, 3, 5, 11, 15, 20) shows flow accumulated in respective cell. It is nothing but number of cells that drain through each cell. After estimation of Flow accumulation, there is a need to *provide threshold value above which the accumulated flow can be considered as a stream.*

For the sample example the Threshold value is considered as 10 units. Therefore, the Q-GIS automatically select the cells having accumulation more than 10 units and forms a stream link towards the outlet. The stream link is shown using Red thick line in the figure (Figure 7). The Threshold value is determined using Trial and Error method.

In the present study, the Threshold value is determined at Trimbakeshwar (The origin point of Godavari river). The Flow Accumulation value at Trimbakeshwar is found to be 41,536 units. Therefore, the Threshold value is considered as 40,000 units to derive Streams. The Streams are extracted using **r.stream.extract** tool which requires Flow Accumulation layer as input. The derived streams are presented in figure (Figure 8).

It is important to calibrate the extracted Streams, i.e. whether they are actually present on ground surface at accurate positions or not? It is done using adding a layer of Q-GIS OSM standard map. It is concluded that, the extracted streams are correctly derived and exists at fairly accurate position on the ground.

**Step-IX: Define Outlet Point to Derive Catchment:**

This is the last step in Delineation of Watershed. All the steps performed earlier and resulted layers will require as input to Delineate Watershed boundary for Whole Upper Godavari Catchment and Sub-catchments.

In Q-GIS there is a, **r.water.outlet** tool which itself is a Watershed basin creation tool. There are two ways to define outlet point;

- a) **Insert the Geographical Coordinates of Outlet point**
- b) **Manually select the Outlet cell using tracker**

In the present study, the outlet point is specified manually by selecting the outlet cell at Jayakwadi Dam for the Delineation of Upper Godavari Basin. The similar process is followed for the delineation of Sub-catchments. The Geographical Parameters of all five sub-basins and Upper Godavari Watershed are presented in table (Table 1). These are estimated using Attribute table and Raster calculator in Q-GIS. It includes area and Perimeter of each watershed.

[9]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

Finally, the map showing Rivers / Streams, Boundary of the catchment, Tourist attractions, Towns and Cities in Upper Godavari Watershed were prepared using Q-GIS 3.18 software. (Figure 9).

#### 6. Conclusion:

"It is concluded that, Quantum Geographical Information System (Q-GIS), an open source software can be effectively used in the delineation of watershed & inclusive streams with the help of various plugins & tools." The Upper Godavari Watershed have 22103.931 Sq. Km. area and 1298.160 Km Perimeter. It includes five sub – watersheds namely Major Upper Godavari, Pravara, Shivna, Dhora and Kham. These results can be effectively used as inputs in hydrological modelling, flow forecasting, landuse management, flood damage reduction and reservoir operation and planning.

#### 7. References:

- [1] **Kaviya B. et. al. (2017):** A Research paper on "Watershed Delineation using GIS in Selaiyur Area", published in International Journal of Pure and Applied Mathematics, Volume 116 No. 13 2017, 417-423, ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version) url: <http://www.ijpam.eu>, Special Issue.
- [2] **Sarangi A. et. al. (2004):** A Research paper on "Performance of GIS interfaces in Watershed Delineation and Stream Network Generation from DEM", published in Journal of Agricultural Engineering, Vol. 41(2).
- [3] **Verma A. K. et. al. (2017):** A Research paper on "Extraction of Watershed Characteristics using GIS and Digital Elevation Model", published in International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 [www.ijesi.org](http://www.ijesi.org), Volume 6 Issue 7, July 2017, PP. 01-06
- [4] **Gunawan G. et. al. (2011):** A Conference paper on Watershed Delineation using GIS for supporting the integrated and Sustainable Watershed Management", A Case Study: Manjuntio Watershed, Bengkulu Province, Indonesia.
- [5] <https://www.researchgate.net>
- [6] [https://youtu.be/aTYHpftI\\_gus](https://youtu.be/aTYHpftI_gus)
- [7] <https://www.nga.mil>
- [8] <https://qgis.org/en/site/forusers/download.html>

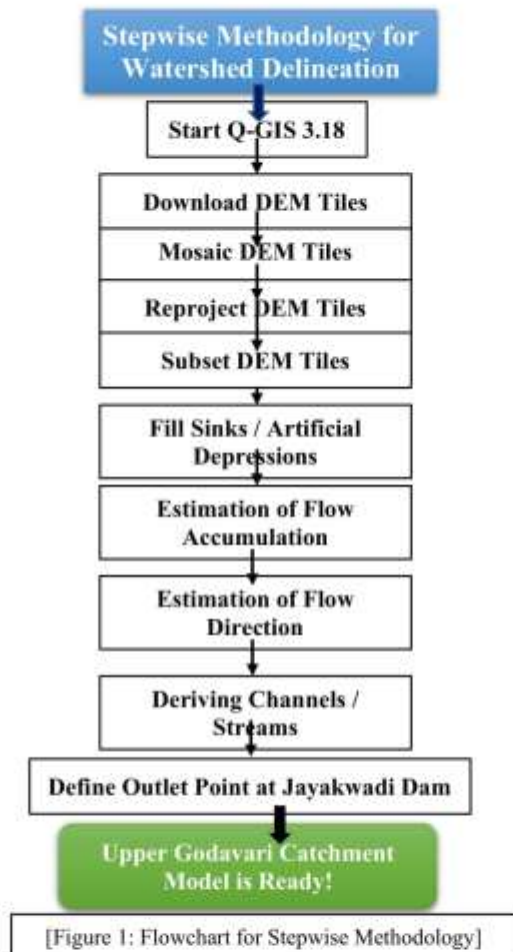
#### 9. Tables:

**Table 1: Geographical Parameters of Watershed**

Sr. No.	Name of Sub-basin	Area (Sq. Km)	Perimeter (Km)
1	Major Upper Godavari	9669.433	827.400
2	Pravara	6371.288	701.100
3	Shivna	2585.894	407.160
4	Dhora	1612.331	303.120
5	Kham	1864.985	398.640
<b>Total</b>	<b>Upper Godavari Basin</b>	<b>22103.931</b>	<b>1298.160</b>

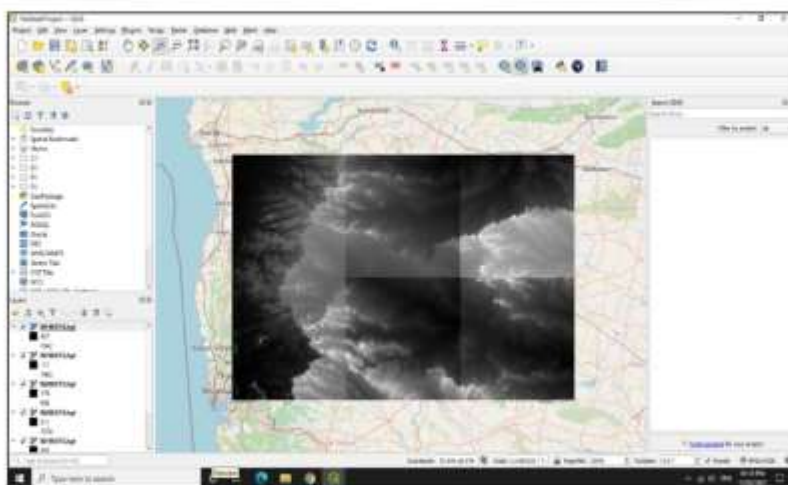
(Source: Computed by Student in Q-GIS 3.18)

10. Figures:



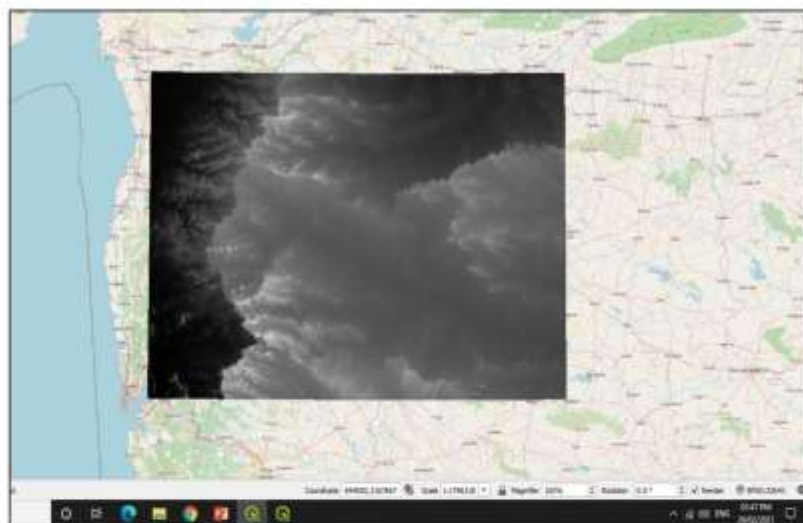
(Figure 2: Downloaded Six DEM tiles)

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*



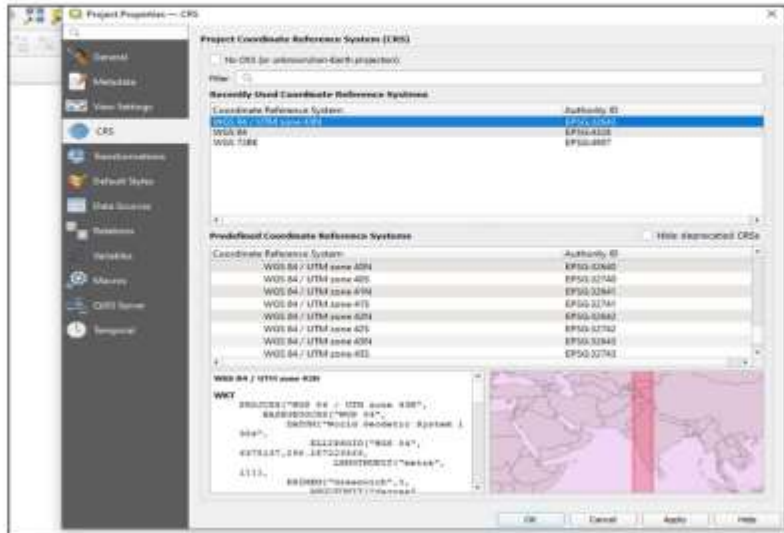
(Source: Prepared by author in Q-GIS 3.18)

(Figure 3: Mosaic DEM tiles)



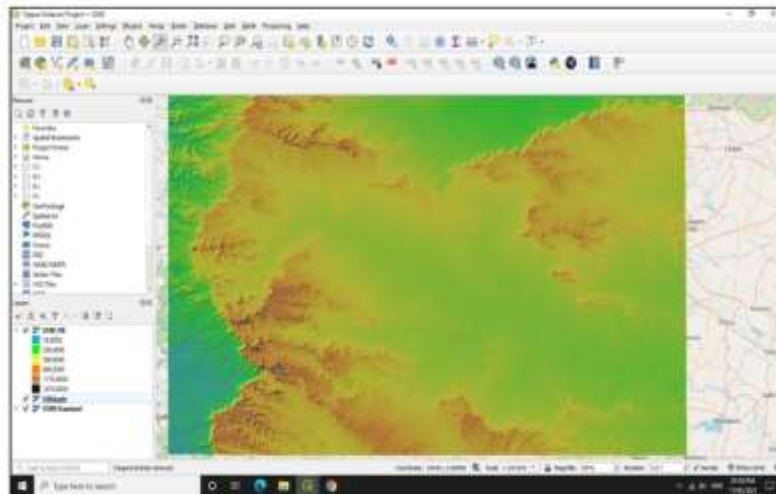
(Source: Prepared by author in Q-GIS 3.18)

**(Figure 4: Reproject DEM tiles)**



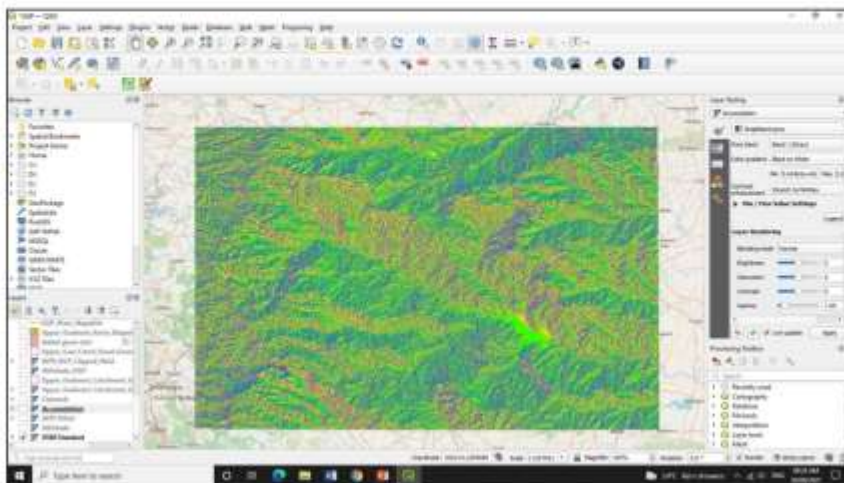
**(Source: Prepared by author in Q-GIS 3.18)**

**(Figure 5: Fill Sinks / Artificial depressions)**



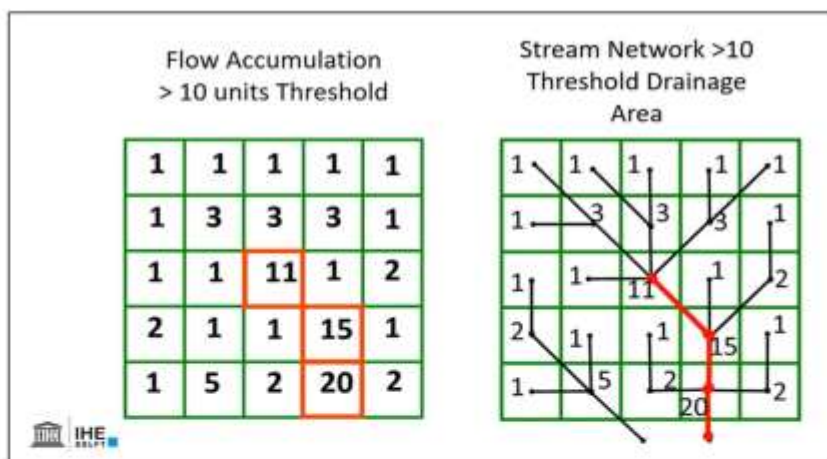
**(Source: Prepared by author in Q-GIS 3.18)**

(Figure 6: Flow Accumulation & Flow Direction)



(Source: Prepared by author in Q-GIS 3.18)

(Figure 7: Sample example of Flow Accumulation method to derive Channel / Streams)



(Source: IHE - DELPT)

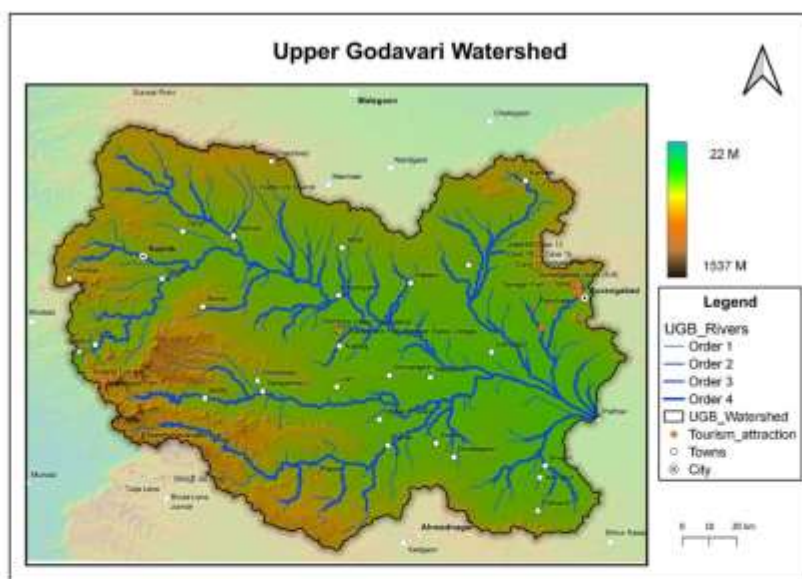
*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

**(Figure 8: Derived Channel / Streams)**



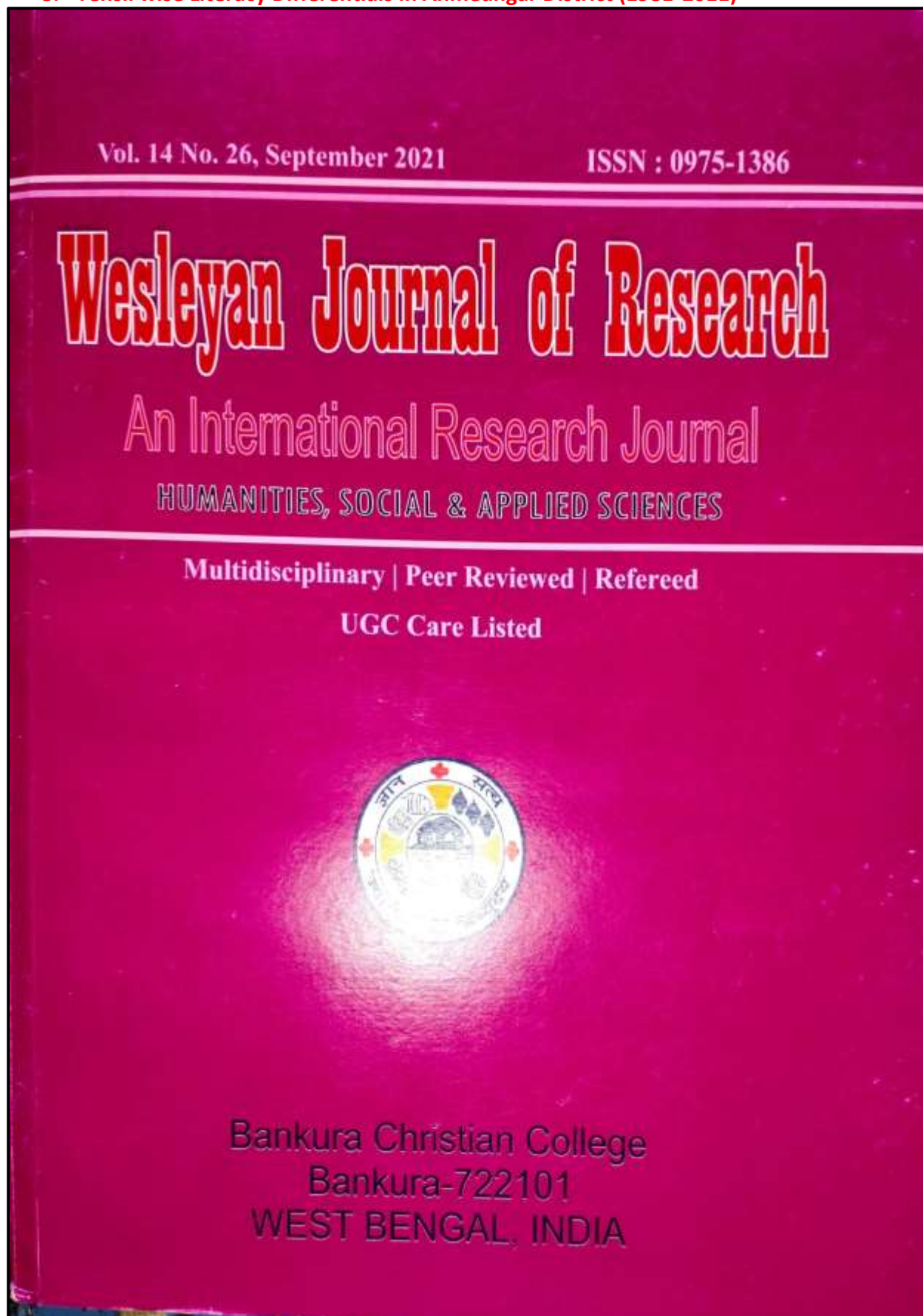
**(Source: Prepared by author in Q-GIS 3.18)**

**(Figure 9: Delineated Upper Godavari Watershed map)**



**(Source: Prepared by author in Q-GIS 3.18)**

8. Tehsil wise Literacy Differentials in Ahmedngar District (1981-2011)





- 8 "TEHSIL WISE LITERACY DIFFERENTIALS IN AHMEDNAGAR DISTRICT (M.S.) 1981-2011"  
*Author (s) by: -Mhaske Jyotsna Dattatraya* 62-72
- 9 SCREENING OF MYCOFLORA ON ALLIUM CEPA L. FROM DIFFERENT LOCALITIES OF  
PARNER TEHSIL MAHARASHTRA  
*Author (s) by: -Rani Shaikh, Rangnath Aher, Dnyaneshwar Sherkar* 73-77
- 10 SYNTHESIS, CHARACTERIZATION AND QSAR STUDY OF 2-(5-METHYL-4-  
PHENYLTHIAZOL-2-YL)-4-OXOTHIAZOLIDINE-5-CARBOXYLIC ACID DERIVATIVES  
*Author (s) by: -Santosh R. Kshirsagar, Rahul R. Dhavase, Amarnath N. Jagdale, Achut S. Munde* 78-88
- 11 IMPACT OF PEG-6000 INDUCED WATER STRESS ON SEED GERMINATION PARAMETERS  
OF WHEAT CULTIVARS.  
*Author (s) by: -Ravindra Deshmukh, Tukaram Thopate, Kalpana Sawant, Anil Bhalerao, Kadlag, S. D* 89-98
- 12 BORON SULFONIC ACID-CATALYZED AN EFFICIENT SYNTHESIS AND ANTIBACTERIAL  
STUDY OF N-SUBSTITUTED PHENYL MALEIMIDES  
*Author (s) by: -T. S. Thopate, C. D. Bhenki, R. N. Deshmukh, S. B. Katariya* 99-106
- 13 STUDY OF DYSTERIA BRASILIENSIS (FREE LIVING MARINE CILIATE) FROM GUHAGAR  
BEACH, RATNAGIRI, MAHARASHTRA  
*Author (s) by: -V. D. Bandar, S. R. Wagh* 107-111
- 14 SYNTHESIS AND CHARACTERIZATION OF SOME NEW THIAZOLYL SCHIFF BASE-METAL  
COMPLEXES  
*Author (s) by: -Vaibhav P. Landage, Rahul S. Bhondwe, Bhausasheb K. Karale, Dilip R. Thube* 112-118

**“TEHSIL WISE LITERACY DIFFERENTIALS IN AHMEDNAGAR DISTRICT (M.S.) 1981-2011”****Mhaske Jyotsna Dattatraya**Assistant Professor, Department of Geography, New Arts, Commerce and Science College, Parner, Dist –  
Ahmednagar, Email: [jyotsnamhasket@gmail.com](mailto:jyotsnamhasket@gmail.com)**Abstract:**

Literacy rate is an important characteristic of population. Ahmednagar district is selected as the study area in the state of Maharashtra. The main aim of present research is to examine changes in general and gender wise literacy rate for each tehsil from 1981 to 2011. The present study is based on secondary sources of data obtained from various published and unpublished sources.

According to 1981 census, literacy rate of Ahmednagar district was only 43.16%, whereas it is increased to 79.05% in 2011. Overall district literacy rate change is about 35.89%. Gender wise changes show that female literacy rate increases more than the male literacy rate i.e. 30.31% change for male and 41.65% change for female literacy rate. Male-female literacy gap is also narrowing & i.e. 11.34%. The major reasons behind this positive change is development of Educational facilities and providing free education for girls till higher secondary stage.

**Keywords: Gender, literacy, Male-Female Gap etc.****Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Mhaske Jyotsna Dattatraya

**1. Introduction:**

Literacy is the utmost important for overall development of the society, which improves the quality of human resource. A high level of literacy rate is an important factor in the process of modernizations. According to 2001 census, Literacy is defined as “A person aged seven and above, who can both read and write with understanding in any language, is treated as literate”. In India from 1991 onwards, population in the age group 0-6 years is excluded while calculating the literacy rate.

Pawar S. N. <sup>[1]</sup> depicted that “Literacy and educational attainment is one of the significant indicators of socio-economic development of the society, which affects demographic behaviour related with marriage, fertility, mortality, migration and work participation rate.” Shakil <sup>[3]</sup> said that Literacy is a human right, a tool of personal improvement and means for social and human development. Jadhav <sup>[4]</sup> explained that Literacy is considered as

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

an of the most important social aspect of any society development. Pagar S. D. [2] studied the Geographical analysis of literacy in Nashik district of Maharashtra and suggested that government should setup new school and colleges as per requirement of each tehsil and encourage the girl education.

The present study has basic aim to examine changes in general and gender wise literacy rate for each tehsil from 1981 to 2011.

## 2. Study Area:

Ahmednagar district is selected as the study area in the state of Maharashtra. It is situated to some extent in the upper Godavari valley and to some extent in the Bhima valley. District lies between 18°10' to 20°00' North Latitude and 73°30' to 75°37' East Longitude. (Figure 1). The distribution of the rainfall is very uneven and average annual rainfall is 583.5 mm. (2011Census) [6]

The total population of Ahmednagar district is 45, 43,159 persons as per 2011 census. From the total population 79.91% population is rural and 20.09% population is urban. Population density was 266 persons per sq. km. The sex ratio was 939 F/ '000'M, literacy was 79.05%. The growth of population from 2001 to 2011 was 12.43%.

## 3. Objective:

1. To examine Tehsil wise literacy differentials in general and gender.
2. To study tehsil wise changes in general and gender wise literacy rate in 1981 and 2011 in Ahmednagar District.

## 4. Material and Method:

In the present study, tehsil is taken as a basic unit of investigation. The present study made use of secondary data. The secondary data was obtained from District Census handbook Ahmednagar. Socio- economic Review, District Statistical Abstract and various articles, books etc., The period selected for the present study is from 1981 to 2011.

Literacy rate is calculated by using following formulas,

$$DTLR = \frac{\text{District total literate population}}{\text{District total Population (excluding 0-6 age group)}} \times 100$$

$$DMLR = \frac{\text{District total Male literate}}{\text{District total Male Population (excluding 0-6 age group)}} \times 100$$

$$DFLR = \frac{\text{District total Female literate}}{\text{District total Female Population (excluding 0-6 age group)}} \times 100$$

[63]

Where, DTLR-District Total Literacy Rate, DMLR- District Male Literacy Rate, DFLR- District Female Literacy Rate

## 5. Result and Discussion:

### 5.1 General literacy differentials (1981 and 2011):

The table no 1 shows General and Gender tehsil wise literacy differential in Ahmadnagar district 1981 and 2011.

#### 5.1.1 General literacy differentials 1981:

According to 1981 Census, it is recorded that out of total population, 43.16% is literate while the Maharashtra state have average literacy rate of 47.18%. Among the various districts in the state, Ahmednagar ranks 17th in terms of literacy rate.

The literacy rate is maximum (57.18%) in Nagar tehsil and the minimum (28.63%) in Akola tehsil (Table 1 and Appendix-1). Other tehsils which recorded literacy rate above the district average includes; Shrirampur (48.58%), Kopergaon (46.99%), and Rahuri (45.58%). It is also observed that size of village and literacy rate are positively co-related.

#### 5.1.2 General literacy differentials 2011:

According to 2011 Census, it is observed that out of total population, 79.05% is literate. The literacy rate is maximum (86.35%) in Nagar tehsil and the minimum (72.62%) in Jamkhed tehsil (Table 1 and Appendix-2). Remaining tehsils which recorded literacy rate above the district average includes; Rahuri (79.74%), Shrirampur (82.12%), Sangamner (79.96%), Kopergaon (79.84%) and Rahata (82.08%). Availability of more educational facilities is the main reason behind higher general literacy rate in these tehsils as compared to other tehsils.

## 5.2 Gender wise literacy differentials and Gaps (1981 and 2011):

### 5.2.1 Gender wise literacy differentials and Gaps 1981:

In 1981, the gender wise average literacy rate for district was 56.51% for males and 29.24% for females. According to 1981 census, it is observed that Nagar tehsil has the highest literacy rate for both males and females i.e. 69.63% and 43.25% respectively, while Akola tehsil has the lowest literacy rate, i.e. 41.14% and 16.20% for males and females respectively. All the tehsils of study region show female literacy is drastically lower than male literacy rate. Economically and agriculturally developed tehsils such as Nagar, Rahuri, Shrirampur, Kopergaon shows male and female literacy rate is above the district average i.e. 56.51% and 29.24% respectively. Gender differences particularly marked especially in drought prone and tribal and less developed tehsils like as, Shevgaon, Sangamner, Pathardi, Jamkhed, Karjat, Shrigonda, Newasa, Parner, and Akola all these tehsil shows female literacy below the district average. According to 1981 census, district average gender wise literacy gap is

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

(27.27%). Male female literacy gap is the highest in Pathardi tehsil (30.17%) while, lowest is in Kopargaon tehsil (21.49 %).

Tehsils like Nagar, Rahuri, Shrirampur, Newasa, Karjat, Shrigonda, Akola and Kopargaon show gender wise literacy gap is below the district average. Male-female literacy gap above the district average is found in Shevgaon, Pathardi, Jamkhed, Parner and Sangamner. The Fig. 2 clearly shows significant gap between gender wise literacy rates in 1981.

Like male female differential, there exists disparity in the literacy rate of rural and Urban areas. As against 40.12% of literates in Rural areas as per 1981 census, there are 63.55% literates in Urban areas of the districts. Between the two sexes, the differential is largest among females (25.91% rural and 52.61% urban) than that of the males (53.90%rural and 73.28%urban)

### 5.2.2 Gender wise literacy differentials and Gaps 2011:

According to 2011 census, gender wise literacy rate for overall district is 86.82% for males and 70.89% for females. Nagar tehsil has the highest literacy rate for both males and females i.e. 91.47% and 80.90% respectively, while Jamkhed tehsil has the lowest literacy rate i.e. 82.31% for males and 62.26% for females. The tehsils Nagar, Rahuri, Shrirampur, Sangamner, Kopargaon and Rahata shows Gender wise literacy rate is higher than the district average. Whereas remaining all eight tehsils shows low male-female literacy than the district average.

In 2011, gender wise literacy differences decreased by increasing male-female literacy rate in the study region. As per 2011 census, district average gender literacy gap is the 15.93%. The gender wise literacy gap is the highest in Shevgaon tehsil (20.73%) while, lowest literacy gap (10.57%) is observed in the Nagar tehsil (Fig. 3).

The tehsils showing literacy gap below the district average (15.93%) are Nagar, Rahuri, Shrirampur, Sangamner, Kopargaon and Rahata and remaining all 8 tehsils show Gender wise literacy gap is above district average. It is evident that male-female literacy rate is in good progress in 2011 census but not that great. In other words, females are lagging behind males in literacy in all the tehsils but as compared to 1981, the Male Female gap is significantly reduced.

### 5.3 Change in General and Gender Wise Literacy between 1981 and 2011:

It is observed that, from 1981 to 2011 census, positive change is occurred in general as well as gender wise literacy rate (Table 1). Overall district literacy rate change is about 35.89%. Gender wise changes show that female literacy rate increases more than the male literacy rate i.e. 30.31% change for male and 41.65% change for female literacy rate. Male-female literacy gap is also narrowing & i.e. 11.34%. It indicates that increase in literacy rate and improvement in status of female. The highest positive change in total literacy is observed in Akola tehsil (46.23%), whereas the lowest positive change exists in Kopargaon tehsil (32.85%).

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Maximum positive change in male, female literacy rate observed in Akola Tehsil i.e. 42.95%, 49.3% respectively, while gender wise lowest Positive change found in Nagar tehsil with 21.84% for males and 37.65% for females.

Gender wise literacy gap is declined and the highest increase in female literacy than male is found 15.81% in Nagar tehsil, while lowest increase is 5.59% exist in Kopergaon tehsil. It is interesting to note that entire tehsils show gender wise literacy gap considerably decreasing, because larger increase in gender wise literacy rate in last decade. Fig. 3, clearly shows that change in Male and Female literacy gap is rapidly decreased in tribal and drought prone area, especially in Akola and Kopergaon tehsils. The major reasons behind this positive change is development of Educational facilities and providing free education for girls till higher secondary stage.

#### 6. Conclusion:

It is concluded that literacy transformation in Ahmednagar district is approaching rapidly to the advanced stage. But, there still exists a significant gap in literacy rates in general and gender wise and also in rural and urban area. So, education administration should be concentrated for improving the education and school enrolment level in backward tehsils. Further, although gender differential in literacy rate continues to exist, female literacy has recorded a larger increase as compared to that in male literacy from 1981 to 2011. As a result of it, the gap between male and female literacy rates has significantly narrowed down during the 2011 i.e. 15.93%.

This type of study is important for future development of existing educational infrastructure along with awareness about child education to achieve a holistic growth. This will definitely be useful for researchers, policy makers and government agencies.

#### 7. References:

- [1] Pawar S. N. (2013): A research article on "Literacy differentials in Ahmednagar district of Maharashtra", published in Golden Research thoughts, Volume 2, Issue 12, June 2013, ISSN 2231-5063.
- [2] Pagar S. D. (2016): A research paper on "Geographical analysis of Literacy in Nashik district of Maharashtra", published in peer reviewed international research journal of geography, Maharashtra Bhugolshstra Sanshodhan Patrika, IISN 0971-6785 (Impact factor 2.561), Volume 33, No. 1, Jan June 2016, Pp: 73-83.
- [3] Shakil M, Lone A. H. & Zafar J. M. (2012): "Measuring Literacy mechanism, an assessment of Literacy level in Pakistan", social and behavioral science, No. 47, Pp: 391-395
- [4] Jadhav R. S. (2015): "Geographical analysis of Shirur tehsils Literacy, Pune district (M.S.)", Global journal for research analysis, Vol 4, Issue 4, April 2015, ISSN no. 2277-8160, Pp: 1-3
- [5] Government of India: Ahmednagar District Census Handbook, 1981
- [6] Government of India: Ahmednagar District Census Handbook, 2011
- [7] Government of Maharashtra: Socio- Economic review of Ahmednagar district, 1981 and 2011.

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Figure 1: Location Map of Study Area

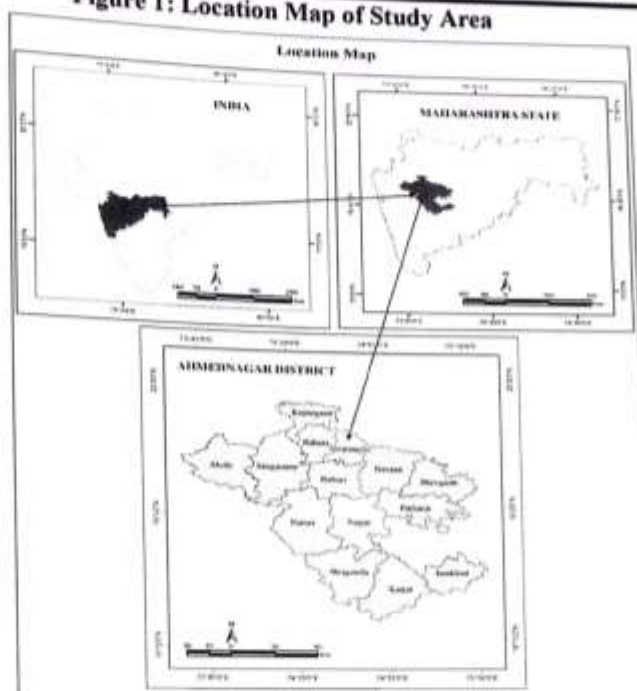


Table 1: General and Gender tehsil wise Literacy Differentials in Ahmednagar District (1981 and 2011)

Sr. No.	Tehsil	1981				2011			
		Total	Male	Female	M-F = Gap	Total	Male	Female	M-F = Gap
1	Nagar	57.18	69.63	43.25	-26.38	86.35	91.47	80.90	-10.57
2	Rahuri	45.21	57.69	32.11	-25.58	79.74	87.42	71.65	-15.77
3	Shrirampur	48.58	60.91	35.50	-25.41	82.12	89.27	74.80	-14.47
4	Newasa	40.09	52.80	26.76	-26.04	78.51	86.53	70.05	-16.48
5	Shevgaon	37.64	52.43	22.61	-29.82	73.94	84.15	63.42	-20.73
6	Pathardi	37.35	52.39	22.22	-30.17	74.74	84.98	63.85	-21.13
7	Jamkhed	35.91	50.39	21.15	-29.24	72.62	82.31	62.26	-20.05
8	Karjat	37.24	50.24	23.96	-26.28	74.11	82.57	64.98	-17.59
9	Shrigonda	40.34	53.28	26.83	-26.45	76.25	84.09	67.88	-16.21
10	Parner	38.27	53.32	23.83	-29.49	75.64	84.23	66.78	-17.45
11	Akola	28.63	41.14	16.20	-24.94	74.86	84.09	65.50	-18.59
12	Sangamner	41.37	54.90	27.47	-27.43	79.96	87.58	71.98	-15.60
13	Kopergaon	46.99	60.45	38.96	-21.49	79.84	87.58	71.68	-15.90

[67]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

14	Rahata	NA	NA	NA	NA	82.08	88.72	75.13	-13.59
<b>Total</b>	<b>District</b>	<b>43.16</b>	<b>56.51</b>	<b>29.24</b>	<b>27.27</b>	<b>79.05</b>	<b>86.82</b>	<b>70.89</b>	<b>15.93</b>

(Source: Computed by researcher based on Secondary Data)

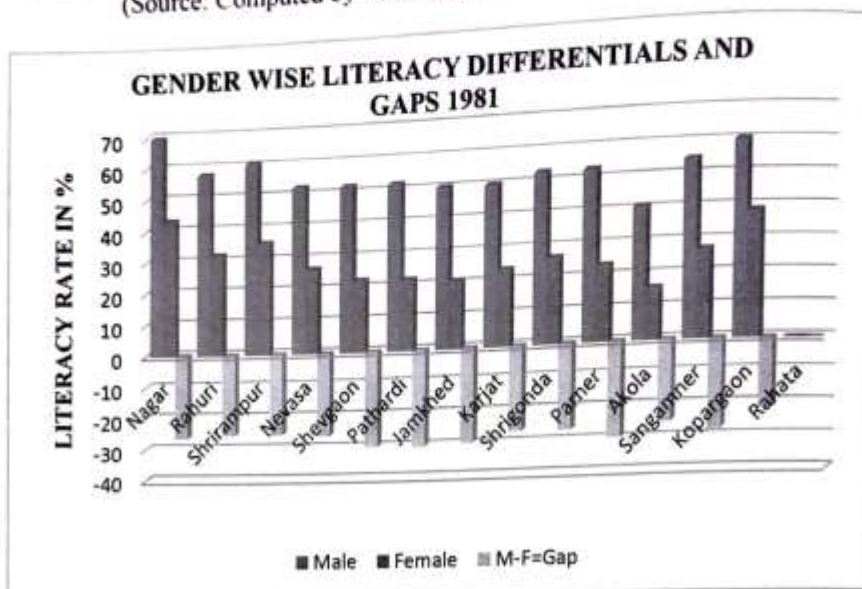


Figure 2: Gender wise Literacy Differentials and Gaps 1981

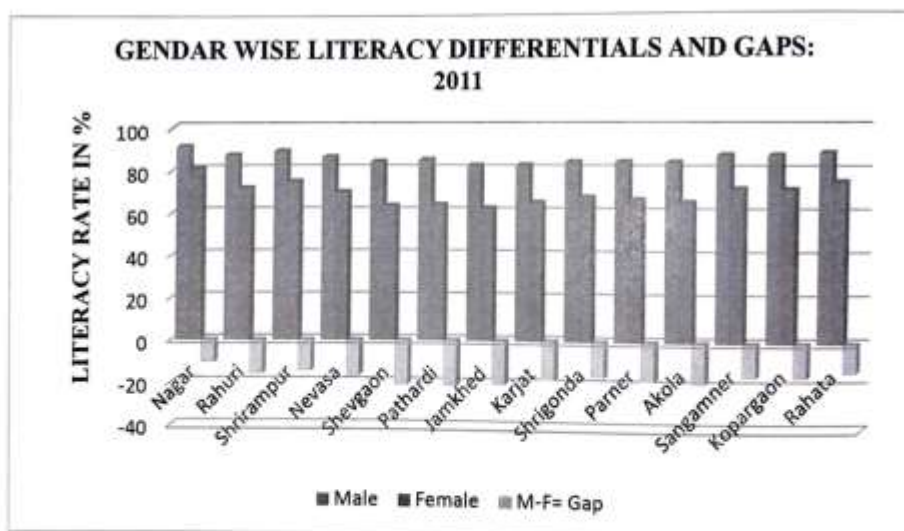
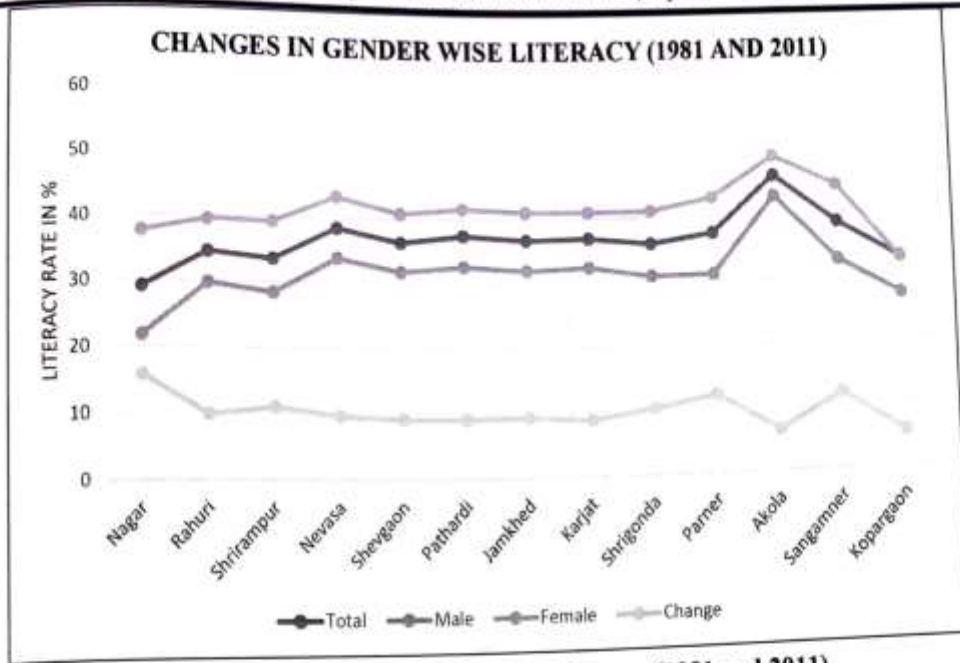


Figure 3: Gender wise Literacy Differentials and Gaps 2011





**Figure 4: Changes in Gender Wise Literacy (1981 and 2011)**

**7. Appendix:**

**Appendix 1: Secondary data obtained from Census 1981**

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Sr. No	Name of Tehsil	Total	Literates		Literacy rate			(M-F)= Gap
			Male	Female	% total	% Male	%Female	Gap
1	A.Nagar Dist	Rural	6,45,043	3,00,595	40.12	53.90	25.91	27.99
		Urban	1,36,270	87,018	63.55	73.28	52.61	20.67
		total	7,81,313	3,87,613	43.16	56.51	29.24	27.27
2	Nagar	Rural	58,240	26,737	46.00	61.23	29.83	31.4
		Urban	76,311	47,970	68.58	77.79	57.72	20.07
		Total	1,34,551	74,707	57.18	69.63	43.25	26.38
3	Rahuri	Rural	51,088	26,150	43.72	56.42	30.37	26.05
		Urban	9,236	5,806	54.83	65.92	43.25	22.67
		Total	60,324	31956	45.21	57.69	32.11	25.58
4	Shrirampur	Rural	72,489	37,388	46.52	59.60	32.64	26.96
		Urban	18,966	12,858	57.35	66.52	47.66	18.86
		Total	91,455	50,246	48.58	60.91	35.50	25.41
5	Nevasa	Rural	57,114	27,575	40.09	52.80	26.76	26.04
		Urban	----	----	0.00	0.00	0.00	0.00
		Total	57,114	27,575	40.09	52.80	26.76	26.04
6	Shevgaon	Rural	36,535	15,505	37.64	52.43	22.61	29.82
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	36,535	15,505	37.64	52.43	22.61	29.82
7	Pathardi	Rural	38,850	16,372	37.35	52.39	22.22	30.17
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	38,850	16,372	37.35	52.39	22.22	30.17
8	Jamkhed	Rural	24,242	9,983	35.91	50.39	21.15	29.24
		Urban	----	-----	0.00	0.00	0.00	0.00
		Total	24,242	9,983	35.91	50.39	21.15	29.24
9	Karjat	Rural	37,714	17,144	37.24	50.24	23.96	26.28
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	37,714	17,144	37.24	50.24	23.96	26.28
10	Shrigonda	Rural	49,373	23,809	40.34	53.28	26.83	26.45
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	49,373	23,809	40.34	53.28	26.83	26.45
11	Parner	Rural	46,344	21,590	38.27	53.32	23.83	29.49

[70]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	46,344	21,590	38.27	53.32	23.83	29.49
12	Akola	Rural	36,159	14,339	28.63	41.14	16.20	24.94
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	36,159	14,339	28.63	41.14	16.20	24.94
13	Sangamner	Rural	63,035	27,513	37.68	51.94	23.13	28.81
		Urban	14,990	10,470	63.51	72.23	54.15	18.08
		Total	78,025	37,983	41.37	54.90	27.47	27.43
14	Kopargaon	Rural	73,860	36,490	45.14	58.93	30.63	28.3
		Urban	16,767	9,914	56.59	68.21	43.94	24.27
		Total	90,627	46,404	46.99	60.45	38.96	21.49

(Source: Computed by researcher based on Secondary Data census 1981 Pp 182-184)

**Appendix 2: Secondary data obtained from Census 2011**

Sr. No	Name of Tahsil	Total	Literate		literacy rate			(M-F)=Gap
			Male	Female	% total	% Male	%Female	Gap
1	A. Nagar Dist	Rural	1392891	1052256	76.89	85.49	67.85	17.64
		Urban	380464	326279	87.57	92.05	82.87	9.18
		total	1773355	1378535	79.05	86.82	70.89	15.93
2	Nagar	Rural	102394	78446	80.15	88.01	71.79	16.22
		Urban	183532	159087	90.02	93.51	86.30	7.21
		Total	285926	237533	86.35	91.47	80.90	10.57
3	Rahuri	Rural	98462	75677	79.12	87.17	70.64	16.53
		Urban	27719	22424	81.97	88.34	75.27	13.07
		Total	126181	98101	79.74	87.42	71.65	15.77
4	Shrirampur	Rural	77679	60986	80.39	88.49	72.00	16.49
		Urban	35749	31889	85.90	91.01	80.81	10.20
		Total	113428	92875	82.12	89.27	74.80	14.47
5	Newasa	Rural	137681	105716	78.51	86.53	70.05	16.48
		Urban	-----	----	0.00	0.00	0.00	0.00
		Total	137681	105716	78.51	86.53	70.05	16.48
6	Shevgaon	Rural	91008	66575	73.94	84.15	63.42	20.73
		Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	91008	66575	73.94	84.15	63.42	20.73
7	Pathardi	Rural	87409	60868	73.47	84.16	62.14	22.02

8	Jamkhed	Urban	11521	9043	85.36	91.77	78.38	13.39
		Total	98930	69911	74.74	84.98	63.85	21.13
		Rural	45621	30604	69.77	80.43	58.26	22.17
9	Karjat	Urban	13456	11192	83.12	89.43	76.63	12.80
		Total	59077	41796	72.62	82.31	62.26	20.05
		Rural	84281	60818	73.48	82.17	64.09	18.08
10	Shrigonda	Urban	4807	4126	86.14	90.34	81.72	8.62
		Total	89088	64944	74.11	82.57	64.98	17.59
		Rural	108313	80688	75.63	83.84	66.84	17.00
11	Pamer	Urban	12193	10320	81.91	86.33	77.24	9.09
		Total	120506	91008	76.25	84.09	67.88	16.21
		Rural	104211	80091	75.64	84.23	66.78	17.45
12	Akola	Urban	-----	-----	0.00	0.00	0.00	0.00
		Total	104211	80091	75.64	84.23	66.78	17.45
		Rural	1,04,492	80,000	74.36	83.71	64.90	18.81
13	Sangamner	Urban	4,381	3,588	88.58	94.19	82.58	11.61
		Total	1,08,873	83,588	74.86	84.09	65.50	18.59
		Rural	1,55,028	118103	77.70	86.16	68.83	17.33
14	Kopergaon	Urban	37,390	33033	90.13	94.05	86.06	7.99
		Total	1,92,418	1,51,136	79.96	87.58	71.98	15.60
		Rural	92307	69799	78.38	86.73	69.53	17.20
15	Rahata	Urban	26371	22491	85.08	90.69	79.32	11.37
		Total	118678	92290	79.84	87.58	71.68	15.90
		Rural	104005	83885	81.62	88.41	74.52	13.89
		total	23345	19086	84.21	90.15	77.93	12.22
			127350	102971	82.08	88.72	75.13	13.59

(Source: Computed by researcher based on Secondary Data Census 2011 Pp 52)

**9. A Temporal Changes In Kukadi Canal Irrigated Area A Study In Parner Tahasil" Ahmednagar (MH)**

Peer reviewed Journal	Impact Factor: 7.265	ISSN-2230-9578
<p><b><i>Journal of Research and Development</i></b></p> <p><i>A Multidisciplinary International Level Referred Journal</i></p> <p><b>September 2021    Volume-12    Issue-7</b></p>		  
<p><b><i>Resource Management and Agricultural Development</i></b></p>		
<p><b>Chief Editor</b>  <b>Dr. R. V. Bhole</b>                  'Ravichandram' Survey No-101/1, Plot No-23, Mundada Nagar, Jalgaon</p>		
<p><b>Executive Editors</b>  <b>Dr. N. G. Mali</b>                  Principal Sambhaji College (Arts, Commerce &amp; Science), Murud, Latur</p>	<p><b>Executive Editors</b>  <b>Dr. S. J. Phule</b>                  President Marathwada Association of Geographers, Latur</p>	
<p><b>Co- Editors</b>                  Dr. H. S. Waghmare, Dr. S. N. Ubale, Dr. G. L. Jadhav                  Prof. M. B. Gaikwad, Dr. B. N. Nagalgave,                  Dr. V. R. Rathod, Dr. S. S. Pawar</p>		
		
<p><b>Address</b>                  'Ravichandram' Survey No-101/1, Plot, No-23, Mundada Nagar, Jalgaon (M.S.) 425102</p>		

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7  
Resource Management and Agricultural Development*

## **Journal of Research and Development**

*A Multidisciplinary International Level Referred and Peer Reviewed Journal*

*9<sup>th</sup> September 2021 Volume-12 Issue-7*

*On*

### **Resource Management and Agricultural Development**

**Chief Editor**

**Dr. R. V. Bhole**

'Ravichandram' Survey No-101/1, Plot  
No-23, Mundada Nagar, Jalgaon

**Executive Editors**

**Dr. N. G. Mali**

**Principal**

Sambhaji College (Arts, Commerce &  
Science), Murud, Latur

**Executive Editors**

**Dr. S. J. Phule**

**President**

Marathwada Association of  
Geographers, Latur

**Co- Editors**

Dr. H. S. Waghmare, Dr. S. N. Ubale, Dr. G. L. Jadhav  
Prof. M. B. Gaikwad, Dr. B. N. Nagalgave,  
Dr. V. R. Rathod, Dr. S. S. Pawar

**Published by-** Dr. N. G. Mali, Principal Sambhaji College (Arts, Commerce & Science), Murud, Latur.

**The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.**

**© All rights reserved with the Editors**

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7.  
Resource Management and Agricultural Development*

### CONTENTS

Sr. No	Paper Title	Page No.
1	A Geographical Analysis of Talukawise Landuse Pattern in Osmanabad District <b>Dr. Rajaram D. Davankar</b>	1-3
2	Agricultural Marketing <b>Mr. Ramshankar Varma</b>	4-6
3	Problems and Prospects of Horticulture: A Case Study of Osmanabad District of Maharashtra <b>Dr. Jadhav Ganesh L.</b>	7-11
4	Classification of Agro Service Centers in Osmanabad District: A Geographical Study <b>Dr. S. B. Ashture, Dr. S. R. Dharashive</b>	12-15
5	Geographical Study Of Fruit Farming In Karmala Tahsil Of Solapur District. <b>Dr. Ankush Shankar Shinde.</b>	16-18
6	Consequences of Climate Change: A Geographical Study <b>B.R. Gurude, Prof. Dr.V.T.Naik</b>	19-22
7	Study on Rain Water Harvesting From Rooftop <b>Dr. Nivrutti Uttam Rathod</b>	23-25
8	Changes In Land Use And Cropping Pattern Of Bhokardan Tahsil: A Geographical Analysis <b>Pramod B. Deshmukh, Dr. S. B. Ashture</b>	26-28
9	A Geographical Analysis Of Utilization Of Improved Seeds In Osmanabad District <b>Dr. Hange A. K.</b>	29-31
10	Trade Area of Market Centersin YavatmalDistrict: A Geographical Study <b>Dr. N.T.Deshmukh</b>	32-34
11	Tahsilwise Percentage of Area under Irrigation to Gross Cropped Area in Yeotmal District <b>Dr.NandkumarMagar</b>	35-37
12	Natural Resources Management and Conservation <b>Dr. D. S. Itle</b>	38-40
13	Case Study Of Irrigation and economic Development: Shrigonda Tahsil (MS) <b>Dr. Dalimbe, S. N.</b>	41-45
14	Shivkalin Water Management <b>Mr.Dinkar Mohanrao Randive</b>	46-47
15	Covid-19 Impact On Indian Agriculture <b>Dr. R.D.Khakre</b>	48-50
16	Microbial Importance In Agriculture: A Review <b>Dr.Pawar Ashok, Dr.Gadakh Pravin</b>	51-52
17	Assessment Of Soil Erosion In Warasgaon Lake Catchment Pune Maharashtra Using, Usle, GIS And Remote Sensing <b>Dr. Swati Shailendra Panhale, Dr. N.G. Mali, Dr. O.V. Shahapurkar</b>	53-59
18	Difficulties of Students in the Study of Abstract Algebra <b>Naik Ashok Machchhindra</b>	60-64
19	Measuring Residents' Attitude for Tourism Development at Nagaon Beach of Raigad district <b>Dr. Amol Manohar Bibe</b>	65-67
20	Agro Processing Industries: Avoided by Farmers <b>Dr. Sarsare S.M.,</b>	68-70
21	The Study Of Rainfall And Sugarcane Landuse In Satara District <b>Dr.Wagmare .J.K Mr. Gaikwad N. V.</b>	71-75
22	Social Study Of Rural Community In Mandangad Tahsil <b>Vishnu Jaybhaye</b>	76-77
23	Distribution Of Primary Schools In Karad Taluka Dist. Satara (MS) <b>S. J. Sakat</b>	78-80
24	A Study Of The Analysis Of Indian Agricultural Development <b>Dr. Chavan Ashok Daulatrao</b>	81-83
25	Agricultural Marketing in India-With special reference to Himachal Pradesh <b>Sonika Saini Manrai , Dr. Ruchy Sharma</b>	84-88
26	Problems And Prospects Of Agricultural Marketing In India <b>Pramod D. Borhade, Dr. M. P. Sharma</b>	89-92
27	Sustainable Management Of Natural Resources <b>Siddesh Dnyandev Boraste</b>	93-95
28	Environmental Literature As A Genre <b>Dr. Meena Kadam</b>	96-97
29	A Study On Agri - Preneurship In India <b>Dr. Vijay Kumar Gonekar</b>	98-100
30	Multiple Benefits Of Fenugreek: Overview <b>J. Jyothi</b>	101-103
31	Geographical Study of Population Dynamics in Osmanabad District <b>Dr. P. R. Baravkar</b>	104-106

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7.  
Resource Management and Agricultural Development*

32	Remote Sensing and GIS Application in Agriculture And Natural Resource Management <b>Rutuja V. Kotkar, Renuka S. Tanpure, Pramod D. Borhade</b>	107-109
33	Study Of Fish Marketing Trends Of Siddheshwar Reservoir,Hingoli District Maharashtra. <b>Niture S D</b>	110-114
34	Socio-Economic Status Of Fishermen Of Siddheshwar Reservoir Of Hingoli District Maharashtra <b>Niture S D</b>	115-119
35	The Study of Molar Refractivities and Polarizability Constants of Diphenoxylate Drug Molecule <b>G.B.Akat</b>	120-122
36	Nature Vs Nature in the plays of Manjula Padmanabhan <b>Mr.Mahadeo Babu Gaikwad</b>	123-124
37	A Review of IoT for Smart Framing in Agriculture Sector <b>Mr. Anand Digambarrao Kadam , Suraj Lahurao Tope, Trupti Digambarrao Kadam, Komal Diliprao Kadam, Dr. Nagsen Samadhan Bansod</b>	125-127
38	Sustainable Management Of Natural Resources <b>Siddesh Dnyandeve Boraste</b>	128-130
39	Sustainable Development Goal–Zero Hunger Change In Cropping Pattern <b>Vinod Sharma</b>	131-133
40	Reading Habit of Users of 'A' Grade Public Libraries in Nanded City <b>Shaikh Sajeed Shaikh Bashir , Dr. Rameshwar Suryabhanji Pawar</b>	134-137
41	Renewable Energy Technologies:Roadmap To Future Generations <b>Dr.L.Malleswara Rao, Dr.APV Appa Rao, P Rama Krishna Rao, Ch. Sundar Singh</b>	138-143
42	A Temporal Changes In Kukadi Canal Irrigated Area A Study In Parner Tahasil" Ahmednagar (M.H) <b>Mr. Sanjay Sukhdev Aher, Dr. Sanjiv Hari Kolpe</b>	144-146
43	A Dirot Wood from the Deccan Intertrappean Beds of Shible (M.S.), India <b>Wanjari M. H , Ghatbandhe N. M</b>	147-149
44	India's Sustainable Development Goals and Agrarian Reforms- Polices and Challenges <b>Dr. Jadhav Rajeshri Apparao</b>	150-151
45	Watershed Management for Sustainable Development <b>Dr.Ishwar Baburao Ghorude, Dr. Kirti Sadhuroo Niralwad</b>	152-154
46	Water Resources Issues and Management in India <b>Dr. N.G. Mali, Dr. A. A. Kalgapure, Dr. R.B. Madale</b>	155-158
47	Agro Based Industries and Rural Development <b>Dr. Sunil D. Chachere</b>	159-161
48	The Concept of Sustainable Development <b>Dr. P. B. Achole.</b>	162-165
49	Declining Size of Holdings and Increase use of Chemical fertilizers in Farming-Need for Sustainable Agriculture in the State of Manipur <b>Dr. Silvia Lisam</b>	166-168
50	Innovative Library Services in Digital Era. <b>Mrs.Sayyed S.N.</b>	169-170
51	Agricultural Land Use and Land Efficiency in Kanakapura Taluk of Ramanagr District; Karnataka <b>B. N. Yaligar., Dr. M. Nagaraj, D. A. Kolhapure</b>	171-175
52	Sustainable Agriculture & Rural Development <b>Dr. Sakhamrao Dnyanoba Waghmare</b>	176-178
53	Correct time duration in life cycle stages family formicidae species of <i>Meranoplus Bicolor</i> & <i>Crematogaster Contento</i> during rainy season in at Mahad <b>Dr. Bhosale P.A</b>	179-182
54	Digital Farming Using Internet Of Things (IOT) For Sustainable Agriculture <b>Prof.Yogesh S. Amle, Prof.Dhananjay S. Borhade, Prof. Pramod D. Borhade</b>	183-187
55	Health and Environment Effects of Air Pollution <b>Dr. Sarwade M. P.</b>	188-190
56	Spatial Distribution of Market Centers in Latur District: A Geographical Study <b>Dr. R. S. Dhanushwer</b>	191-193
57	Challenges and Marketing Strategies For Msmes <b>Dr. R. S. Musale</b>	194-197
58	A Study of Farmers' suicide: Psychological Perspectives Approaches in Maharashtra <b>Dr.Munaji Kishanrao Rakhonde</b>	198-200
59	Role of Small Scale & Cottage Industries in the Economic Growth of Indian Economy <b>Dr. B. V. Dakore</b>	201-203
60	Study the effect of aqueous leaf extract of Adulsa (Adathoda zeylanica L.) on growth of Macrophomina Phaseolina Fungus by using different concentrations <b>M. M. Dudhbhate</b>	204-205
61	A Study of Per Capita Net Sown Area in Hingoli District <b>Dr. Vajjnath Kantiram Chavan</b>	206-208



*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7  
Resource Management and Agricultural Development*

62	Irrigation Facilities for Agriculture in India <b>Dr. H. L. Jadhav</b>	209-212
63	Challenges and Issues of Indian Agriculture <b>Walankikar A.V. Aithal S.V.</b>	213-215
64	To Prepare Physical Fitness Norms for 9th & 10th School Going Boy's Students <b>Prof. Anirudh Baburao Birajdar</b>	216-220
65	Application of Agriculture Technology in Drought Prone Agriculture Area in Osmanabad Tahasil: A Geographical Analysis <b>Dr. Abhaykumar Vijay Dharashive, Dr. Rahul Pradiprao Jadhav</b>	221-224
66	Water Resources Conservation and Management <b>Dr. Ashok D. Kalam, Dr. R. F. Ambad</b>	225-228

*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7  
Resource Management and Agricultural Development*

### A Temporal Changes In Kukadi Canal Irrigated Area A Study In Parner Tahasil" Ahmednagar (M.H)

Mr. Sanjay Sukhdev Aher<sup>1</sup> Dr. Sanjiv Hari Kolpe<sup>2</sup>

<sup>1</sup>Dept of Geography New Arts, Commerce and Science College, Parner Dist. Ahmednagar.

<sup>2</sup>Dept of Geography Arts, Commerce and Science College Gangakhed Dist. Parbhani.

<sup>1</sup>Email. Id: Sanjayaher86@gmail.com

<sup>2</sup>Email. Id: shkolpe@gmail.com

#### Abstract

Irrigation is the most important role in agricultural development fix water resources affect in agricultural and social development depended only rainy season only seasonal crops be growing agriculture irrigated crops might ready high yields crops use and properly irrigation facility available irrigation essential part of agriculture development Present study in parner tahsil selected study area under before and after Kukadi canal project which 20 village 1996 to 2006 in this ten year mostly changes in irrigation development before and after increase in irrigated area canal 20 km to 79 km reach to water supply 36% to 67 % increase to irrigated area in 2006 In 1996 in this year 8835.70 hector area in irrigated but after used of canal irrigation 2006 16632.55 hector area in irrigated in 20 village.

**Key Words-** water resources, irrigation facilities, canal irrigation

#### Introductions

Irrigation in a region or country will depend several factors as a surface, rock structure, , quality and quantity of ground water, catchment area and soil profile of the land. These factors vary considerably from place to place. parner Tahsil receives inadequate rainfall distribution is uneven. it becomes essential water, which has poured, canals, tanks etc. inadequate rain during the growing season. Therefore, an integrated development of water and land resources irrigation variation in parner tahsil mostly 70-80% area not a fixed irrigation facility canal irrigation sources of agriculture but canal irrigation not a every point need for lift irrigation This research paper examine to Before development in canal irrigation area under irrigation and after canal irrigation development growth and development area under different irrigation, methods of irrigation and limitation of irrigation, changes intensity of irrigation in tahsil highlighting the spatial distribution increased area irrigation in parner tahsil selected area.

#### Study Area

The Parner tahsil selected for the study to present work. The tahsil is confined by 180 49'40" N, to 190 21'13"N. Latitudes and 740 10'22"E to 740 38'34" E. longitudes geographically .it located on "Deccan Plateau" and "Rain shadow zone Therefore tehasil Characterized with low rainfall and it is identified as "drought prone area There are 131 villages in parner tahsil parner tahsil is largest tahsil in Ahmednagar district . Parner tahsil geographical area of 1,930.28 Sq. Km. And 750sq .mi total population parner tahsil 2001 census population in praner tahsil 246552 total area in parner tahsil 1868 sq..

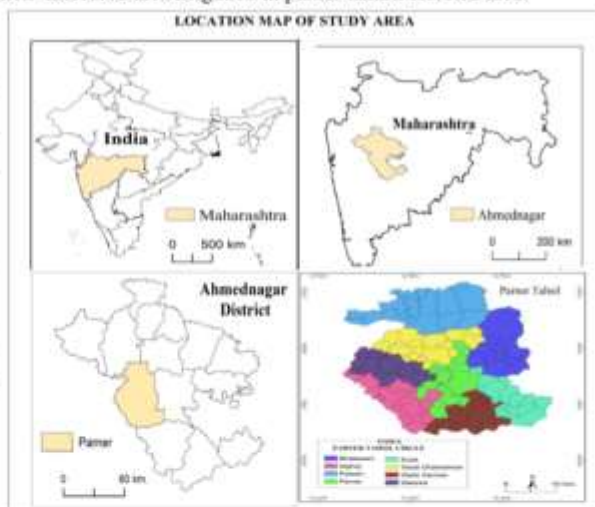
density of population 132 km<sup>2</sup> literate population 71.5% and other area in used in 13.71% and most area in Agricultural area under 76.55% total population

#### Objective

the main objective of present study area solve the problem related irrigated area

1. To known geographical set up Parner tahsil
2. To study changes irrigated area in study region

**Hypothesis** Whether the irrigation sources development and it's affected in irrigated area



*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal, Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7 Resource Management and Agricultural Development*

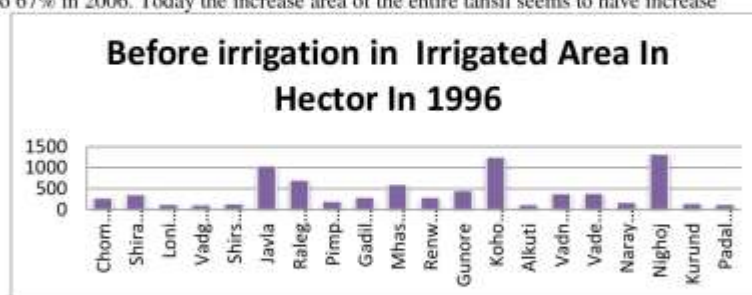
**Methodology**-The present paper in secondary data .data have been collected statistical abstract in Ahmednagar district and village area count tahasil agricultural office in parner and kukadi canal branch in parner tahasil The suitable map and graphs represented data and analysis to subject matter the main irrigated practices in study area observed in 1996to 2006 to area under irrigated before in kukadi canal in 1996 in 20 village 8835 hectores area in irrigated kukadi canal irrigated area in 2006 in 20 village 16632 hectores area irrigated 36% to 67% area is increases to the kukadi canal irrigated area

**Data Analysis** Parner tahsil kukadi canal project under irrigated village and total area in hector

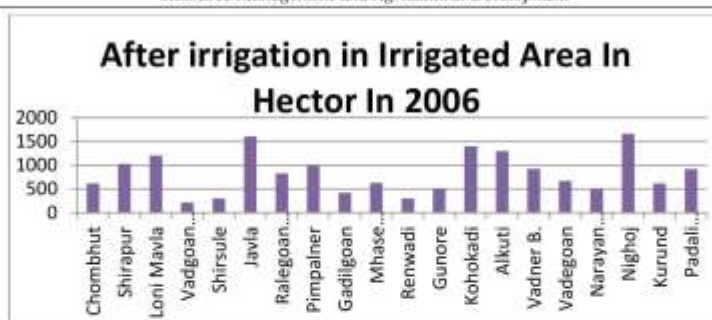
Sr.No.	Village Name	Before irrigation in Irrigated Area In Hector In 1996	After irrigation in Irrigated Area In Hector In 2006	Total Area In Hector
1	Chombhut	275.65	616.00	710.28
2	Shirapur	359.24	1028.33	1969.88
3	Loni Mavla	123.87	1205.00	1707.89
4	Vadgoan Gund	116.00	215.20	434.02
5	Shirsule	140.00	300.00	437.46
6	Javla	1046.07	1605.00	2155.94
7	Ralegoan Therpal	700.00	828.35	1001.31
8	Pimpalner	201.00	1000.00	1707.96
9	Gadilgoan	296.88	417.00	455.81
10	Mhase (Khurd)	600.00	627.00	865.86
11	Renwadi	292.68	300.00	343.58
12	Gunore	458.00	500.00	665.60
13	Kohokadi	1254.00	1400.00	1565.86
14	Alkuti	123.50	1300.50	1851.44
15	Vadner B.	383.07	925.20	1079.34
16	Vadegoan	387.70	672.27	1110.89
17	Narayan Gavhan	174.06	500.00	1587.62
18	Nighoj	1323.03	1660.00	2860.25
19	Kurund	151.95	615.70	1010.42
20	Padali Ranjangoan	129.00	917.00	1016.67
Total	8835.70	8835.70	16632.55	24538.08

(Source: Village Area Count and Tahsil Agriculture Office Parner)

A study of 20 villages in Parner tahsil which come under irrigation in the pre-irrigation in kukadi canal shows that 8835.70 hectores of this 20 villages were under irrigation in the year 1996 considering all the source of irrigation which the availability of irrigation facilities i.c 20 km to 79 km. Of canal after the canal reaches the benefit area and farmers get water through the area under all irrigation sources seems to have increase to 16632 hectores in the year 2006 in the net increase is 7796.15 hectores. The total area of this 20 villages is 24538.08 hectores compared to this area the total irrigated area was 36% in 1996 and it has increase to 67% in 2006. Today the increase area of the entire tahsil seems to have increase



*'Journal of Research & Development' A Multidisciplinary International Level Referred and Peer Reviewed Journal,  
Impact Factor-7.265, ISSN: 2230-9578, 9 September-2021, Volume-12, Issue-7  
Resource Management and Agricultural Development*



**Conclusion**

Before kukadi canal in 1996 which 20 village irrigation area minor development and socio-economical development less but after kukadi irrigation project developed in parner tahsil that time the catchment area of kukadi canal in 20 village agriculture and socio-economic development in 20 village out of 131 village The irrigation area of Nighoj village has increased the most area has come 1660 hectares and javla and kohokadi irrigation area has become increased which this situation after kukadi irrigation project.

**References :**

1. Chandana R.C geography of population kalyani publication lundhiyana
2. District census hand book 1991-2011
3. Gazetter of ahmednagar district 1993
4. A.M Michel Irrigation theory and practice

## 10. A geographical study of irrigation pattern in parner tehsil Ahmednagar (MH)"

www.irjhis.com ©2021 IRJHIS | Volume 2 Issue 9 September 2021 | ISSN 2582-8568 | Impact Factor 5.71



### INTERNATIONAL RESEARCH JOURNAL OF HUMANITIES AND INTERDISCIPLINARY STUDIES

(Peer-reviewed, Refereed, Indexed & Open Access Journal)

DOI : 03.2021-11278686

ISSN : 2582-8568

IMPACT FACTOR : 5.71 (SJIF 2021)

#### A GEOGRAPHICAL STUDY OF IRRIGATION PATTERN IN PARNER TAHSIL, AHMEDNAGAR (M.H)

**Mr. Sanjay Sukhdev Aher**

Department of Geography  
New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar  
E-mail: Sanjayaher86@gmail.com

**Dr. Sanjiv Hari Kolpe**

Department of Geography  
Arts, Commerce and Science College,  
Gangakhed, Dist. Parbhani  
E-mail: shkolpe@gmail.com

DOI No. 03.2021-11278686 DOI Link :: <https://doi-ds.org/doi/10.2021-38193734/IRJHIS2109003>

#### **Abstract:**

*Irrigation is necessary particularly in and uncertain rainfall area. it is essential and arterial application of water to overcome the deficiencies in rainfall for growing crop. The present study has aimed to explain the irrigation pattern of parner tahsil during 2010 to 2020. irrigation is an artificial supply water to land for growing crops and to increase the per hector yield Irrigation plays a vital role in meeting rising demands of food and fodder for growing human diestock population; moreover it is an age old practice of ancient civilization design to reduce moisture deficiency.*

**Keywords:** Irrigation Pattern, Surface Water Irrigation, Ground Water Irrigation, Others Sources of Irrigation, Bore well Irrigation, Well Irrigation,

#### **INTRODUCTION:**

Approaches of irrigation in a region or country will depend up on several factors such as, surface configuration, rock structure, water table, quality and quantity of ground water, proximity and extent of water potential catchment area and soil profile of the land. These factors vary considerably from place to place in a given region. Ahmednagar district (parner Tehsil) receives inadequate rainfall and its distribution is uneven. Thus it becomes essential to redistribute rain water, which has pound, canals, tanks etc. to compensate for the inadequate rain during the growing season. Therefore, an integrated development of water and land resources of a district is of fundamental of its agricultural economy. In ancient times, irrigation was through wells and inundation structure. Today, land is irrigated by a variety of ways, such as canals and raising sub-soil water since canal water cannot be taken to every point, need for lift irrigation arises. In a way, tube wells are the pulsing hearts and irrigation channels the arteries, which carry life and nourishment to arable fields.

IRJHIS2109003 | International Research Journal of Humanities and Interdisciplinary Studies (IRJHIS) | 20

[www.irjhis.com](http://www.irjhis.com) ©2021 IRJHIS | Volume 2 Issue 9 September 2021 | ISSN 2582-8568 | Impact Factor 5.71

This research paper proposes to examine to growth of irrigated area under different sources of irrigation, along with a consideration of methods of irrigation applied and limitation of irrigation, changes therein and intensity of irrigation in the district. The emphasis here is on highlighting the spatial distribution pattern of the above Ahmednagar District.

#### **HYPOTHESIS:**

- 1) Temporal changes in irrigation pattern

#### **OBJECTIVES:**

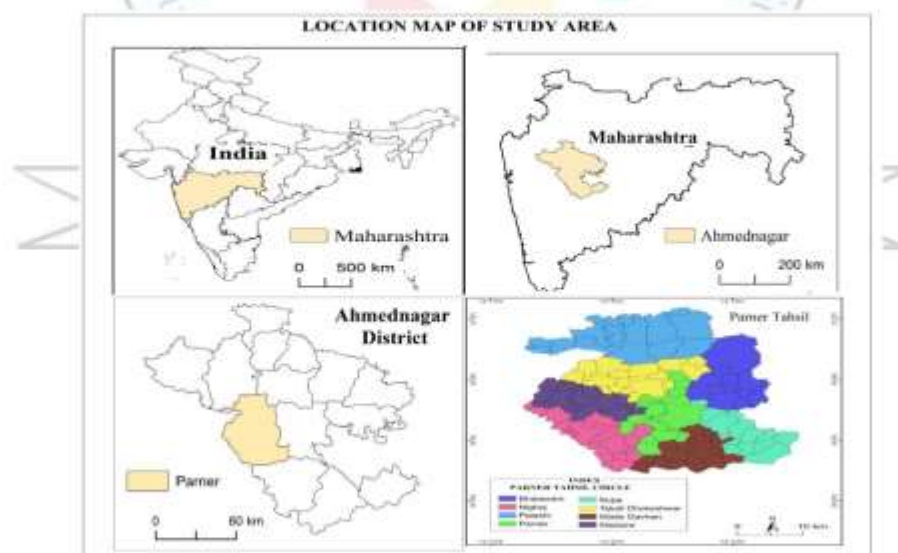
- 1) The Irrigation pattern in Parner Tahsil.
- 2) To find the Sources of Irrigation in Parner Tahsil.
- 3) To changes in irrigation pattern study area

#### **STUDY AREA:**

The parner tehsil of Ahmednagar district has been selected for the study to present work. The tehsil is confined by 18<sup>0</sup>49'40" N. to 19<sup>0</sup>21'13"N. Latitudes and 74<sup>0</sup>10'22"E to 74<sup>0</sup>38'34" E. longitudes geographically. it located on "Deccan Plateau" and climatological, it lies in the "Rain shadow zone" of Maharashtra state. Therefore tehsil Characterized with low rainfall and it is identified as "drought prone area in Ahmednagar district.

There are 131 villages constitutes into Eight revenues circles in parner tehsil Takali Dhokeshwar circle 19 villages, parnercircle 15 villages, wadigavan circle 19 village, Wadzire circle 15 villages, Supa circle 14 villages, Nighoj circle 21 village, palashi circle 15 village and Bhalawani circle 13 village. Parner tehsil geographical area of 1,930.28Sq.Km.the total population of the tehsil was 246535 people according to 2011 census.

**FIG 1: LOCATION MAP OF STUDY AREA**



IRJHIS2109003 | International Research Journal of Humanities and Interdisciplinary Studies (IRJHIS) | 21

**DATA BASE AND METHODOLOGY:**

The present study is based on fieldwork (Compiled by the Author) and secondary data collected from census Reports of government of India, district census handbook (2001 and 2011) Socio-economic review and district statistical abstract. The Geographical study of Irrigation pattern 2010 to 2020. The collected data has been processed and analyzed by using different quantitative, statistical technique. The tabulated data has been presented by graph and maps Using GIS. To make the comparative analysis study of Irrigation pattern in parner tehsil has also been computed. It can give better understanding regarding the Irrigation pattern in parner tehsil in Ahmednagar district following statistical formula used for change detection in different elements of our study.

$$\text{Change} = \frac{\text{Current Year} - \text{Base Year}}{\text{Base Year}}$$

**ANALYSIS AND RESULT:  
SOURCES OF IRRIGATION**



**GROUNDWATER IRRIGATION:**

Groundwater is the water present beneath Earth’s surface in rock and soil pore spaces and in the fractures of rock formations. A unit of Rock or an unconsolidated deposit is called an aquifer when it can yield amusable quantity of water. The depth at which soil pore spaces or fractures and voids in rock become completely saturated with water is called the water table. Groundwater is recharged form the Surface; it may discharge from the surface naturally at springs and seep, and conform oases or wetlands. Groundwater is also often withdrawn for Agriculture, Municipal and industrial use by construction and operating extraction well. The study of the distribution and movement of groundwater is hydrogeology, also call groundwater hydrology.

**WELL IRRIGATION:**

A Well is a hole dug in the ground to obtain the subsoil water. an ordinary well is about 3-5 meters deep but deeper well up-to 15 meters are also dug. This method of Irrigation has been used in India from time immemorial. Various methods are used to lift the ground water from the well for

other purposes. Some of the widely used methods are the Persian wheel, reht, charas or mot, and dinghy (lever).

Well Irrigation is popular in areas where sufficient sweet Ground water is available. These areas include a large part of the Great Northern plain, the Godavari, the Krishna and the Cauvery, Parts of the Narmada and the Tapi Valleys and the weathered layers of the Deccan Trap and Crystalline Rocks and the Sedimentary Zones of the peninsula. However, the greater part of the Peninsular India is not suitable for well irrigation due to rocky Structure, uneven Surface and Lack of underground water suitable for well Irrigation.

#### **BOREWELL IRRIGATION:**

Ahmednagar District being and our farmers depend mainly on groundwater for irrigation. With increasing population, lesser land holdings and urbanisation, deeper borewells are dug for groundwater abstraction. Borewells are very similar. Both are basically vertical drilled wells, bored into an underground aquifer in the earth's surface, to extract water for various purposes. The difference in the two lies in the type of casing used the depth of this casing and the type of soil where they are drilled. Casing to support the external surfaces of the borehole against collapse may be needed at certain depths, and usually is made up of PVC pipes. Electrical pumps are usually used to pump out the water the borewells, though the government is now giving subsidy for solar pumps. This convenience of pumps may increase the depletion of the groundwater at an increased pace. Central Ground Water Board (CGWB) has come with reports on the groundwater status in the country. Uncontrolled use of bore well technology leads to exploitation of groundwater at higher rates than the rate of water recharge, which may cause drastic depletion of groundwater.

**TABLE 1: WELL IRRIGATION PATTERN OF PARNER TEHSIL**

S.R	CIRCLE	2010	PERCENT	2020	PERCENT	CHANGE	CHANGE PERCENT
1	Bhalawani	530	12.22	1124	12.79	1.1207	<b>112.07</b>
2	Nighoj	739	17.04	1844	20.99	1.4614	<b>146.14</b>
3	Palashi	800	18.45	1109	12.62	0.3862	<b>38.62</b>
4	Parner	200	04.61	577	06.56	1.885	<b>188.50</b>
5	Supa	279	06.44	724	08.24	1.594	<b>159.49</b>
6	Takali Dhokeshwar	630	14.54	1488	16.93	1.361	<b>136.19</b>
7	Wade Ghavan	519	11.96	845	09.61	0.6281	<b>62.81</b>
8	Wadzire	639	14.74	1074	12.22	0.6875	<b>68.75</b>
<b>Total</b>		<b>4336</b>	<b>100</b>	<b>8785</b>	<b>100</b>	<b>91239</b>	<b>912.39</b>

Source: (Compiled by the Author)



**Fig 2: WELL IRRIGATION PATTERN OF PARNER TEHSIL**



Well irrigation is very useful and traditional practice in parner tehsil from the ancient time this method was widely used. The well irrigation pattern in parner tehsil in year 2010 is 4336 well irrigation it is increased in year 2020. 8785 well irrigation in parner tehsil. Bhalawani circle increase in year. 2020. (12.79%) as compare to other all circle the all circle day by day increase in well irrigation in parner tehsil.

**TABLE 2: BORWELL IRRIGATION PATTERN OF PARNER TEHSIL**

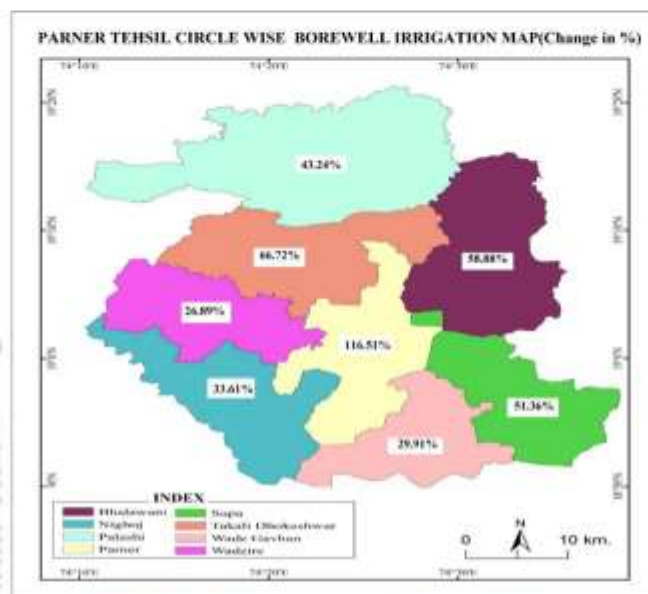
S.R	CIRCLE	2010	PERCENT	2020	PERCENT	CHANGE	CHANGE PERCENT
1	Bhalawani	945	18.49	1501	19.58	0.5888	<b>58.88</b>
2	Nighoj	842	16.47	1125	14.67	0.3361	<b>33.61</b>
3	Palashi	622	12.17	891	11.62	0.4324	<b>43.24</b>
4	Parner	339	06.63	734	09.57	1.1651	<b>116.51</b>
5	Supa	658	12.87	996	12.99	0.5136	<b>51.36</b>
6	Takali Dhokeshwar	559	10.93	932	12.16	0.6672	<b>66.72</b>

www.irjhis.com ©2021 IRJHIS | Volume 2 Issue 9 September 2021 | ISSN 2582-8568 | Impact Factor 5.71

7	Wade ghavan	498	09.74	647	08.44	0.2991	<b>29.91</b>
8	Wadzire	647	12.66	821	10.71	0.2689	<b>26.89</b>
	<b>Total</b>	<b>5110</b>	<b>100</b>	<b>7664</b>	<b>100</b>	<b>42712</b>	<b>427.12</b>

Source: (Compiled by the Author)

Fig 3: BORWELL IRRIGATION PATTERN OF PARNER TEHSIL



Bore Well irrigation is very useful and traditional practice in Parner Tehsil from the ancient time this method was widely used. The Borewell irrigation pattern in parner tehsil in year 2010 is 5110 Borewell irrigation it is increased in year 2020. 7664 Borewell irrigation increase in parner tehsil. Bhalawani circle more increase in year, 2020. (19.58%) as compare to other all circle the all circle day by day increase in Bore well irrigation in Parner Tehsil.

TABLE 3: OTHER SOURCES OF IRRIGATION PATTERN OF PARNER TEHSIL

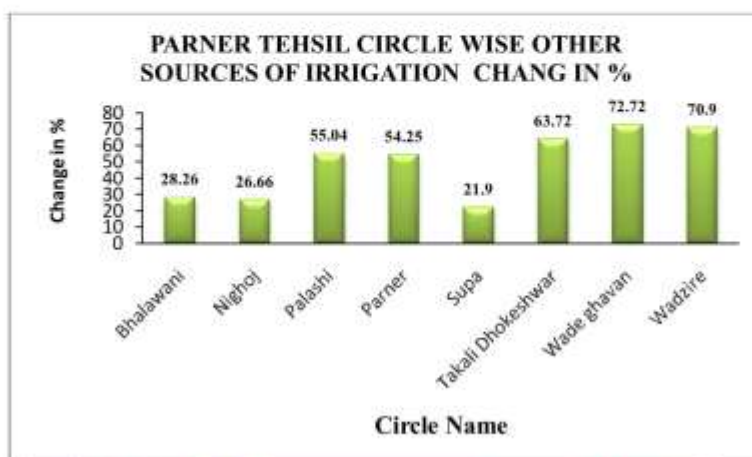
S.R	Circle	2010	Percent	2020	Percent	Change	Change %
1	Bhalawani	92	09.30	118	08.08	0.2826	<b>28.26</b>
2	Nighoj	195	19.71	247	16.92	0.2666	<b>26.66</b>
3	Palashi	109	11.02	169	11.58	0.5504	<b>55.04</b>
4	Parner	188	19.00	290	19.87	0.5425	<b>54.25</b>
5	Supa	105	10.61	128	08.77	0.2190	<b>21.90</b>
6	Takali Dhokeshwar	102	10.31	167	11.44	0.6372	<b>63.72</b>

IRJHIS2109003 | International Research Journal of Humanities and Interdisciplinary Studies (IRJHIS) | 25

7	Wade ghavan	88	08.89	152	10.41	0.7272	<b>72.72</b>
8	Wadzire	110	11.12	188	12.88	0.7090	<b>70.90</b>
	<b>Total</b>	<b>989</b>	<b>100</b>	<b>1459</b>	<b>100</b>	<b>39345</b>	<b>393.45</b>

Source: (Compiled by the Author)

Fig 4: OTHER SOURCES OF IRRIGATION PATTERN OF PARNER TEHSIL



Other sources of irrigation pattern are very useful and traditional practice in parner tehsil from the ancient time this method was widely used. The other sources irrigation pattern in Parner Tahsil in year 2010 is 989 other sources found and 2020 year irrigation it is increased in parner tehsil 1459 other irrigation increase in.wade ghavan circle 72.72% more increase in year. 2020. As compare to other all circleThe all circle day by day increase in other sources irrigation in Parner Tahsil.

**CONCLUSION:**

The study on the changes taking place in the irrigation sector in Parner Tahsil during the period of 10 years from 2010 to 2020 has been studied through this research paper.

The following conclusions have been drawn from the study of irrigation sources according to the circle in Parner Tahsil.

- In the study area well irrigation is the highest change in Parner circle is 188.50% followed by Supa 159.49% Nighoj 146.14% Takli dhokeshwar 136.19% Bhalawani 112.07% and Wadzire 68.75% and wade ghavan has 62.81% Well irrigation is found to have occurred in 2020 as compared to 2010
- Studying Borewell Irrigation in Parner Tehsil, the highest percentage of bore is found in Parner circle at 116.51 per cent. 36% Palashi 43.24% Nighoj 33.61% Wade Ghavan 29.91% Wadzire 26.89% We find increase in borewell irrigation

[www.irjhis.com](http://www.irjhis.com) ©2021 IRJHIS | Volume 2 Issue 9 September 2021 | ISSN 2582-8568 | Impact Factor 5.71

- Other water sources in Parner Tehsil have increased by 72.72% in Wade Ghavan villages according to the circle. 04% Parner 54. 25% Bhalawani saw an increase of 28.26%, Nighoj saw an increase of 26.66% and Supa saw an increase of 21.90%.
- When the overall well irrigation of Parner Tehsil was studied, 912 in 2020 as compared to 2010. An increase of 39% has been observed while a study of borewells has shown an increase of 427. 12% and a study of other sources of irrigation has shown an increase of 393. 45%.

#### REFERENCES:

- 1) **Bansil, P.C (2004):**“Water Management in India” Concept Publication Company, 2004.
- 2) **Census of India**, District Census hand book, Ahmednagar District, 2001 and 2011
- 3) **Gujar, R.K, (1987)**, Irrigation for Agricultural Modernization Scientific Published, Jodhapur, Page 105.
- 4) **Kumaraswamy, K (2009)** “Sustainable development of water Resources-A case study from Tamil Nadu” Enrich Environment-Multidisciplinary International Research Journal, VoL2, Issue-5.PP.55-61.
- 5) **Maharashtra State Gazetteer**, Ahmednagar District 2001.



IRJHIS2109003 | International Research Journal of Humanities and Interdisciplinary Studies (IRJHIS) | 27

11. Role of media in strengthening the Indian democracy

**நவீனத் தமிழாய்வு**  
(தமிழ்நாட்டுக் கல்வியியல் ஆய்விதழ்)



*Journal of*  
**Modern Thamizh Research**  
(A Quarterly International Journal)

---

**Chief Editor**  
Dr. M. Sadik Batcha

**Advisory Editor**  
Dr. N. Chandra Segaran

**Editorial Board**  
Dr. MAM. Rameez  
Dr. Jeyaraman  
Dr. A. Ekambaram  
Dr. G. Stephen  
Dr. S. Chitra  
Dr. S. Senthambich Pava  
Dr. Aranga. Pari  
Dr. A. Shummughom Pillai  
Dr. P. Jeyakrishnan  
Dr. S. Easwaran  
Dr. Kumara Selva  
Dr. A. Palanisamy  
Dr. Ganesan Ambedkar  
Dr. Kumar  
Dr. S. Kalpana  
Dr. T. Vishnukumaran  
Dr. M. N. Rajesh  
Dr. M. Ramakrishnan  
Dr. Govindaraj  
Dr. Uma Devi  
Dr. Senthil Prakash  
Dr. M. Arunachalam  
Dr. S. Vignesh Ananth  
Dr. Pon. Kathiresan  
Dr. S. Bharathi Prakash

சான்றிதழ்

**Certificate**

*This is to certify that Dr. / Mr. / Ms.*

**VIRENDRA S. DHANASHETTI**  
Associate Professor, Department of Political Science,  
New Arts, Commerce and Science College, Parner, Dist. Ahmednagar-414302, India.

*has Published a paper titled*

**ROLE OF MEDIA IN STRENGTHENING THE INDIAN DEMOCRACY**

Sl No. **47** / **50**  
Pages **338-349**

Published by  
**RAJA PUBLICATIONS**  
No. 10 (Upstair), Ibrahim Nagar, Khajamala,  
Tiruchirappalli - 620 023, Tamil Nadu, India.  
Mobile - 9600535241  
Website : www.rajapublications.com

ISSN : 2321 - 984X

செயல்பெற்ற 2022  
July - September 2021

29



Chief Editor  
**Dr. M. Sadik Batcha**  
Associate Professor  
PG and Research Department of Thamizh  
Jamal Mohamed College (Autonomous)  
Tiruchirappalli - 620 020, Tamil Nadu, India  
Mobile : 94434 17242, Email : ms\_batcha@yahoo.co.in

<p>செப்டம்பர் 2021 Vol. 9 No. 3</p>	<p>செப்டம்பர் 2021 July - September 2021 ISSN : 2321-984X</p>
<p><b>Chief Editor</b> Dr. M. Sadik Batcha</p> <p><b>Advisory Editor</b> Dr. N. Chandra Segaran</p> <p><b>Editorial Board</b> Dr. MAM. Rameez Dr. Jeyaraman Dr.A. Ekambaram Dr. G. Stephen Dr. S. Chitra Dr. S.Senthamizh Pavai Dr. Aranga. Pari Dr. A. Shunmughom Pillai Dr. P. Jeyakrishnan Dr. S. Easwaran Dr. Kumara Selva Dr. A. Palanisamy Dr. Ganesan Ambedkar Dr. Kumar Dr. S. Kalpana Dr. T. Vishmukumaran Dr. M. N. Rajesh Dr. M. Ramakrishna Dr. Govindaraj Dr. Uma Devi Dr. Senthil Prakash Dr. M. Arunachalam Dr. S. Vignesh Ananth Dr. Pon. Kathiresan Dr. S. Bharathi Prakash</p>	<p><b>நவீனத் தமிழாய்வு</b> (மீளாண்டுக் காலாண்டு ஆய்விதழ்)</p> <p><i>Journal of</i> <b>Modern Thamizh Research</b> (A Quarterly International Journal) Arts and Humanities, Language and Library Studies, Tamil UGC C-Listed International Journal</p> <p><b>RAJA PUBLICATIONS</b> No. 10 (Upstair), Ibrahim Nagar, Khajamalai, Tiruchirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241 Website : <a href="http://www.rajapublications.com">www.rajapublications.com</a></p>
	<p><b>29</b></p>

செய்தி எண்	ஆதி-புரட்சி 2022 July - September 2021	ISSN : 2321 - 984X
Vol. 9 No. 3		
1. கு. சந்திரசேகரன் & செ. செந்திர பிரகாஷ்	வண்பேச்சி கவிதைகளில் துணைவினைகளில் அமைப்பும் பொருள்மையம்	1-18
2. செ. கமலசேகரன் & செ. சந்திரசேகரன்	முனைவல் திரைப்படங்களின் படைப்பாக்கமும் பின்னணிபும்	19-27
3. சி. தாமஸ் & சி. அமுதா	கவிமையல் தலைவன், தலைவி சொல்லாடல்கள்	28-33
4. தா. சிவசுந்தரன் & ம. சிதாரகண்ணு	இந்து மதத்தின் இடிகா புராணங்களே வாழ்க்கையின் வழிகாட்டி	34-37
5. சி. ஹரிநாதன்	எட்டுத்தொகையில் உயிர்த்தும் புணர்ச்சி	38-42
6. மு. இராஜசுந்தரன் & இரா. பாலசுந்தரன்	தெய்வம் நில மக்களின் வாழ்வியல் குறைகள்	43-50
7. D. லாஸ் குமாரசெந்திரி & த. கிந்திரன் செறி	புராணம் உணர்ந்தும் பெண்களின் பாண்புகள்	51-56
8. V. CHANDRA & J. DHARAGESHWARI	DEPICTION OF CHALLENGING WORLD OF YOUTH IN R.K.NARAYAN'S THE BACHELOR OF ARTS.	57-63
9. செ. சேதுநாயகம் & த. கிந்திரன் செறி	அகநானூறு காட்டு வாழ்வியல்	64-67
10. D. BHUVANI & J. DHARAGESHWARI	R.K. NARAYAN AND BHARATI MUKHERJEE CULTURAL TRANSACTIONS IN THEIR NOVELS - A COMPARATIVE STUDY	68-72
11. தா. தாமஸ் & செ. செந்திர பிரகாஷ்	கவிதை தலைவன் மூத்திரியின் பாடுபொருள் சொல்லம்	73-78
12. செ. சந்திரசேகரன் & இரா. அருண்மொழி	தெருவ்வாட்டியில் காண்பெறும் இயற்கை காட்சிகள்	79-86
13. ஆ. சிவசுந்தரன் & ம. சிதாரகண்ணு	குணக்கதைகள் கவிதைகளில் மொழி நடை	87-91
14. செ. வித்யா & சி.வாக்ஷி	வறுமையை வெளிப்படுத்தாத தாய்மை	92-97
15. செ. திருவள்ளுவன் & த. சுவாமிநாதன்	பழமைய கவிதைகளில் பெண்களின் சிந்தனைகள்	98-101
16. ச. முருகேசன்	தமிழில் வழங்கும் பாடல்கள்	106
17. A. RAJINI & A. RENUKA	ORIGIN AND GROWTH OF SALVATION ARMY IN TAMILNADU	111
18. ச. ஆனந்தகண்ணு	மலைபாளிப் பழங்கால மக்களின் உடங்கு குறைகள் கல்வராயன் கலை	119
19. எஸ். மதுரை & ம. சிதாரகண்ணு	எங்க இலக்கியத்தில் இடம்பெற்றுள்ள புத்தகங்கள், கண்ணாட்டி	121
20. KISHOR N. DESAI	APPLICATION OF QR CODE IN LIBRARIES	127
21. எஸ். பாலசுந்தரன் & Y. கவிதா	பெரியபுராணமும் கலை மறு அமுதாயம்	135-7
22. AVINASH RAMESH CHINTAMANI	EFFECT OF ARTIFICIAL INTELLIGENCE ON OVERALL FINANCIAL AND NON-FINANCIAL EXPERIENCES OF COMMERCE PORT	143-149
23. த.மஞ்சள் & ஆனந்தி செவ்வியா	பெண்களின் முன்னேற்றம்	150-153
24. J. BENET RAJADURAI	THE LIVING CONDITIONS OF FISHMEN COMMUNITY	154-164
25. செ. சேதுநாயகம் & செ. சுவாமிநாதன்	மிதாவிசை - கையில வகைகள் த சமுதாயச்சிந்தனைகள்	165-169
26. C. SWATHANTHAR	THE FIRST PRINCE VISIT TO INDIA 1869-70 - A TREND SETTING	170-176
27. ச. மணி & ம. சிதாரகண்ணு	ஒப்பீட்டு முறைகள் திருத்தமுள்ள	177-182
28. MANISHA & IL SAMAN	Public Ethics: The Role of Committee on Publication Ethics (COPE) in Research Publications	183-189
29. த. செல்வ சும்	செய்தி எண் விநியோகம் மாதங்களை	190-193
30. R. M. MARW	A STUDY ON PERCEPTION AND SATISFACTION ON LIBRARY SERVICES: A CASE OF UNAIDED COLLEGES	196-205
31. ஆ. தமிழரசு	பொருள்மையம் மூலம் உணர்வு பொருள்	206-212
32. M. KARUPPAIA, M. SURESH KUMAR & S. BALAJI	INFLUENCE OF THE CHANGES ON SELECTED STRENGTH PARAMETERS IN RESPONSE TO INTERVAL TRAINING AMONG KABADDI PLAYERS	213-221
33. S. VARALAKSHMI	IMPACT OF SWISSBALL TRAINING AND CORE BOARD TRAINING ON SELECTED PHYSICAL VARIABLES AMONG MALE HOCKEY PLAYERS	222-229
34. உ. பிரகாஷ்	மெய்ப்பாட்டியல் உணர்ந்தும் உணர்ச்சி உணர்வியல்	230-235
35. KRISHNA MAHADEV PATIL	A CRITICAL STUDY OF THE MAHARASHTRA RESETTLEMENT OF PROJECT DISPLACED PERSONS ACT, 1976	236-241
36. எஸ். செல்வி & ச. காந்திமணி	இலக்கியச் சிந்தனைச் சிறுவகைகளில் பெண்கள்	242-245
37. ANANT MADHAV KULKARNI & P. MUTHUMARI	IMPACT OF OPEN EDUCATIONAL RESOURCES ON ACADEMIC LIBRARIES AND LIBRARY PROFESSIONALS	246-254
38. ச. அமுதன் ஹக்கீம்	இணைய தளங்கள் புதுகவிதைகளின் பன்முகத்தன்மை	255-259
39. YOGESH B DAPHAL	THE CUSTOMIZATION OF DSPACE USER INTERFACE (UI) OF SELECTED INSTITUTIONAL DIGITAL REPOSITORIES(IDR) IN INDIA- A COMPARATIVE STUDY.	260-267
40. மு. அக்பர் அலி யூசப் கர்வாணி & ச. கமலசுந்தரன்	ஆதிதே மு. முறையிலும் தாண்டி கரும் அன்மை பாத்திரமாயின் அழகிய குணங்கள்	268-289
41. P. SURESH KUMAR	SLEUTHING AND DISABILITY: A STUDY ON THE REFASHIONED GAZE	290-297
42. ச. முருகேசன்	திருநாளைகள் குறித்த தாட்டுப்பாட்டு பதிவுகள்	298-302
43. VAIBHAV ANILDALE	EDWARD ABBEY'S THE MONKEY WRENCH GANG: REFLECTIONS ON ECO MASCULINISM AND ECO TERRORISM AS EMERGING ECOCRITICAL PARADIGMS	303-307
44. த. அன்பாதி	புராணத்தில் உடம்புமெய் புணர்ச்சி	308-314
45. HARI PANDHARI WANGARWAR	THE COMPARATIVE STUDY OF PUBLIC HEALTH EXPENDITURE AND PUBLIC HEALTH INFRASTRUCTURE OF VARIOUS STATES OF INDIA	315-330
46. வ. வானி & ம. சிதாரகண்ணு	பக்தி (தமிழ்) இலக்கிய வளர்ச்சியில் ஆண்டளவின் பங்கு	331-337
47. VIRENDRA S. DHANASHETTI	ROLE OF MEDIA IN STRENGTHENING THE INDIAN DEMOCRACY	338-349
48. த. உமாசெல்வி & வி. செந்திரசேகரன்	பக்தி இலக்கியத்தில் திருமுறைப்பற்ற - ஒரு ஆய்வு	350-356
49. V. SUJATA	THE SELF CONCEPT AND ACADEMIC ACHIEVEMENT IN RELATION TO GENDER AND STREAM OF SUBJECTS OF CLASS XI STUDENTS OF DURGA DISTRICT	357-363
50. செ. பத்மா	காப்பியங்களில் துறைய ஆளுமை	364-368

Published by : Raja Publications, No. 10, Upstair, Ibrahim Nagar, Khajamalaj, Tiruchirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241  
 Printed : The Printing House, Tiruchirappalli - 620 023, Tamil Nadu, India. Ph : +91 - 431-2420121

**Modern Thamizh Research**

A Quarterly International Multilateral Thamizh Journal

Published by

**Raja Publications, Trichy-23,**

**INFORMATION FOR AUTHORS**

Journal of **Modern Thamizh Research** (JMTR) is published Four (Every March, June, September & December) times a year. It primarily publishes significant original papers and survey articles on important advances of Modern Thamizh research in any of the following major areas:

- ☞ Classicalism (கெளவியம்)
- ☞ Modernism (நவீனம்)
- ☞ Folklorism (நாட. சூட்டநவீயம்)
- ☞ Archeologism (செதாஸவீயம்)
- ☞ Spritualism (பக்தவீயம்)
- ☞ Traditioanlism (புரவீயம்)
- ☞ Mediaism (மல. கவீயம்)
- ☞ Journlism (இதழீயம்)
- ☞ Translationism (மொழிபெயர்ப்பீயம்)
- ☞ Comparativism (ஒப்பீயம்)
- ☞ Educationalism (கல்வீயம்)
- ☞ Histroism (வரலாற்றுீயம்)

**Submission of the Manuscript**

1. Manuscripts written in Thamizh or English may be submitted in two copies to the Chief Editor **Dr. M. Sadik Batcha, Associate Professor of Tamil, PG and Research Department of Thamizh, Jamal Mohamed College (Autonomous), Tiruchirappalli - 620 020, Mobile : 9600535241, Email : ms\_batcha@yahoo.co.in**
2. Manuscripts should be prepared according to the following format. The first page of the manuscript should contain
  - (i) the title
  - (ii) the name(s) and institutional affiliation (s) of the author(s).
  - (iii) an abstract of not more than 100 words; and
  - (iv) a footnote giving the name and present address of the author to whom proofs and reprint order form should be addressed.
  - (v) References at the end of the manuscript should be arranged in alphabetical order of the first letter of the surname and styled and punctuated according to the following format.
 

[1] author(s) name(s), "Book name", Page, Edition number, Published Year, Book Publisher address.

**Publication of Accepted Papers**

The editorial Policy of JMTR is to give a clear reply about the acceptance of all submitted papers, within a period of one month.

**Subscription Rate of JMTR**

Libraries, Institutions and other establishments can subscribe for JMTR through publisher : **Raja Publications, 10, (Upstair), Ibrahim Nagar, Khajamalai, Tiruchirappalli - 620 023, Thamizh Nadu, India. Mobile : 9600535241 website : rajapublications.com** and in case of any difficulty they should write to the Chief Editor at address given elsewhere.

Subscription Rates	Years	Printed
(Year) India INR ₹	1 Years Only	2000
Other Countries INR ₹	1 Years Only	3000
(Life) India ₹	10 Years Only	10,000
Other Countries INR ₹	10 Years Only	20,000



**Chief Editor**

**Dr. M. SADIK BATCHA**  
Associate Professor  
Department of Tamil  
Jamil Mohamed College (Autonomous)  
Tiruchirappalli - 79, Tamil Nadu, India

**Advisory Editor**

**Dr. N. CHANDRA SEGARAN**  
Assistant Professor of Tamil  
Centre of Indian Languages, School of Language,  
Literature & Culture Studies,  
Sriparvathi Nehru University,  
New Delhi - 610 067, India

**Editorial Board****Dr. MAM Rameez**

Head  
Department of Languages,  
Sri Lectum, Grade 1 in Tamil  
South Eastern University of Sri Lanka  
Dhuel, Sri Lanka & 32360

**Dr. S. Chitra**

Professor & Head  
Dept. of Tamil  
Bharathiar University  
Coimbatore - 641 046  
Tamil Nadu, India

**Dr. P. Jayakrishnan**

Director (MSCDCS)  
Department of Tamil  
University of Kerala  
Karyavattom,  
Thiruvananthapuram - 695 581  
Kerala, India

**Dr. Ganesan Ambedkar**

Associate Professor  
Department of Dravidian &  
Computational Linguistics,  
Dravidian University,  
Kuppam - 517 426  
Andhra Pradesh, India

**Dr. M. N. Rajesh**

Assistant Professor,  
Department of History,  
School of Social Sciences,  
University of Hyderabad,  
Dr. C. R. Rao Road, Gachibowli,  
Hyderabad - 500046, Telangana state

**Dr. Senthil Prakash**

Assistant Professor  
Department of Tamil  
Bazha Bhawan  
Visva Bharathi, Santienikethan  
West Bengal - 731 235, India

**Dr. S. Bharathi Prakash**

Assistant Professor  
Tamil  
PSG College of Arts & Science  
Aymashi Road, Civil Aerodrome Post,  
Coimbatore - 641 014

**Dr. Joyaraman**

Professor and Head  
Department of Tamil  
Thiruvalluvar University,  
Vellore - 632 115  
Tamil Nadu, India

**Dr. S. Senthambizh Pavai**

Professor & Director  
Centre for Tamil Culture  
Alagappa University  
Karaikudi - 630 003  
Tamil Nadu, India

**Dr. S. Easwaran**

Associate Professor & Head  
Department of Tamil  
National College (A)  
Tiruchirappalli - 620 001  
Tamil Nadu, India

**Dr. Kumar**

Assistant Professor of Tamil  
School of Social Sciences & Humanities  
Central University of Tamilnadu  
Tiravoor - 630 005, Tamil Nadu, India

**Dr. M. Ramakrishnan**

Assistant Professor,  
Centre for Tribal Folklore,  
Language & Literature,  
Central University of Jharkhand,  
CTI Campus, Brambe, Ranchi - 835 205  
Jharkhand, India

**Dr. M. Arunachalam**

Associate Professor  
PG. & Research Dept. of Tamil  
E.V.R. College (A)  
Tiruchirappalli - 620 023,  
Tamil Nadu, India

**Dr. A. Ekambaram**

Professor  
Department of Tamil Literature  
Madras University  
Chennai - 600 005  
Tamil Nadu, India

**Dr. ARANGA. PARI**

Professor  
Department of Tamil  
Annamalai University,  
Chidambaram - 608 002  
Tamil Nadu, India

**Dr. Kumara Selva**

Associate Professor & Head  
Department of Tamil  
Nesamam Memorial Christian College  
Maethandam - 629 185  
Kanyakumari, Tamil Nadu, India

**Dr. S. Kalpana**

Assistant Professor  
Department of Tamil Studies  
Annamalai University  
Annamalai Nagar - 608 002  
Tamil Nadu, India

**Dr. Govindaraj**

Assistant Professor  
Center for Bharathidasan Studies  
Bharathidasan University  
Tiruchirappalli - 620 024  
Tamil Nadu, India

**Dr. S. Vignesh Ananth**

Assistant Professor in Tamil  
Department of Indian Languages,  
Faculty of Arts,  
Banaras Hindu University  
Varanasi - 221 005, Uttar Pradesh

**Dr. G. Stephen**

Professor & Head  
Department of Tamil Studies  
Manonmaniam Sundaranar University  
Tiruvveli - 627 017  
Tamil Nadu, India

**Dr. A. Shanmughom Pillai**

Associate Professor  
Department of Folklore  
Tamil University  
Thanjavur - 613 010  
Tamil Nadu, India

**Dr. A. Palanisamy**

Professor  
Dept. of Physical Education and Yoga  
Bharathidasan University  
Tiruchirappalli - 620 024  
Tamil Nadu, India

**Dr. T. Vishnekumar**

Assistant Professor  
Department of Tamil  
Dravidian University, Kuppam,  
Andhra Pradesh - 517 426, India

**Dr. Uma Devi**

Assistant Professor  
Department of Modern Indian  
Languages and Literary Studies  
University of Delhi  
Delhi - 110 007, India

**Dr. Pon. Kathiresan**

Assistant Professor in Tamil  
Ganesar College of Arts & Science  
Melaisivapuri - 622 403  
Pudukkottai (Dt.)  
Tamil Nadu, India

**நவீனத் தமிழாய்வு**  
(வணிகத் துறாவில் ஆய்விதழ்)



*Journal of*  
**Modern Thamizh Research**  
*(A Quarterly International Journal)*

---

*Chief Editor*  
Dr. M. Sadik Batcha

*Advisory Editor*  
Dr. N. Chandra Sogaran

*Editorial Board*  
Dr. MAM. Rameez  
Dr. Jeyaraman  
Dr. A. Ekambaram  
Dr. G. Stephen  
Dr. S. Chitra  
Dr. S. Senthambizh Pava  
Dr. Aranga. Pari  
Dr. A. Shanmughom Pillai  
Dr. P. Jayakrishnan  
Dr. S. Easwaran  
Dr. Kumara Selva  
Dr. A. Palanisamy  
Dr. Ganesan Ambedkar  
Dr. Kumar  
Dr. S. Kalpana  
Dr. T. Vishnakumaran  
Dr. M. N. Rajesh  
Dr. M. Ramakrishnan  
Dr. Govindaraj  
Dr. Uma Devi  
Dr. Senthil Prakash  
Dr. M. Arunachalam  
Dr. S. Vignesh Ananth  
Dr. Pon. Kathiresan  
Dr. S. Bharathi Prakash

சான்றிதழ்

*This is to certify that Dr. /Mr. /Ms.*

**VIRENDRA S. DHANASHETTI**  
Associate Professor, Department of Political Science,  
New Arts, Commerce and Science College, Parner. Dist. Ahmednagar-414302, India.

*has Published a paper titled*

**ROLE OF MEDIA IN STRENGTHENING THE INDIAN DEMOCRACY**

Sl.No. 47 50  
Pages 338-349

Published by  
**RAJA PUBLICATIONS**  
No. 10 (Upstar), Ibrahim Nagar, Khajamala,  
Truchirappalli - 620 023, Tamil Nadu, India.  
Mobile : 9605535241  
Website : www.rajapublications.com

செப்டம்பர் 2021  
July - September 2021  
ISSN : 2321 - 984X

**Certificate**

*Chief Editor*  
  
**Dr. M. Sadik Batcha**  
Associate Professor  
PG and Research Department of Thamizh  
Jamal Mohamed College (Autonomous)  
Truchirappalli - 620 020, Tamil Nadu, India  
Mobile : 94434 17242. Email : ms\_batcha@yahoo.co.in

29

## ROLE OF MEDIA IN STRENGTHENING THE INDIAN DEMOCRACY

VIRENDRA S. DHANASHETTI

Associate Professor, Department of Political Science,  
New Arts, Commerce and Science College, Parner, Dist. Ahmednagar-414302, India.

### ABSTRACT:

Democracy means 'a system of government in which all the people of a country can vote to elect their representatives'. Indian media came into existence in 1780 with the introduction of a newspaper namely 'The Bengal Gazette' and since then it has matured leaps and bounds. It has been playing a very important role in shaping human minds.

Media plays a crucial role in shaping a healthy democracy. It is the backbone of a democracy. Media makes us aware of various social, political and economic activities happening around the world. It is like a mirror, which shows us or strives to show us the bare truth and harsh realities of life.

Media is considered as the fourth pillar in modern democracies among the world because, of its role in enhancing public awareness, creating public opinion and generating popular perceptions in public domain. But how far they are successful in performing these functions of a 'watchdog' over the activities of various governmental and private institutions or acting as independent representatives of the public needs to be verified. In India the role of media seems to score very low in terms of both these dimensions. However, one can't say that there is a complete absence of responsible media in India, but compared to its role in the time when media was not a tool in the hands of corporate world or of the governmental interest its role as a bridge between the government and the citizens was more empathetic. Therefore through this paper an attempt is made

to analyze the role of media in shaping public opinion and consolidating democracy in India and what are the factors that influences it from performing its functions independently.

**KEYWORDS:** Media, Democracy, Positive and Negative media,

### INTRODUCTION:

"I would rather have a completely free press with all the dangers involved in the wrong use of that freedom than a suppressed or regulated press." said India's first Prime Minister Jawaharlal Nehru. The mass media constitute the backbone of democracy in any country. Voters base their decisions on the political information media supply to the masses. They identify issues in our society and serve as a medium for the forethought. They are also the guardians that we rely on for mistakes and malpractices by those who have power. It is therefore reasonable to require that the media perform to certain standards with respect to these functions, and our democratic society rests on the assumption that they do (McQuail 1993). The most important democratic functions that we can expect the media to serve are listed in an often-cited article by Gurevitch and Blumler (1990). These two functions include surveillance of socio-political developments, identifying the most relevant issues, providing a platform for debate across a diverse range of views, holding officials to account for the way they exercise power, provide incentives for citizens to learn, choose, and become involved in the political process, and resist efforts of forces outside the

---

 ROLE OF MEDIA IN STRENGTHENING THE IDEAN DEMOCRACY
 

---

19

media to subvert their independence. The Indian media has no doubt impressed a position for itself & reserves a strong hold on the public. The concept of freedom as illustrated in the Indian Constitution in Art.19 (1) (a) that gives us Freedom of Speech & Expression, has been optimally utilized by the media. Refrain from saying misutilized, as the debate about the alleged misuse of freedom by media is still an open discourse.

Modern societies could not imagine to live without a vibrant mass communication living under an era of Liberalization, Globalization and Privatization. Media in this sense is regarded as the fourth estate of democracy next to Legislature, Executive and Judiciary. Media plays an important role in generating public awareness, shaping public opinion and forming popular perceptions. Since the first printing press was invented, followed by the introduction of global economy the boundaries of media have expanded to include audio-visual and social media also. Gradually, with time all these three types of media-print, audio-visual and social-mushroomed around the world with an enhanced role. The manners in which reports are filed and news is disseminated came to have a considerable impact on shaping public opinion and even influencing foreign policy of states as well as promoting regional cooperation.

Therefore, if modern values like liberty, equality, justice and fraternity form the roots of the tree of democracy likewise media and journalism formed the branches of it. A democratic regime can run to its utmost potential when there is wide participation on the part of the general masses. However, such participation is made possible when the media in that particular regime is vibrant and free enough to create public awareness and shape public opinion. Accessibility

to right information not only helps in making responsible informed choices; but also serves as a 'check' on the government one elects. In this way media plays an important role in bridging the gap between the people and the government for which they are also called the fourth pillar of democracy.

Therefore taking this as the background, an attempt would be made in this paper to analyse the role of media in shaping public opinion and consolidating democracy in one of the greatest democracies within South Asia i.e. India. In addition the three basic objective of this paper would be: Firstly, to analyse what are the factors which influences media and its approach towards creating public awareness in the country? Secondly, to understand, If media in India play a role in promoting jingoistic nationalism and thirdly, does media also influences foreign and security policies of a country? Followed a conclusion towards the end.

#### SIGNIFICANCE OF SUBJECTS:

Role of Indian media in Indian democracy is always investigate by political analyst and media interpreter. A range of different scientific disciplines are to scrutinize for what they might contribute to an perception of the economic and other factors that influence broadcast media, and how the media in turn influence the political climate and the democratic process in modern democracies. The contributions from the different disciplines are combined into an integrated model of a fundamental network. So it is important to re-examine the role of media in 21<sup>st</sup> century to contribution of strengthening the Indian Democracy.

#### OBJECTIVES OF THE RESEARCH:

1. To study the changing nature of Indian media in 21<sup>st</sup> century.

7. To study the contribution of media in strengthening the Indian democracy.

**RESEARCH METHODOLOGY:**

Secondary data collection methods and descriptive research method has used by researcher for this research. Research is limited around the Media and its contribution to strengthening the Indian democracy.

**WHAT IS MEDIA?**

Media in general refers to the storage and transmission channels or tools used to store and deliver information or data. In short, it is the main means of mass communication. It creates messages with embedded values and disseminates those messages to a specific portion of the public in order to achieve a specific goal. As such, it can create awareness, perpetuate issues, establish priorities, narrow the democratic deficit and mold societies (in passive but effective way). Thus, it is a form of information generator, educator and entertainer. This means of communication to general public have evolved over years. In the beginning of civilization, we only had the ability to transmit messages from person to person, through letters and conversation. Later, humans developed written languages and messages were recorded through record players. This method further evolved with the capability to copy written messages over and over again. In the twentieth century media took the form of mass media which includes print media and electronic media. Print media, being the leader over a considerable period of time has now come under competition with audio-visual media, which is reshaping many of the social responses.

The impact of visual media is direct and effective as it is said, "a picture conveys thousand words". However, radio too apart from providing news and views has also developed as a flair for

entertainment, thereby getting a lot of acceptance. At first, radio was the electronic media of choice. This later evolved into television in the form of audio-visual media and eventually came the electronic media. Electronic media is enjoying broader use every day with an increase in electronic devices being made. The meaning of electronic media, as it is known in various spheres, has changed with the passage of time. The Internet is arguably one of the most effective tools in electronic media for communication. It has indeed made it possible to disseminate information and ideas in real time across the globe. Social media sites like-Yahoo, Facebook, Twitter etc., have diminished all barriers to communication and made people-to-people contact much easier and faster. Further, with every advancement in technology and software manufacturing new mobile phones are launched every year which have further given an edge to media, to spread its reach and information within the palms of an individual to around the world.

**ROLE OF MEDIA IN INDIAN DEMOCRACY:**

With over 82,000 newspapers, over 800 television stations, and 61.3 million internet users, India's media has exploded, while other countries have a comparable presence of print and audiovisual media, as well as internet penetration. As a result, the media has gained extraordinary clout in the country's society and politics. But, the role of media in India is not just confined to disseminating information and entertainment. In a country where there is large scale poverty, unemployment and underdevelopment media plays a significant role in educating the masses in regard to the opportunities and fundamental rights that each individual enjoys as well their responsibility towards the nation as citizens of the country.

However, as the media's structure has undergone a massive and continuous flow of change in form, content, and ownership patterns, more challenges are accumulating to understand how public discourse, particularly within the media, can be managed in order to enable a transparent, well-informed policy response with positive human rights outcomes, both within and across countries. In this regard, the following are some of the beneficial and harmful roles of media in Indian democracy.

Media plays a crucial role in shaping a healthy democracy. It is the backbone of a democracy. Media makes us aware of various social, political and economic activities happening around the world. It is like a mirror, which shows us or strives to show us the bare truth and harsh realities of life.

The media has undoubtedly evolved and become more active over the years. It is the media only who reminds politicians about their unfulfilled promises at the time of elections. T.V news channels excessive coverage during elections helps people, especially illiterates, in electing the right person to the power. This reminder compels politicians to be up to their promises in order to remain in power.

Television and radio have made a significant achievement in educating rural illiterate masses in making them aware of all the events in their language. Coverage of exploitative malpractices of village heads and moneylenders has helped in taking stringent actions against them by attracting government attention.

The media also exposes loopholes in the democratic system, which ultimately helps government in filling the vacuums of loopholes and making a system more accountable, responsive and citizen-friendly. A democracy without media is like a vehicle without wheels.

In the age of information technology we are bombarded with information. We get the pulse of the world events with just a click of a mouse. The flow of information has increased manifolds. The perfect blend of technology and human resources (journalist) has not left a single stone unturned in unearthing rampant corruption in politics and society. We all are well aware of what tehelka did. Thanks to technology that has brought a kind of revolution in journalism.

#### Impact of media:

The impact of media is really noteworthy. Excessive coverage or hype of sensitive news has led to communal riots at times. The illiterates are more prone to provocations than the literates. Constant repetition of the news, especially sensational news, breeds apathy and insensitivity. For instance, In Dhananjay Chatterjee case, the overloaded hype led to death of quite a few children who imitated the hanging procedure which was repeatedly shown in most of the T.V. news channels. There is a plethora of such negative impacts. Media should take utmost care in airing or publishing such sensational news.

Commercialization has created a stiff competition in media. In order to outdo each other print media has often gone one step further in publishing articles, cover stories, etc. on sex.

Media experts say this is one of the means of attracting readers who are glued to T.V. news channels, which have cropped up swiftly in a recent past and they believe this is a cheap form of journalism.

#### POSITIVE ROLE OF MEDIA IN INDIAN DEMOCRACY:

It has helped in bringing about revolutions whether through generating awareness at a mass scale about the Right to Information Act or the

various schemes and policies which are focused towards inclusive growth and development undertaken by the Indian Government. Social media or visual media both plays active role in dissenting detailed information about major events and movements to the drawing rooms of the people. Whether earlier it was 'India Against Corruption' or Anna Hazare Movement or the Parliamentary elections of recent, past during the year 2014, the media gives so much live coverage to these events that people are inspired to step out from their homes and take part in such mass movements or campaigns. Likewise issues related to demand for autonomy or separate state e.g Boroland for Boros in Assam or Gorkhaland for the Gorkhs of West Bengal. People have taken to the streets, forcing the administration to become more flexible and agree to negotiations with activist organizations, and the media has played a key role in keeping these conversations alive.

Furthermore, investigative reporting in the print and visual media has aided in the exposure of large-scale corruption that has defrauded the country. The Jessica Lal murder case, the Commonwealth Games Scam, the Adarsh Housing Society Scam, the Cash for Vote Scam, the Bofors Scam, the Nirvaya Rape Case, or the Rohith Verma suicide case are only a few of the highlights in Indian media coverage. When the bureaucracy, politicians, or other public officials have abused their political power, voices have been raised across publications and television channels. Initiatives to promote community media for citizens to vent their grievances have also been launched. Participatory communication, rather than communication that flows from the top down, is more important in this case.

Social media, a recent newcomer in the media sphere, has also shown to be more democratic than print or visual media. Citizens who are familiar with

the internet have had the option to share their opinions on a variety of topics. In many cases groups have been formed in social networking sites by likeminded people who discuss and debate over a number of social issues on the part of the government policy formulations and seek new ideas for way ahead. However, while this is currently limited to urban social space, it is slowly spreading to non-urban areas, and its impact has been phenomenal in terms of the space it provides for people to interact and exchange views, particularly with the controlled visa regimes that characterise the region's people-to-people contact. For example, social networking services like Facebook and Twitter were used to rally support against the Delhi Gang Rape, with individuals all around the world displaying a 'Black Spot' on their Facebook pages.

Internet has been used by various public service organizations and N.G.Os to inform people about their objectives and also to make them aware of various initiatives on the part of the government as well as non-government organizations for social up-liftment. In social media the barrier to communication is minimal which helps in the formation of a participative environment. There is also greater empowerment of the users through higher level of interactivity and flexibility in choice of media outlets. Further, the different mediums of media also keeps the elected representatives accountable to their duties, by highlighting whether they have fulfilled their wishes for which they were elected and whether they have stuck to their oaths of office. Thus, media acts as a trump card for common man. It shows people what they can actually do and what they ought to do.

**NEGATIVE ROLE OF MEDIA IN INDIAN DEMOCRACY:**

In contemporary times there are changes in every possible field and one question that needs

to be answered is that 'did the changes affect media?' Currently, the media too has become a very big business. Although the number of channels compared to early nineteenth century has showed an upwards trend but not in the quality. Every media channel is looking for TRP ratings more than some reputation. In recent times, Indian media has also been subjected to a lot of criticism for the manner in which they have disregarded their obligation to social responsibility. Dangerous business practices in the field of media have affected the fabric of Indian democracy. Post liberalization transnational media organizations have spread their wings in the Indian market with their own global interest. These are big multinational corporations who own a chunk of the mass media market ranging from newspapers, television, radio, book publishing to music industry. Five of world's largest media conglomerates include General Electric, Walt Disney, News Corporation, Time Warner, Viacom and CBS. In India there are big players like the Times Group and ABP who rule the roost in the media arena. Therefore, in a bid to open up the Indian market 26 percent foreign direct investment has been allowed in news publication and 74 percent has been allowed in non-news segments by the Government. The media in contemporary times have become obsessed with hard core politics, conflict, and confrontation for the simple reason that it does not need much effort and costs less than incisive, investigative reporting. This is because it is easier to find government officials and experts to talk about big plans for new superhighways and flyovers than to interview proponents of electric public transport. Agriculture, land reform or the environment get scant coverage because they do not tend to be relevant to city-dwellers. It is not surprising, therefore, that stories about the new economic

paradigms that offer simpler, cheaper, and more relevant alternatives for a majority of population, are either ignored or covered scantily by the mainstream press. This is why across India, Pakistan, Bangladesh and Nepal, hundreds of millions of people have no access to sanitation but still there is not much mention of this in media coverage. In these four South Asian countries, a total of some 300 million, most of them women, cannot read or write, 300 million people drink water from contaminated ponds and streams. But, the fact is this kind of news or information hardly makes their way as headlines of a newspaper or news channel.

Further, the impact of globalization over communication technology is boundless. It has increased the perviousness of the media too. There is now a constant flow of real time global news in all the three sources of media. Robinson argues, "this has impacted how governments form foreign policy, as the scope for calm deliberation is reduced and policy-makers are forced to respond to whatever media houses focus on. So how the 'reality' of regional conflict (or issues of disputes) is represented and constructed in media, and how that construction shapes the mind-set of the people and creates their attitude towards neighboring countries in South Asia, is impossible to generalize. In fact, the regional hostility of India with its neighboring country Pakistan would have ended so far, if the media and the politicians wouldn't have kept the issue alive through highlighting or constructing the wrongs of each other rather than the peace initiatives undertaken by both the countries. Similarly, in recent past, certain media houses in Nepal portrayed the Indian aid and evacuation effort in Nepal in the aftermath of earthquake and Chinese rescue operation differently interpreting Indian aid as an attempt to influence Nepalese politics and Chinese aid as



VIRENDRA S. DHANASHEETI

344

benign devoid of any foreign policy motive. All these instances only confirm the potential role that the media can play in instigating politically and ideologically motivated violence, sometimes blatantly pursuing the political interests of particular political parties. Thus, the socio-political and economic context of media in South Asia is embedded differently in different countries which determine their behaviour and aspirations thereby constraining their capacity to play a greater role in shaping the discourse on regionalism.

Likewise another disturbing trend that has emerged in the present media houses in India is the use of media in the battle between rival political groups. In fact, this new phenomenon is in operation in India with newspapers and news channels taking sides while presenting facts. In addition, sensationalism has become a part and parcel of media today to gain TRP. A relatively insignificant news is presented again and again highlighting not much what actually happened, but what all could happen. Every channel is trying to capitalize on the fear factor or the mere gossip material. Now-a-days rather than casting programmes which would generate national unity and integrity more attention is paid on the news which would keep societal evils like identity politics or religious issues alive. For example, The Aamir Khan issue over intolerance, the Rohit Verma case over caste politics, the Asharam Baba Case or the recent issues over granting martyrdom to Afzal Guru in Jawaharlal Nehru University etc. To this end, Coronel argues that, "promotion of hate speech in place of constructive debate and creating an atmosphere of suspicion rather than social trust has the danger of making people cynic about the democratic setup leading to its breakdown."

Thus, media or journalism is a field that requires an individual to balance the ethical aspects of invading another person's privacy with getting the information they need to cover a specific story. Instead, it is getting increasingly common to find out what a certain celebrity has said or done yesterday in today's newspaper and magazine tabloids. For example, the entertainment media is more interested in covering how much weight Ashwariya Rai Bachan has gained or lost or which celebrity couple had divorced. Agreed that private lives of celebrities' interest people, but celebrities are human beings too and their privacy should be respected. In order to sustain interest of the viewer, news channels have stooped to lower levels; everything from witchcraft to celebrity weddings and 'sting operations' (real or staged) get aired with an aura of national importance. With so many competitors around, each channel looks for newer ways to attract viewers and in the process completely sidelines its primary objective. Thus, our society has become so fixated in watching and reading about others that they had forgot to realize the real problems and drawbacks that paralyze our country from reaching the heights of development.

Besides this, one of the most negative impact of media is 'Paid Media'. Paid News is a scandalous phenomenon in Indian media, in which mainstream media (with a few exceptions) were found to be systematically engaged in publishing favorable articles in exchange for payment. The Election Commission of India has detected hundreds of cases where politicians paid money to newspapers or TV channels to carry glowing reports on them. Bennet & Coleman, which owns the Times of India, is reported to have asked celebrities and rich people to pay for favorable coverage. They have offered a "private treaty" agreement which accepts an equity stake in a

company in return for favorable coverage. Similar practices by other media companies came to light, such as a steel company sued Television news company Zee News for allegedly demanding advertisements so as not to telecast shows in relation to the Indian Coal allocation Scam. Likewise politicians like Ashok Chavan, Narottam Mishra and Umlesh Yadav etc. were caught by Election Commission for arranging publication of news items, masquerading as advertisements, in newspapers praising themselves for State Assembly elections. Therefore, because of such corrupt media practices, people are gradually losing their trust or belief over media.

As such, if media loses its power of public trust and act as pawns in the hands of the Government and corporate world or other external sources, then this would lead to adverse consequences. The citizens would not only lose hope over media as a generator of their opinions to the Government as well as the interpreter between them and the government. Instead, the entire society would turn chaotic and instable with least amount of tolerance left in them to find solutions to regional or domestic problems. This would ultimately immobilize democracy. Wright and Rogers states that, "such processes undermine the autonomy and effectiveness of the news media as the 'fourth estate' of the political system serving the public interest by helping to create an informed citizenry." Therefore, the role of media in Indian Democracy requires a new breed of journalism i.e. one without mental borders who have the energy and understanding to move beyond the traditional classroom concepts of reporting and writing, reporters who do not just report but look behind the headlines to examine cause and effect, and constantly explore regional or international linkages to national problems. In this regard, investigative journalism should be encouraged in

order to go in-depth and behind the scenes so that in the process it could effectively strengthen democracy and defend the free press. They need to be multidisciplinary and be able to investigate how development is linked to politics, the economy and national priorities. The role of the media should not be a public address system for the already influential rather it should show the loop holes that lead to underdevelopment and low growth.

#### **MEDIA'S CONTRIBUTION TO STRENGTHENING THE DEMOCRACY:**

The Former Speaker of Lok Sabha, Somnath Chattrjee, often seen pleading with the Member of Parliament to behave them-selves for they were being observed by the people at large, thanks to the live telecasts of parliamentary proceeding.

#### **A. STRONG POINT OF MEDIA**

Media is the forth pillar of democracy. Democratic consolidation has been linked to the construction of a strong civil society. New studies suggest that when dealing with civil society it is important to determine not only its density but also its ability to participate in policy-making. In addition, groups and associations claim that, through media support, they are better able to consolidate their actions and impact in their social context. Drawing from agenda setting; and framing theories we explore the degree to which the media contributes to this process through a discourse that reflects the density and/or ability approach. Using content analysis from print media in Barranquilla, Colombia a city that reflects key dimensions of Colombia civil conflict - from 2000 to 2006, focal groups with media representatives, and interviews with leaders of civil society groups and associations, we seek to identify recommendations for improved media coverage and policy recommendations for groups and

associations that will strengthen civil society organizations' contribution to democracy in developing countries faced with social and political unrest.

#### B. CONTRIBUTION TO DEMOCRACY DEVELOPMENT

There are many different theories about how mass media influence people's attitudes, worldview, and behavior. Here, I will mention the ones that are most relevant to the topic in question. While historical as well as contemporary observations are full of examples attesting to the power of the mass media to influence people; early experimental studies have failed to confirm the assumption that mass media have a strong power to change people's attitudes (McGuire 1986). This discrepancy between experiments and real world observations was solved with the introduction of theories of cognitive processing, such as *agenda setting*, *framing*, and *priming* (Lowery and DeFleur 1995).

The effect of agenda-setting is epitomized in the famous quote by Bernard Cohen (1963), saying that the press "may not be successful much of the time in telling people what to think, but it is stunningly successful in telling its readers what to think *about*". People need to orient themselves in a complex world full of complex issues. In the absence of other cues, people tend to judge the importance of issues from their salience in the media and to focus their attention on those presumably most important issues. There is plenty of evidence that the media have a strong influence on people's perception of which issues are important and which problems they want their government to do something about (McCombs and Reynolds 2002).

The agenda-setting influence of the news media increases when the need for orientation

among the audience is high. The agenda-setting effect is lower for obtrusive issues that people can observe directly, as well as for other issues that the audience is well informed about. The media have little power to set the agenda when people have sufficient political knowledge to counter argue the claims made by the media (Iyengar et al. 1982; McCombs and Reynolds 2002).

They also presented various potential solutions to the gaps and challenges identified in coverage of the elections. It was observed that role of media on strengthening democratic culture was central to any reform process and stakeholders agreed that improvement in the information environment in the run up to the local elections was important step.

#### C. CHALLENGES IN FRONT OF INDIAN DEMOCRACY AND MEDIA

Traditionally, media scholars have described the selection of news with concepts like *gate keeping* and *newsworthiness*. These concepts are based on a scenario where an editor or journalist sorts incoming news according to news value and political criteria. If all these claims have any merit at all, then we have to drastically revise our view of the way our democracy works. The Concise Encyclopedia of Democracy (Dehnen 2000) makes only brief mentioning of the possibility of political, commercial or other influences on the mass media. Most other treatises on the theory of democracy make no mentioning at all of any such problems. The political and cultural consequences of this alleged misinformation of the public are not fully explored. What are the effects of the commercialization of news on the democratic process? Which way does this influence push the development of our society? The study of these questions is difficult because it must integrate findings from many different scientific disciplines.

**D. CHALLENGES TO DEMOCRACY:**

India's democratic system has been working successfully for the last half a century. But this democratization has also been facing several challenges.

- 1. Divisive tendencies 2. Extremism / Terrorism 3. Unemployment 4. Political instability
- 5. Parochialism 6. Growing illiteracy 7. Corruption and nepotism. There should be certain essential conditions for the successful working of the democratic system.
- 1. Equality of opportunity 2. Literacy 3. Tolerance and fraternity 4. People with a civic sense
- 5. Social justice 6. Free and fair election system 7. Purposeful and principled leadership
- 8. Strong and responsible opposition 9. Independent and impartial judicial system

Democracy is not only a form of government but also a way of life the representative democratic system is in existence in almost all countries including India. Election is a decisive process in a democratic system. There are certain conditions for granting right to vote. Party system plays an important role in the subsistence of democracy. Election Commission bear the responsibility of conducting the elections in India. In a democratic set up the opposition has duties and responsibilities just as a ruling Party.

**CONCLUSION:**

Hence, keeping in view the conditions of the country in terms of growing conflicts and violence, increased corruption levels and rising poverty leading to intolerance in the society the responsibility of media as the fourth state of the country increases. Citizens in India can re-elect a

Government, if they are not satisfied with its performance only after a gap of five years but it is through media through which they can put forward their grievances before it every day. In short, media acts as the voice of the citizens of the country, at the same time even the media should also be accountable to the general public. Therefore, press freedom should become a blessing for the people of this country.

However, such a blessing could turn into a curse when manipulations set in. When media turns into a mere business conglomerate, news is nothing but a commodity. In this regard, rather than presenting the culture and traditional values of various states of the country, which is a hot-spot of diversity which would lead to unity and tolerance more focus is given on the news of religious intolerance, ethnic-conflicts and preaching of hate-news in the name of 'national interest.' To this end, Guha Thakurta raises a question in the context of India, "If India's biggest corporate conglomerate is also India's biggest media company, what it does to diversity of opinion, plurality of opinion, what it does to unfavorable news coverage?" He therefore points out when big business interests get into media business as, "they influence what comes out into public, what is heard and read...The greater the monopolization and corporatization of media, the less the space for smaller voices, differing voices, dissenting voices." Therefore, media has its own interest and biases and with corporate overtaking of the media houses, the media-government collaboration is likely to continue. This led to the ex-Minister of State for External Affairs, General V.K. Singh, to call the phenomena as "presstitute."

In spite of such tendency to control the media, in recent decades, the media in South Asia has undergone dramatic transformation. It has tried to probe and serve issues which were regarded

sensitive from the governmental viewpoint such as corruption in high places, mal-governance, plight of the minorities, behavior of the security agencies, etc. This is due to intense competition among the media houses to earn viewership or TRP's and establish their credibility. Moreover, the rise of the social media has made it imperative for the mainstream media to be even more investigative and objective in its coverage of issues of public interest.

Therefore, it is necessary that media should self-monitor or self-censor so that professional integrity and ethical standards are not sacrificed for sensational practices. The self-regulatory mechanism across media organisations need to be strong enough to stop anomalies whenever they occur. Agencies like Press Council of India need to be vigilant to stem the rot. Big media conglomerates are a serious threat. To counter this problem pluralistic media organisations which are financially viable need to be encouraged. Media should understand the possible effects of their reports on public. Whether its politics, crime, business, fashion, education or parenting, media guides us and sets trends. It is not just a profitable business endeavour, but it's an enterprise which carries a huge moral responsibility on its shoulders. This field thus demands honesty, moral courage, high moral values, discipline and a truly educated and enlightened background. It should guide us towards truth and from darkness towards light. Community participation is a goal that the media should strive for in a country like India. Thus, media is called a pillar of society and a healthy society is not possible without a healthy media.

The media has a crucial role in not only strengthening democratic processes in each of the countries in the region, but also in fostering greater cooperation and understanding among them.

Indian democracy has grown up and strengthening with help of media. There is true that some of irregularities came in media industry. Some of new values are sum up and some of important old values are decreased. They can create the demand for change and ensure that the process is implemented in the best possible manner. The vast resources that many media organisations in the region today have and the fact that technology has removed most constraints of distance and time give the media houses and individual journalists a unique opportunity to play the role that audiences trust them to perform.

No one is perfect in this world and so is the media. Here I am not degrading the media, rather I would say there is still a lot of scope for improvement by which media can raise up to the aspirations of the people for which it is meant. I cannot think of a democracy without active and neutral media. Media is like a watchdog in a democracy that keeps government active. From being just an informer it has become an integral part of our daily lives. With the passage of time it has become a more matured and a more responsible entity. The present media revolution has helped people in making an informed decisions and this has led to beginning of a new era in a democracy.

**REFERENCES:**

1. Lok Sabha Corruption Inquiry Committee Report.
2. www.scattmage.com, January 2009.
3. Indian Readership Survey, 2008.
4. Barnett, C., *Media, democracy and representation: Disembodying the public*, in C. Barnett & M. Low (eds.), *Spaces of Democracy: geographical perspectives on citizenship, participation and representation*

ROLE OF MEDIA IN STRENGTHENING THE INDIAN DEMOCRACY

125

(London, U.K: Sage Publication, 2004) pp. 185-206.

5. H.N.Ray, Political Theory: Interpretation and Interventions, 2006.
6. Bogart, L., *Media and Democracy*, in L. L. Dennis & R. W. Snyder (eds.), *Media & Democracy* (U.S.A: Transaction Publication, 1995) pp.6-8.
7. Coronel, S., *The Role of the Media in Deepening Democracy*, (2003).
8. Dutta, Soumya, *Social Responsibility of media and Indian Democracy* (Global Media Journal - Indian Edition, Summer Issue, June 2011) pp.1-8.
9. Fink, Conrad C. *Media ethics: In the Newsroom and Beyond* ( U.S.A: McGraw-Hill Book Company, 1988).
10. Habermas, J. *Information and democracy*, in F. Webster (ed.), *Theories of the Information Society* (New York, NY: Taylor & Francis, 2006) pp.161-163.
11. Panikkar, N. K., *Opinion: Media and the public sphere*, The Hindu, January 2012.
12. Parceiro, S., *The Role Of Media in Democracy: A Strategic Approach*, 1999.
13. Gurevitch, Michael, Stephen Coleman and Jay G. Blumler, *Political Communication—Old and New Media Relationship*, *Annals of the American Academy of Political and Social Science*, Vol. 625 ,Sep., 2009, pp. 164-181.
14. Singh, Priyanka (ed.), *Role of Media in Promoting Regional Understanding in South Asia*, Institute for Defence Studies and Analyses (IDSA), (New Delhi: Pentagon Press, 2016).
15. Pattanaik, Smruti S., *Elite Perceptions in Foreign Policy: Role of Print Media in Influencing India-Pakistan Relations, 1999-1999*, (New Delhi-RCSS, Manohar Publishers, 2004).
16. Stromberg, David, *Mass Media and Public Policy*, *European Economic Review*, Vol. 45, 2001, pp.652-653.
17. Vaidya, Samarth, *Corruption in the media's gaze*, *European Journal of Political Economy*, Vol. 21, 2005, pp. 667-687.
18. Yochai Benkler, *the Wealth of Networks*, 2006.

©

**12. The Impact of COVID-19 on Indian Economy**





**Bunts Sangha's  
S. M. Shetty College of Science, Commerce and Management Studies  
Powai, Mumbai**

PERMANENTLY AFFILIATED TO UNIVERSITY OF MUMBAI  
NAAC Accredited 'A' Grade  
MAC RBND Certificate of Merit 2019  
ISO 21001:2018 Certified

**NATIONAL LEVEL MULTI-DISCIPLINARY  
E-CONFERENCE- 2021**

**"PANDEMIC INDUCED CREATIVE DISRUPTIONS:  
ISSUES, CHALLENGES, AND PROSPECTS"**

Thursday, 30<sup>th</sup> September, 2021

Organised by  
**DEPARTMENT OF ACCOUNTANCY AND FINANCIAL MANAGEMENT**  
in collaboration with  
**DEPARTMENT OF COMMERCE,  
UNIVERSITY OF MUMBAI**

Publication Partner



**Indian Academicians and Researcher's Association**



**International Journal of Advance and Innovative Research**

Volume 8, Issue 4 (II) October - December 2021

**CONTENTS****Research Papers**

TO STUDY THE IMPACT AND ROLE OF MASS MEDIA DURING THE COVID- 19	1 – 7
Ms. Priyanka Yadav	
A STUDY OF IMPACT OF GST ON BEAUTY PARLOURS RUN BY WOMEN IN MUMBAI CITY DURING PANDEMIC PERIOD	8 – 12
Mr. Sanjay Chandralal Premchandani and Dr. S B Adkine	
IMPACT OF COVID-19 ON CHOCOLATE, SWEET AND CONFECTIONERY INDUSTRY RUN BY FIRST GENERATION ENTREPRENURS OF SHIRUR TEHSIL	13 – 18
Manjusha Arun Thorat Patil and Dr. Sanap S. B.	
LIFE AND HEALTH INSURANCE – TOOLS TO SAFEGUARD YOUR INVESTMENT	19 – 22
Mr. Ritesh Sheth and Dr. Sangeeta N. Pawar	
MIDC: MUTUAL IOT DEPENDENCY AND CLOUD COMPUTING	23 – 28
Mr. Rajesh Yadav	
AN EMPIRICAL RESEARCH ON IMPACT OF GST ON HOTEL INDUSTRY IN MUMBAI REGION DURING PANDEMIC COVID 19	29 – 35
Principal Dr. S B Adkine and Mr. Sanjay Chandralal Premchandani	
A STUDY ON ASSESSMENT OF SERVICE QUALITY OF TELECOM SERVICE PROVIDERS IN MUMBAI TELECOM CIRCLE USING SERVQUAL MODEL	36 – 43
Dr. Jaya Manglani and Mr. Vikas D. Singh	
ROLE OF MICROFINANCE IN THE EMPOWERMENT OF UNORGANISED WOMEN WORKERS IN THANE DISTRICT	44 – 48
Dr. A. Mahesh Kumar and Dr. Upendra A Tiwari	
A STUDY OF WOMEN FACULTY'S WORK-LIFE BALANCE WHILE WORKING FROM HOME DURING THE COVID-19 PANDEMIC	49 – 54
Dr. Sussmita Daxini and Prof. Neha Mehta	
LOCK YOUR STRESS AND UNLOCK YOUR JOY	55 – 57
Sunita Sherifani	
IMPACT OF PANDEMIC ON TEACHING AND E – LEARNING: ISSUES AND CHALLENGES FROM TEACHERS' AND STUDENTS' PERCEPTIONS	58 – 64
Mr. Vipul Manohar Tandel	

<b>A STUDY OF OUT OF HOME (OOH) MEDIA STRATEGIES IN ERA OF COVID DISRUPTION: A LITERATURE REVIEW</b>	141 – 143
Prof. Rupa Rawal and Dr. Armod Markale	
<b>BLOCKCHAIN-BASED SOLUTIONS TO INTERNET OF THINGS SECURITY AND PRIVACY ISSUES</b>	144 – 149
Dr. Manisha Landge	
<b>LEARNING IN TIMES OF COVID-19: STUDENTS PERSPECTIVE</b>	150 – 155
Mrs. Ankita Mehta	
<b>DOMESTIC TOURISM - A PANDEMIC INDUCED STRATEGY TO SUSTAIN THE TOURISM SECTOR IN INDIA</b>	156 – 160
Ms. Shradha Prakash Charvan and Dr. Surekha Mishra	
<b>COMPARATIVE FINANCIAL STATEMENT ANALYSIS OF MARUTI SUZUKI INDIA LIMITED: A STUDY</b>	161 – 165
Dr. Anitaba Sukhdevsinh Gohil	
<b>OTT – A PANDEMIC INDUCED HIGH PERFORMING SERVICE IN MUMBAI CITY (WITH REFERENCE TO THE YEAR 2020-2021)</b>	166 – 169
Ms. Shradha Prakash Charvan	
<b>THE IMPACT OF COVID-19 ON INDIAN ECONOMY</b>	170 – 172
Dr. Ashok V. Ghorpade	
<b>ISSUES AND POTENTIALS OF CENTRAL BANK DIGITAL CURRENCY: PANDEMIC AND BEYOND</b>	173 – 180
Mr Vinitkumar Jagdishprasad Varma and Dr Bhavsinh Dodia	
<b>WOMEN ENTREPRENEURSHIP DEVELOPMENT THROUGH SELF HELP GROUPS</b>	181 – 185
Nikita Gajjar and Dr. Amul Kotadia	
<b>EXPLORING THE VIABILITY OF FLEXIBLE PEDAGOGY IN COVID ERA</b>	186 – 191
Ms. Richa Sharma and Mrs. Samhitha Sharma Kain	
<b>A STUDY OF ONLINE DEMAND OF FMCG GOODS DURING COVID -19 AND ITS IMPACT ON THE ECONOMY</b>	192 – 198
Ms. Farheen Qureshi	
<b>A STUDY OF SAVINGS AND INVESTMENT HABIT OF STUDENTS DURING PRE AND POST COVID ERA: WITH SPECIAL REFERENCE TO IMPACT ON STUDY TIME</b>	199 – 202
Ms. Sahana Raviprasad and Dr. Srihara Shetty	
<b>CUSTOMERS' AWARENESS AND ADOPTION OF GREEN BANKING - A STUDY WITH REFERENCE TO MUMBAI REGION</b>	203 – 207
Mr. Sandeep Shetty and Mrs. Niveditha Shetty	

### THE IMPACT OF COVID-19 ON INDIAN ECONOMY

Dr. Ashok V. Ghorpade

Assistant Professor, Department of Economics, New Arts, Commerce & Science College, Parner

#### ABSTRACT –

The Covid-19 pandemic has not affected our fiscal deficit and disinvestment target much. In this year's union budget, Finance minister Nirmala Sitharaman announced a fiscal deficit target of 6.8% for 2021 to 2022. India's fiscal deficit for 2020-21 zoomed to 9.5% of GDP as against 3.5% projected earlier. Overall world is stopped due to continuous waves of Covid-19. It is one of the global epidemics. Firstly it was founded in China, later on it spreads in overall world. Near about 190 nations in overall world are under the dark shadow of Covid-19. World economy is passing through a very dangerous period. The economic and social disruption caused by the said pandemic. Millions of Peoples are at risk. As far as the Indian economy is taken into account, it is completely collapsed. Industrial sector, Agro sector and Service sector were affected by the stroke of Covid-19. Number of nations has declared lockdown for establishing control on wide spread on Covid-19. Due to lockdown overall industrialization is stopped. Due to this industrial sector is collapsed, as a result of this retrenchment was made on industries. Peoples had lost their jobs. Trade was also stopped in pandemic situation. Only agro sector is working stumbling.

*Keywords: Covid-19, Indian Economy, Employment, Industrial Sector*

#### INTRODUCTION:-

The disease, which started in China and is currently spreading around the world, has been dubbed covid-19. Before the outbreak began in December 2019, there was no record of a new corona virus or related outbreak in the world. It seems to be more or less widespread in all the countries of the world. The whole world economy seems to be declining. Before covid-19, India's economic growth rate averaged 7.4 per cent, but due to covid-19, the country's economic growth mortality rate was minus 21.3%. The country's growth rate is projected to be 2.4% in FY 2021-22. The nationwide lockout has had a profound effect on all parts of the country.

#### Objectives of Research

1. To study the effects of Covid-19 on India's economic development.
2. To study the effects of Covid-19 on the agricultural sector in the country
3. To study the effects of covid-19 on the industrial sector
4. To study unemployment in the country due to covid-19
5. To study the fiscal deficit in the country due to covid-19.

#### Assumptions of Research.

1. Covid-19 has affected the agricultural sector
2. Covid-19 has led to an increase in unemployment in the country
3. Covid-19 has affected the industrial sector in the country

#### Scope of Research

The scope of the research presented is very large and the global epidemic has crippled not only the Indian economy but also the entire global economy.

#### RESEARCH METHODOLOGY: -

A completely second instrument has been used for the present research in which information and statistics will be compiled on the basis of various dailies, magazines, websites and texts.

#### Topic extension

The Covid-19 virus had taken people down all over the world. Also in India, it was locked down from March 24, 2020, due to the decision of the Government of India to lock down in the early days

The incidence of corona was reduced and the mortality rate was also reduced.

#### REVIEW OF LITERATURE:

This is being recent issue; there are very few articles in newspaper, in books and other sources. I referred those articles.

#### Effect of Covid-19 on Various Regions of India:

1. **Impact of Covid-19 on India's agricultural sector-** Covid-19 Prior to this, the average economic growth rate of the agricultural sector in India was 3.3 per cent. According to estimates, the country's GDP in agriculture is projected to increase from 2.5% in FY19 to 4% in 2020. But the covid-19 layoffs have had a knock-on effect on the agricultural sector. Houses in demand for farmland, decline in exports, closure of transport system, closure of market committees, etc. caused many difficulties in the process of distribution of agricultural commodities. As a result, the economic condition of the farmers has become unfavorable. The Central Government has tried to provide some incentive grants to the farmers but it has not had a very favorable effect on the farming community.
2. **Impact of Covid-19 on India's Unemployment sector-** According to CMIE, India's unemployment rate was 3.4 % in June 2017 before the strike. Before the strike, India's unemployment rate was 8.7 % in March 2020. This has resulted in stagnation of all industries, trades, etc. except hospitals, drug stores, food related services, etc. In terms of employment, there is a huge increase in unemployment in all sectors except agriculture. Unemployment seems to be on the rise in the unorganized sector in India. The loss of employment in many places such as builders, street vendors, vegetable sellers, peddlers, rickshaw pullers has led to starvation and poverty.

**Impact of Covid-19 on Industry sector-** The worst effects of the Covid-19 epidemic have been felt deeper and more widely in the country's industrial sector. Prior to the layoffs, the country's industrial growth rate was 20.1 percent in January 2020. After April 2020, many industries suffered huge losses due to the closure of the industrial sector due to lockouts across the country. Many jobs have been lost due to the shutdown announced in the entire country. As the demand for goods in the economy declined, so did the income of the industry, and as a result, the workers in the industry were laid off. The ban seems to have hit micro, small and medium enterprises the hardest. In short, the overall manufacturing output fell by 39.3 per cent, the construction sector by 50.3 per cent, trade, hotels, transport and messaging by 47 per cent.

**Impact on the Country's Fiscal Deficit-** The Covid-19 pandemic has not affected our fiscal deficit and disinvestment target much. In this year's union budget, Finance minister Nirmala Sitharaman announced a fiscal deficit target of 6.8% for 2021 to 2022. India's fiscal deficit for 2020-21 zoomed to 9.5% of GDP as against 3.5% projected earlier. The central government's fiscal deficit swelled to 1.1 per cent of the target set in the fiscal year 2020-21 in November 2012. The fiscal deficit, which is the difference between government expenditure and government revenue, is Rs 10.75 lakh crore. It was observed to increase up to. Due to the Corona epidemic and the lockdown announced by the Raj, the government received less revenue than expected from the disruption in the finance and trade cycle. The government will have to increase its spending to get rid of the severe recession caused by the Corona Nineteen blockade, which will increase the country's fiscal deficit.

#### CONCLUSION

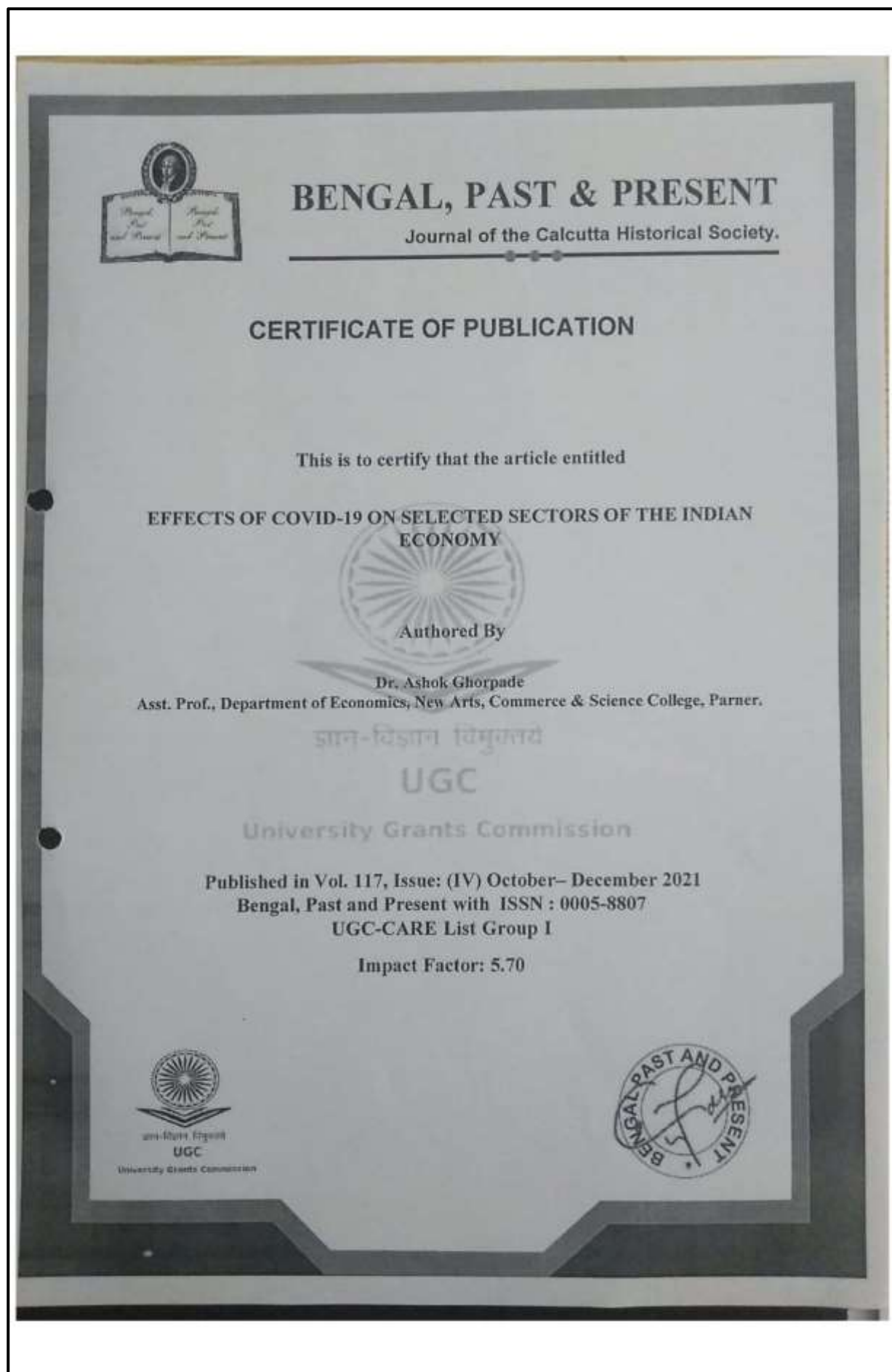
1. Covid-19 has affected all sectors of the country's economy but the impact on the agricultural sector is long lasting. Covid-19 has caused farmers to lose their standing crops. The farmers are facing financial difficulties due to various reasons such as labor problem, farm price problem, debt repayment problem, illness of family members.
2. Covid-19 has also adversely affected the industrial sector. Micro, small and medium enterprises seem to be hit hard financially. The industry sector is in financial crisis due to raw material problems, labor problems, transportation problems, overdue loan installments, declining production demand.
3. Covid-19 has led to a huge increase in unemployment in the country. About 85 to 90 per cent of jobs are in the unorganized sector, with many semi-skilled and skilled workers, such as handcarters, construction workers, street toy vendors and tea vendors, seen starvation and unemployment on the rise.
4. The crisis of fiscal deficit is likely to be exacerbated in the future as the government has to help the people by raising funds in various ways to strengthen the country's shaky economy and reverse the recession.
5. Inflation in the country has taken a turn for the worse due to various reasons such as the problem of raw materials, the problem of transportation, the problem of fuel. On the one hand, employment has been cut off and on the other hand, inflation has broken the backbone of the common man.
6. Although the Reserve Bank's reduction in interest rates has given some relief to the industry, various factors such as overdue loan installments, rising raw material prices, rising fuel costs, labor shortages have made industry management even more difficult.

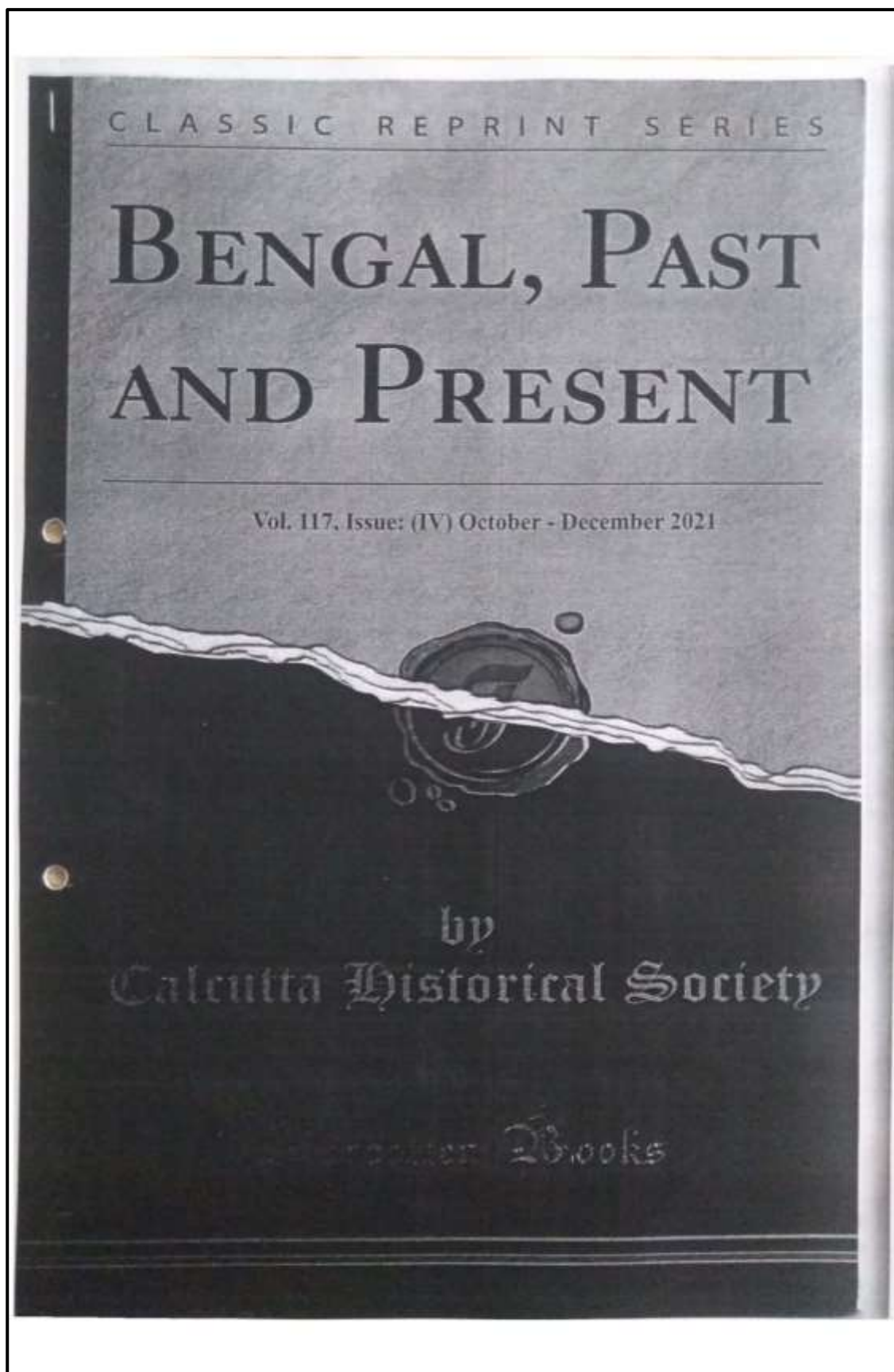
**RECOMMENDATIONS: -**

1. The government should give five kilos of wheat and five kilos of rice to the poor people for free for a few more months.
2. The government should deposit Rs.5000 per month in the account of the working class in the financial year 2021-22.
3. The government should curb inflation as the rising cost of food grains, the two thousand rupees increase in fuel prices in the financial year announced by the Reserve Bank, has crippled the economic math's of the general public.
4. RBI should not make any change in interest rates for the financial year 2001-22.
5. Meals and accommodation should be provided to unorganized workers at work.
6. Farmers should be provided interest free loans for financial 2021-22.
7. The government should provide tax relief to small and medium enterprises.
8. As long as there is an epidemic of covid-19 in the country, free clinics and medicines should be provided to the poor farmers, workers, artisans, laborers.
9. Foreign investors should be encouraged to invest in the country.
10. Guarantee prices of agricultural commodities to help reduce losses to farmers.
11. Small and medium enterprises should be given some more concessions to encourage them to increase production.

**BIBLIOGRAPHY:**

1. [www.esakal.com](http://www.esakal.com) 5 January 2021
2. RBI (2020). Press release of meeting dated 27th March 2020. [rbifocs.rbi.org.in](http://rbifocs.rbi.org.in) Google Scholar
3. [www.orfonline.org/marathi/impact-of-covid-19-on-rural-lives-and-livebook-in-india-654101](http://www.orfonline.org/marathi/impact-of-covid-19-on-rural-lives-and-livebook-in-india-654101)
4. Dainik Lokatta, "antarrashtriya potatach rashtriya sampadkiy lekh" dated on 6<sup>th</sup> May 2020
5. Dainik Lokatta, " Jag badhel pan kase parimal"- by Maya Sudhakar dated on 7<sup>th</sup> May 2020
6. Dainik Sakal, "Udyog Bekar Kamgar"- Anant Bagayatday dated on 11<sup>th</sup> May 2020
7. Dainik Sakal, " Navya Samsyuni Navy Sambodhi" - By Dr. Atul Deshpande dated on 14<sup>th</sup> May 2020
8. [www.financialexpress.com](http://www.financialexpress.com)- Amit Kumar
9. [www.indiatoday.in](http://www.indiatoday.in)
10. [www.timesofindia.com](http://www.timesofindia.com)
11. [www.bbc.com/marathi/international-52291688](http://www.bbc.com/marathi/international-52291688)
12. [www.aksharnama.com/client/article\\_detail/4243](http://www.aksharnama.com/client/article_detail/4243)





## Contents

Sr. No.	Name of Topic	Page No.
1	A STUDY ON PROCESSED FOODS – A CONSUMER'S PERSPECTIVE	1-5
2	COMPARATIVE ANALYSIS OF WATER CONSUMPTION IN CO-OPERATIVE DRIP IRRIGATION AND FLOOD IRRIGATION SCHEMES: A CASE STUDY OF HALADI KT WEIR IN KARVEER TEHSIL OF KOLHAPUR DISTRICT	6-10
3	HARDINESS AND PSYCHOLOGICAL WELL – BEING AMONG COLLEGE STUDENTS	11-14
4	A STUDY OF SMARTPHONE ADDICTION AND LONELINESS AMONG COLLEGE STUDENTS	15-18
5	A STUDY ON THE IMPACT OF ONLINE CLASSROOM TRANSACTION UTILISING UDL GUIDELINES & 7E LEARNING CYCLE BASED LESSON PLANS, ON EXECUTIVE FUNCTION OF LOW ACHIEVERS AT RISK OF ACADEMIC FAILURE STUDYING IN PRIMARY AND MIDDLE SCHOOL LEVEL OF MAINSTREAM SCHOOL	19-29
6	IMPACT OF COVID 19 ON AMCHHOOR PRODUCTION OF AKKALKUWA TAHSIL IN NANDURBAR DISTRICT (MS) INDIA	30-33
7	A STUDY OF THE DIFFERENCE BETWEEN OBEDIENCE AND DISOBEDIENCE TENDENCY OF JUNIOR COLLEGE STUDENTS OF AMBEGAON TAHSIL	34-36
8	ANTHOLOGY AND OTT RELEASE: THE NEW NORMAL IN TAMIL CINEMA POST COVID-19	37-40
9	BONBIBI MYTH: ENVIRONMENTAL CONCERNS IN AMITAV GHOSH'S NARRATIVE	41-45
10	BUDDHIST STUPA: AN ALTERNATIVE WAY OF LIFE FROM SPIRITUAL UPLIFTMENT TO ECONOMIC STABILITY	46-51
11	THE STUDY OF THE IMPLEMENTATION OF TEACHING-LEARNING IN ONLINE EDUCATION DURING THE CORONA PERIOD	52-55
12	COVID 19 AND IMPACT ON LANDLESS AGRICULTURE WOMEN LABOUR WITH SPECIAL REFERENCE TO MOHOL BLOCK	56-62
13	COVID-19 INDIA'S LATER DISRUPTED ECONOMIC POLITICS	63-66
14	THE ROLE OF MEDIA FOR ADOLESCENTS DURING COVID-19 PANDEMIC	67-70
15	EFFECTS OF COVID-19 ON SELECTED SECTORS OF THE INDIAN ECONOMY	71-73
16	IMPACT OF COVID-19 ON WOMEN'S LIFE	74-76
17	ENVIRONMENT EDUCATION	77-81
18	CRITICAL STUDY OF THE USE OF DIGITAL MEDIA DURING THE COVID-19 PANDEMIC	82-90



Bengal, Past and Present

UGC Care Group 1 Journal

ISSN : 0005-8807

### EFFECTS OF COVID-19 ON SELECTED SECTORS OF THE INDIAN ECONOMY

**Dr. Ashok Ghorpade**

Asst. Prof., Department of Economics, New Arts, Commerce & Science College, Parner.

#### Abstract

Overall world is stopped due to continuous waves of Covid-19. It is one of the global epidemics. Firstly it was founded in China, later on it spreads in overall world. Near about 190 nations in overall world are under the dark shadow of Covid-19. World economy is passing through a very dangerous period. The economic and social disruption caused by the said pandemic. Millions of peoples are at risk. As far as the Indian economy is taken into account, it is completely collapsed. Industrial sector, Agro sector and Service sector were affected by the stroke of Covid-19. Number of nations has declared lockdown for establishing control on wide spread on Covid-19. Due to lockdown overall industrialization is stopped. Due to this industrial sector is collapsed, as a result of this retrenchment was made on industries. Peoples had lost their jobs. Trade was also stopped in pandemic situation. Only agro sector is working stumbling.

**Keywords:** Covid-19, World economy, Employment.

#### Introduction

The disease, which started in China and is currently spreading around the world, has been dubbed covid-19. Before the outbreak began in December 2019, there was no record of a new corona virus or related outbreak in the world. It seems to be more or less widespread in all the countries of the world.

The whole world economy seems to be declining. Before covid-19, India's economic growth rate averaged 7.4 per cent, but due to covid-19, the country's economic growth mortality rate was minus 21.3 %. The country's growth rate is projected to be 2.4 % in FY 2021-22. The nationwide lockout has had a profound effect on all parts of the country.

#### Objectives of Research

1. To study the effects of Covid-19 on India's economic development.
2. To study the effects of Covid-19 on the agricultural sector in the country
3. To study the effects of covid-19 on the industrial sector
4. To study unemployment in the country due to covid-19
5. To study the fiscal deficit in the country due to covid-19

#### Assumptions of Research.

1. Covid-19 has affected the agricultural sector
2. Covid-19 has led to an increase in unemployment in the country
3. Covid-19 has affected the industrial sector in the country

#### Scope of Research

The scope of the research presented is very large and the global epidemic has crippled not only the Indian economy but also the entire global economy.

#### Research Methodology:

A completely second instrument has been used for the present research in which information and statistics will be compiled on the basis of various dailies, magazines, websites and texts.

#### Topic extension

The Covid-19 virus had taken people down all over the world. Also in India, it was locked down from March 24, 2020, due to the decision of the Government of India to lock down in the early days. The incidence of corona was reduced and the mortality rate was also reduced.

#### Review of Literature:

Vol. 117, Issue: (IV) October – December 2021

71

## Bengal, Past and Present

UGC Care Group I Journal  
ISSN : 0005-8807

This is being recent issue; there are very few articles in newspaper, in books and other sources, I referred those articles.

### Effect of Covid-19 on Various Regions of India:

#### 1. Impact of Covid-19 on India's agricultural sector-

Covid-19 Prior to this, the average economic growth rate of the agricultural sector in India was 3.3 per cent. According to estimates, the country's GDP in agriculture is projected to increase from 2.4% in FY19 to 4% in 2020. But the covid-19 layoffs have had a knock-on effect on the agricultural sector. Houses in demand for farmland, decline in exports, closure of transport system, closure of market committees, etc. caused many difficulties in the process of distribution of agricultural commodities. As a result, the economic condition of the farmers has become unfavorable. The Central Government has tried to provide some incentive grants to the farmers but it has not had a very favorable effect on the farming community.

#### 2. Effect of Covid-19 on India's unemployment sector-

According to CMIE, India's unemployment rate was 3.4 % in June 2017 before the strike. Before the strike, India's unemployment rate was 8.7 % in March 2020. This has resulted in stagnation of all industries, trades, etc. except hospitals, drug stores, food related services, etc. In terms of employment, there is a huge increase in unemployment in all sectors except agriculture. Unemployment seems to be on the rise in the unorganized sector in India. The loss of employment in many places such as builders, street vendors, vegetable sellers, peddlers, rickshaw pullers has led to starvation and poverty.

#### Effect of covid-19 on industry sector-

The worst effects of the Covid-19 epidemic have been felt deeper and more widely in the country's industrial sector. Prior to the layoffs, the country's industrial growth rate was 20.1 percent in January 2020. After April 2020, many industries suffered huge losses due to the closure of the industrial sector due to lockouts across the country. Many jobs have been lost due to the shutdown announced in the entire country. As the demand for goods in the economy declined, so did the income of the industry, and as a result, the workers in the industry were laid off.

The ban seems to have hit micro, small and medium enterprises the hardest. In short, the overall manufacturing output fell by 39.3 per cent, the construction sector by 50.3 per cent, trade, hotels, transport and messaging by 47 per cent.

#### Covid-19 the Impact on the Country's Fiscal Deficit

The central government's fiscal deficit swelled to 1.1 per cent of the target set in the fiscal year 2020-21 in November 2020. The fiscal deficit, which is the difference between government expenditure and government revenue, is Rs 10.75 lakh crore. It was observed to increase up to. Due to the Corona epidemic and the lockdown announced by the Raj, the government received less revenue than expected from the disruption in the finance and trade cycle. The government will have to increase its spending to get rid of the severe recession caused by the Corona Nineteen blockade, which will increase the country's fiscal deficit.

### Conclusion

1. Covid-19 has affected all sectors of the country's economy but the impact on the agricultural sector is long lasting. Covid-19 has caused farmers to lose their standing crops. The farmers are facing financial difficulties due to various reasons such as labor problem, farm price problem, debt repayment problem, illness of family members.
2. Covid-19 has also adversely affected the industrial sector. Micro, small and medium enterprises seem to be hit hard financially. The industry sector is in financial crisis due to raw material problems, labor problems, transportation problems, overdue loan installments, declining production demand.
3. Covid-19 has led to a huge increase in unemployment in the country. About 85 to 90 per cent of jobs are in the unorganized sector, with many semi-skilled and skilled workers, such as handcart, construction workers, street toy vendors and tea vendors, seen starvation and unemployment on the rise.
4. The crisis of fiscal deficit is likely to be exacerbated in the future as the government has to help the people by raising funds in various ways to strengthen the country's shaky economy and reverse the recession.
5. Inflation in the country has taken a turn for the worse due to various reasons such as the problem of raw materials, the problem of transportation, the problem of fuel. On the one hand, employment has been cut off and on the other hand, inflation has broken the backbone of the common man.

Vol. 117, Issue: (IV) October – December 2021

72

## Bengal, Past and Present

UGC Care Group 1 Journal  
ISSN : 0005-8807

6. Although the Reserve Bank's reduction in interest rates has given some relief to the industry, various factors such as overdue loan installments, rising raw material prices, rising fuel costs, labor shortages have made industry management even more difficult.

**Recommendations:**

1. The government should give five kilos of wheat and five kilos of rice to the poor people for free for a few more months.
2. The government should deposit Rs.5000 per month in the account of the working class in the financial year 2021-22.
3. The government should curb inflation as the rising cost of food grains, the two thousand rupees increase in fuel prices in the financial year announced by the Reserve Bank, has crippled the economic math's of the general public.
4. RBI should not make any change in interest rates for the financial year 2001-22.
5. Meals and accommodation should be provided to unorganized workers at work.
6. Farmers should be provided interest free loans for financial 2021-22.
7. The government should provide tax relief to small and medium enterprises.
8. As long as there is an epidemic of covid-19 in the country, free clinics and medicines should be provided to the poor farmers, workers, artisans, laborers.
9. Foreign investors should be encouraged to invest in the country.
10. Guarantee prices of agricultural commodities to help reduce losses to farmers.
11. Small and medium enterprises should be given some more concessions to encourage them to increase production.

**Bibliography:**

1. w.w.esakal.com 5 January 2021
2. RBI (2020). Press release of meeting dated 27th March 2020. rbi/docs.rbi.org.in Google Scholar
3. www.orfonline.org/marathi/impact-of-covid-19-on-rural-lives-and-livebook-in-india-654101
4. Dainik Loksatta, "antarrashtriya potatach rashtri sampadkiy lekh" dated on 6th May 2020
5. Dainik Loksatta, " Jag badlel pan kase parimal" - by Maya Sudhakar dated on 7th May 2020
6. Dainik Sakal, "Udyog Bekar Kamgar"- Anant Bagayatday dated on 11th May 2020
7. Dainik Sakal, " Navya Samasyani Navy Sambodhi" - By Dr. Atul Deshpande dated on 14th May 2020
8. www.financialexpress.com- Amit Kumar
9. www.indiatoday.in
10. www.timesofindia.com
11. www.bbc.com/marathi/international-52291688
12. www.aksharnama.com/client/article\_detail/4243
13. www.wikipedia.org/wiki
14. www.hsph.harvard.edu/viswanathlab/fq/marathi

**13. Road Transport Priority of Indian Society**

The information and views expressed and the research content published in this journal, the sole responsibility lies entirely with the author(s) and does not reflect the official opinion of the Editorial Board, Advisory Committee and the Editor in Chief of the Journal "IDEAL". Owner, printer & publisher Vinay S. Hatole has printed this journal at Ajanta Computer and Printers, Jaisingpura, University Gate, Aurangabad, also Published the same at Aurangabad.

**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)

**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)

Cell No. : 9579260877, 9822620877 Ph. No. : (0240) 2400877

E-mail : ajanta6060@gmail.com, www.ajantapublishan.com

**IDEAL - ISSN 2319 - 359X - Impact Factor - 6.601 (www.sjifactor.com)**


**EDITORIAL BOARD**


**Mehryar Adibpour**  
Faculty of Computing London  
Metropolitan University,  
Holloway Road, London.

**Dr. Ashaf Fetoh Eata**  
College of Art's and Science,  
Salmau Bin Abdul Aziz University, KAS

**Dr. Altaf Husain Pandi**  
Dept. of Chemistry University  
of Kashmir, Kashmir, India.

**Dr. Ramdas S. Wanare**  
Associate Professor & Head Accounts & Applied Stat,  
Vivekanand Art's Sardar Dalip Sing Commerce  
& Science College Samarth Nagar, Aurangabad (M.S.)

**Dr. Prashant M. Dolia**  
Dept. of Computer Science and Applications,  
Bhavnagar University, India.

**Dr. P. A. Koli**  
Professor & Head (Retd).  
Dept. of Economics, Shivaji University,  
Kollapur - (M.S.) India.

**Dr. Rana Pratap Singh**  
Professor & Dean School for Environment Science,  
Dr. Babasaheb Bhimrao Ambedkar University  
of Raebareilly, Lucknow - India.

**Dr. Joyanta Barbora**  
Head Dept. of Sociology University of  
Dibrugarh- India.

**Dr. Jagdish R. Baheti**  
H.O.D., SNJB College of Pharmacy,  
Neminagar, Chandwad, Nashik (M.S.) - India.

**Prof. P. N. Gajjar**  
Head, Dept. of Physics,  
University of School of Sciences,  
Gujarat University, Ahmedabad- India.

**Dr. Memon Ubed Mohd Yusuf**  
Asst. Prof. Dept. of Commerce,  
Sir Sayyed College Aurangabad (M.S.) - India.



PUBLISHED BY



**Ajanta Prakashan**

Aurangabad. (M.S.)



VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - I ❧

S. No.	Title & Author	Page No.
1	Discrimination against Dalit in India with Reference to Human Rights <b>Dr. Gobinda Chandra Sethi</b>	1-5
2	Correlation between Spatial Intelligence and Mathematics Attitude of Secondary Students <b>Ku. Nita Laxmanrao Choure</b> <b>Dr. Suhaskumar Ruprao Patil</b>	6-9
3	Efficacy of Benomyl against Wilt of <i>Coriandrum Sativum</i> Linn., Caused by <i>Fusarium Oxysporum</i> F. Sp. Coriandrii <b>R. S. Karpe</b> <b>T. R. Kavale</b>	10-14
4	Handling Image in Database <b>Balu Rustum Kharat</b>	15-21
5	A Review on Antimicrobial Potential of Ocimum Sanctum (Tulsi) <b>Dr. Dinisha Malviya</b>	22-25
6	Effect of Aluminium Ions Substitution on Microstructure, Electrical Resistivity and Drift Mobility of Nanocrystalline Calcium Hexaferrites <b>Sanjay R. Gawali</b> <b>Pandurang R. Moharkar</b>	26-34
7	Ardent Feeling of Universality in Saint Dnyaneshwara's <i>Pasayadan</i> and Chicago Speech of Swami Vivekananda <b>Vaibhao C. Patil</b>	35-39
8	Effect of Spraying of Stomp on Morphological Characters of <i>Sida acuta</i> Burm. f. <b>Mhaiskar M. N.</b>	40-46
9	Growth of Most Preferred ICI Based Banking Services in Scheduled Commercial Banks in India <b>Shila Uttam Palode</b> <b>Dr. Kharat D. B.</b>	47-53
10	Value of Teaching Mathematics <b>Mr. Pandhare Balu Shankarsa</b>	54-61

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - I ❧

S. No.	Title & Author	Page No.
11	Numbers: Overview <b>Mr. Sahebrao Deoram Mohan</b>	62-68
12	Homelessness, Dislocation and Identity Crisis in Caryl Phillips Final Passage <b>Dr. Vijay Dashrath Misal</b>	69-71
13	Overview of Major Crops in Sindhudurg District <b>Prof. Neelam D. Dhuri</b>	72-79
14	Suicidal Ideation and Academic Stress Among Adolescents <b>Dr. Smritikana Ghosh</b> <b>Anjana Kumari</b>	80-85
15	Practices in Education and Role of Teachers for Providing Successful Mental Health in Schools and Educational Institutions <b>Sreedevi Nagireddy</b>	86-90
16	Physico-Chemical Analysis of Khazana Bawali District Beed (M.S.) India <b>P. B. Sirsat</b>	91-94
17	Central Government Concessions and Benefits Available to War Widows / War Disabled and Retired / Serving Defence Personnel <b>Lt. Dr. R. P. Gawande</b>	95-98
18	National Education Policy 2020 Challenges & Issues <b>Dr. Laxmisha A. S.</b>	99-106
19	A Study on Right of Speedy and Fair Trial with Special Reference to Criminal Procedure Law and Constitution <b>Pragya Kulhar</b> <b>Dr. Vinod Kumar</b>	107-111
20	History and Evolution of Volleyball <b>Dr. Shobha Pramod Shinde (Bhagat)</b>	112-119
21	A Study of Human Rights in the Special Context of Scheduled Caste and Scheduled Tribe <b>Patil Minakshi Pradiprao</b>	120-125



VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

 CONTENTS OF ENGLISH PART - I 

S. No.	Title & Author	Page No.
22	An Acquisition of a Language through Literature: A Stylistic Study of William Blake's Verses <b>Prof. Dr. Vinodkumar P. Chaudhari</b>	126-132
23	Thermal Comfort <b>Dr. Ratna Sanjay Waghmare</b>	133-140
24	Effects of Gender Variations on Mental Health: A Critical Review <b>Nousheen Farha</b> <b>Dr. Prafull D. Kulkarni</b>	141-145
25	A Study of Impact of Covid -19 on Indian Education Sector <b>Dr. S. B. Karande</b>	146-153
26	Road Transport: Priority of Indian Society <b>Dr. Yuvaraj M. Waghare</b>	154-160

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

## 26. Road Transport: Priority of Indian Society

**Dr. Yuvaraj M. Waghare**

H.O.D. and Assistant Professor in Commerce, New Arts, Commerce and Science College,  
Parner Dist- Ahmednagar (MS).

### **Abstract**

The road transport possesses relatively very high power of extensiveness influencing the very wider area directly. The linking of approach roads increases the marginal utility through highways. Its covered greater areas for highway connectivity for the transportation. The roads can be use different types of users. People can walk, going through cycling, bullock cars can move from one place to another and motor vehicle can be use. People can easily have carried out their luggage, goods and other essential things by using roads.

The railways cannot provide door to door facilities to the people as roads can do easily. The real challenge to the railway is time saving, which comes from road transport. Comparatively lower cost of service in railways cannot provide the facilities provide by the road transport. So it is convenient to all class of people to use road transportation. On the other side comparison between water transport and road transport is totally worthless, because scope of water transport, source for transportation, service facilities, safety, goods transits, these are factor are much better in road transportation. So again we can say that the people always give first preference for road transportation.

**Keywords:** Road, Transport, Railway, Sources, Kms, Highway, Rural

### **Introduction**

Road network is very large in India. In 2004, there are 33.20 lakh roads being used, which have been well-developed since the time of Chandragupta Morya and King Ashok. It was later increased during the Mughal Empire. In British times, British Government began to build pucca roads to comply with laws and laws and to develop goods. After India became independent, the Government of India started to enable road transport more efficiently.

If you want to study on a transport journey, it can be said that it has started from the creation of humans. This is due to the fact that as soon as social responsibility and needs are met, transport instruments and forms are being created. And when it is said that after the search of a wheel, the real tools of the traffic were created, but it would not be wrong if the person said that it started by walking on foot. When the man started the journey to meet the need, it was more

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

**IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601** (www.sjifactor.com)

---

convenient to travel to the nearest town, but to go away, it required that the time required for physical and physical abilities decreased. Then the man started traveling with animals like donkeys, bulls and horses. The man got the convenience of traveling, but he used to get some goods as per his requirement, so that he started limiting for the same flow, and after that the search of the wheels started to get the goods and goods.

#### **Objectives of Study**

This research project is totally completed in accordance with the following objectives.

1. To overview the history of Indian transportation
2. To study various transportation sources available in India
3. To study Road transportation network

#### **Research Methodology**

The research has been done using secondary data only. The study of research is completed by step by step from review of Literature to the data on various websites, research publication, Newspapers, Articles, official documents, periodicals, Government records, etc.

#### **History of Transportation in India**

With achievement of independence in 1947 and introduction of economic planning in India, high hopes were raised in the minds of the people of a higher standard of living and necessary ingredient of this was naturally an efficient, economic and adequate means of transport from and to the remotest of the villages. The provision of a transport system, so large in size and resource needs, could not have been handled if the Government had not stepped in. This brought in a large scale expansion of public sector road transport undertakings already existing and starting of new undertaking in those areas where none existed earlier.

#### **Sources of Transportation in India**

If we think about the ways of transportation in India, then you have to think of three main types, namely, the road, road, water and airways. The traffic route consists mainly of rail, tram and metro. Since it is mainly a very wide network of trains in India, its use is widely used. Tram is used in Kolkata city and Metro is used in big cities like Delhi, Mumbai.

**A) Railway:** After the search of steam engine, a major change was made in the transport sector. The first full scale railroad in the world, after the British started in 1804, has laid the foundation of the railway in India. The first railway route from Mumbai to Thane was started in 1853 during the British Government. During the Indian independence period 53596 km The railway line was constructed. 2017 was thought to be the railway route 1,14907 km. Has spread to up to. Indian Railways is fast connecting two cities in India.

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

**B) Tram:** Kolkata is the only Indian City, having an operational tram network. The first Electric tram in Asia ran in Kolkata in 1902. CTC (The Calcutta Tramways Company Limited), which was registered in 1880 as a company in London, was taken over by Government of West Bengal in 1967. Modern day trams are the outcome of development of technology and design. The cars gradually evolved with time. In 2013, CTC brought in air-conditioned tram cars.

**C) Metro:** Growing cities, growing population and growing traffic has invariably called for a shift from private modes of conveyance to public transport. India, however has lagged behind though its first metro, the Kolkata Metro, started working almost 25 years ago. The reasons could be attributed to lack of funds planning as is known that such projects require huge capital investments.

**D) Road transport:** The most popular and most widely used type of transport in India is the road transport. Normally the number of roads in India from 1951 is as follows.

**Table No. 2.1 : Statement of showing No. of Roads in India**

<b>1951</b>	<b>1961</b>	<b>1971</b>	<b>1981</b>
4,00,004 km	5, 24,000 km	10,22,000 km	14, 91,000 km
<b>1991</b>	<b>2001</b>	<b>2011</b>	<b>2019</b>
23, 27,362 kms	3373520 Kms	4676838 Kms	59,03,293 kms

From the above table it is noticed that the number of roads in India is increasing day by day, hence the road transport needs more efficient and faster travel.

Road transport types usually include buses, motorbikes, auto rickshaws, trams, taxis.

- 1. Cycle Rickshaw:** This is the oldest type in India which is now being wiped out. Cycle rickshaw has started in India in the period of 1940. This was the most widely used type in independent India. In particular, the use of this in Delhi has increased considerably. We see this type of thing today in Vidharbha in Maharashtra. Cycle rickshaw is a tricycle with thick type, where two to three people can travel in it.
- 2. Auto Rickshaw:** Auto rickshaw is the most popular type used for public transport in large cities. In this case, generally 3 to 4 people can travel. In large cities like Mumbai, Pune, Kolkata, rentals were levied according to the meter. So the passengers are not robbed due to the fare charged. Even in rural areas, it has started using auto rickshaw nowadays, it is being used very well in Konkan of Maharashtra.
- 3. Taxi:** Taxis are available by booking from cities like Ahmedabad, Bangalore and Hyderabad. Taxi service is easily available on the streets in Mumbai and Kolkata cities. Taxis are used on sharing principles in many cities because taxi journey is more

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

expensive than auto rickshaw. That means that the total rental cities are taken between them by taking passengers from the same route. This makes the use of the taxi and the burden of the rent reduced. Presently, many private companies such as salvage, ola are making the taxi service available. Passenger chooses the taxi as per your requirement.

4. **Bus:** Most people in India, if they are using their means for travel, are simply the bus. The main reason for this is that the people of all levels receive affordable and comfortable accommodation facility. Generally, the state corporation has been established in every state in India to provide bus facilities, which are working under state government control. From ordinary bus to A.C. Buses with facilities are started by the State Transport Corporation so that passengers can enjoy their travel needs.

The type of traffic mentioned above is used by people in India as per their requirement. The way of the vaastu type is used as it is the other way. Generally, roads have been classified in the following ways in India.

#### Classification of Roads Transportation in India

**1. National Highways:** The National Roadways connecting the state, the capital, the major cities and the ports are the National Highways. The central government has the responsibility to produce and maintain these roads.

**2. State Highways:** State Highways are working to add state capital and smaller cities. It is the responsibility of the state to take care of the highways of the state.



**3. District Roads:** All the roads covered under the district board are known as District Roads. They are doing the work of linking the district and tehsil.

**4. Village Roads:** Village Roads are being used to link all the villages in one state to the tehsil and district.

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601 (www.sjifactor.com)

**5. Border Roads:** The roads built by the Border Roads organization are called Border Roads. These roads are being developed to have connectivity with boarder areas in India and neighboring countries.

There are 18 highways in the state This is the state of Maharashtra These highways are working in other states with major states of Karnataka, Andhra Pradesh, Gujarat, Delhi. In Maharashtra, Mumbai, Pune, Nashik, Kolhapur, Aurangabad, Amravati, Wasim, Ahmednagar, Akola, Jalgaon are working on these cities with national highways.

#### **6. Expressways / Highways in Maharashtra**

**1. Express Highway:** Maharashtra State Government decided to construct Mumbai Pune Express Highway in 1997 with the help of Maharashtra State Road Development Corporation Limited (MSRDC). The project was originally scheduled for a period of 30 years on Build Operate and Transfer (BOT) basis. On March 24, 1999, the Government issued an order for this order. It was a big challenge to build an Express Highway, because bypassing the Khandala and Lonavala Ghats was a big issue. This express highway with a lane of 6 lanes is generally 70 to 120 km. Completes distance of Pune at 3.30 hours per hour.

**2. Eastern Express Highway:** Is the Expressway Highway connecting to South Mumbai and North Mumbai? It is a very important highway to reduce the city's crowds in Mumbai. This highway starts from Chhatrapati Shivaji and connects to Shiva Panvel Highway and then connects the city to the outside. 50,000 passenger cars run daily on this highway. Also the special bus for the passengers is also available on this route.

**3. Mumbai Nagpur Highway (via Aurangabad):** National highway no. The Mumbai-Nagpur Highway connecting the 6th pass is from Aurangabad. This is the biggest highway connecting the state capital and sub-capital, so this journey takes approximately 12 hours. Therefore, the state government has taken an ambitious project to make the new Mumbai-Nagpur Express Highway in the name of 'Samrudhi'.

**4. Sion Panvel Expressway:** Connecting Navi Mumbai (Panvel) to Mumbai is a highway. The length of the highway is 25 kms. This National Highway 4 is connected to Panvel. Since connecting with central Mumbai is mainly due to highways, the problem of traffic is reduced considerably.

**5. Western Express Highway:** 26 km from Bandra (South Mumbai) to Mira Bhaindar (North Mumbai) It is a long-distance highway expressway. It is further connected to National Highway 8.

**6. Latur-Nanded Highway:** It is a highway connecting two major cities of Latur and Nanded in Marathwada region of Maharashtra. 250km AH highway is connected to the National

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

**IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601** (www.sjifactor.com)

Highway No. 9. The state government is considering constructing a 4-lane highway in Mumbai, Latur.

**7. Mumbai Nashik Highway:** Built on Build Operate and Transfer (BOT) basis, this highway is known as National Highway No.3. 183 kms from Nashik to Mumbai The distance is completed within only 3 hours. The highway passes through Thane, Kalyan via Virkoli, Ghatkopar, Mulund, Dadar

**8. Pune Nashik Expressway:** National Highway No. 50 is a highway connecting Pune and Nashik. 209 km This highway passes through Sinnar, Sangamner, Narayangaon, Khed, Chakan, Bhosari. Because of the large MIDC like Sinnar, Chakan on these highways, due to the removal of a bypass from all the cities, the problem of traffic has reduced considerably.

### Conclusion

As per the States Reorganization scheme of Government of India, the linguistic State of Maharashtra was politically evolved on the 1st May, 1960. The area of Maharashtra State is 3,07,713 Sq. kms. As per the area, it is the third largest state of India after Rajasthan and Madhya Pradesh. The state is about 800 kms from East to West and 700 kms from North to South. As per the census of 2001 the population of Maharashtra was 9.68 crores.

The framework of the physical setting of Maharashtra is simple. The Sahyadri or the Western Ghats, with an average height of 1200 meters runs southwards along the western edge of the Deccan Plateau from near the Tapi mouth and extends much further beyond the southern limits of the state. To have a clear understanding about the system of transport, it is essential to study its origin and evolution and the factors that have contributed to its development from older to present time. The roads in the ancient and medieval times were used both for transport and communication.

### References

- B. Prabhcharan, A. Anuray, V. Rajagopal. "Service quality on Tourism Applications of structural equation modeling". Service quality and Satisfaction Part IV- IIMK Conference on Tourism in and India -challenges Ahead. 15-17 May 2008 IIMK.
- Babakus, Emil and George W. Boiler (1992), "An Empirical Assessment of the SERVQUAL Scale," *Journal of Business Research*, 24, 253-268.
- Bahia, Kamilia and Jacques Nantel (2000), "A Reliable and Valid Measurement Scale for the Perceived Service Quality of Banks," *International Journal of Bank Marketing*, 18/2,84-91.

VOLUME - IX, ISSUE - II - MARCH - AUGUST - 2021

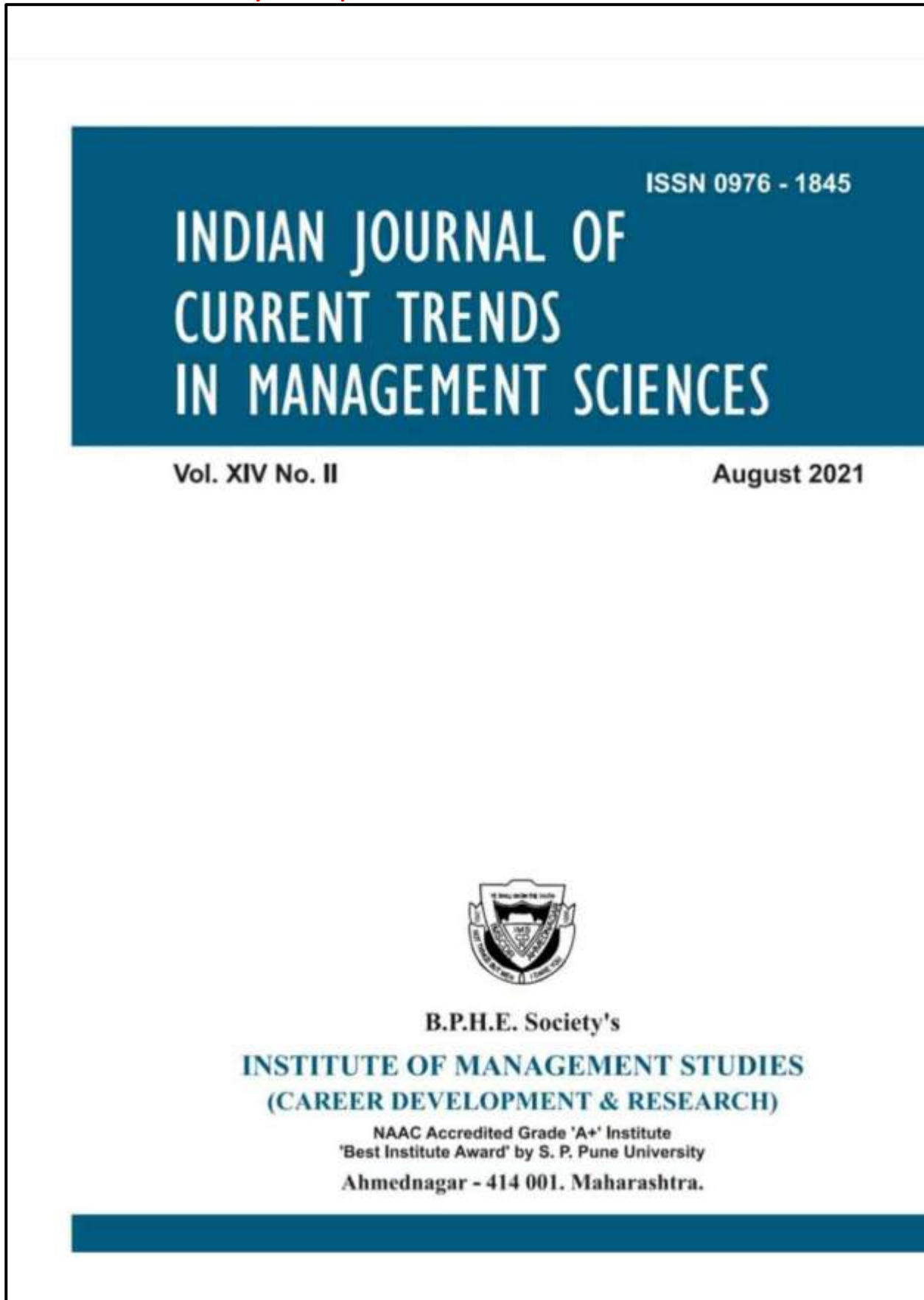
**IDEAL - ISSN - 2319 - 359X - IMPACT FACTOR - 6.601** ([www.sjifactor.com](http://www.sjifactor.com))

---

- Barnes, James G. (2001), *Secrets of Customer Relationship Management: It's All About How You Make Them Feel*, New York, NY: McGraw-Hill.
- Bitner, Mary Jo, and Amy R. Hubbert (1994), "Encounter Satisfaction versus Overall Satisfaction versus Quality," in *Service Quality*, R. Rust and R. Oliver, eds. Thousand Oaks, CA: Sage Publications, 72-94.
- Deshpande, Rohit and Frederick E. Webster, Jr. (1989), "Organizational Culture and Marketing: Defining the Research Agenda," *Journal of Marketing*, 53 (January), 3-15.
- Dabholkar, Pratibha A., Dayle I. Thorpe, and Joseph O. Rentz (1996), "A Measure of Service Quality for Retail Stores: Scale Development and Validation," *Journal of the Academy of Marketing Science*, 24 (1), 3-16.
- Government of India, *Census Report 2011-12*
- Government of India, *Economic Survey, 2015-16, 2017-18*
- [economictimes.indiatimes.com/articleshow /Jan 06, 2009](http://economictimes.indiatimes.com/articleshow /Jan 06, 2009),
- <https://data.gov.in/resources/statistics-road-accidents-india-2013-2016>
- <https://timesofindia.indiatimes.com/archive/year-2017>,



14. A Study of Competitive Wine Tourism Destination in Maharashtra state



	<b>Article</b>	<b>Author</b>	<b>Page No.</b>
10.	Nurturing Learners' Passions And Emotions To Maintain Attention Spans In A Heterogeneous Classroom	Dr. Parag A. Narkhede Prof. Anil Kumar Marthi	76
11.	Management Of Higher Education Using Innovative Teachingbefore And During Covid19 Pandemic N Maharashtra State	Dr. Gajanan P. Mudholkar	81
12.	Agrarian Systems And Agricultural Performance In India: An Overview	Abhishek Prakash	91
13.	An Overview Of Suggestive Recovery Strategies For Travel And Hospitality Brands During And Post Covid -19	Dr. Pronoti V. Telore*	100
14.	A/ B Testing: What, Why, How, And Which Components To Test.	Dr. M. I. Sayyed*	105
15.	A Study Of Competitive Wine Tourism Destination In Maharashtra State	Harish Kalan Dr. Bhushan Dinkar Bhalerao	112

///

INDIAN JOURNAL OF CURRENT TRENDS IN MANAGEMENT SCIENCES  
Vol. XIV. No.II, August 2021

112

## A STUDY OF COMPETITIVE WINE TOURISM DESTINATION IN MAHARASHTRA STATE

Harish Kalan\*, Dr. Bhushan Dinkar Bhalerao \*\*

### I. ABSTRACT:

Special interest tourism is one of the most crucial stages in the evolution of tourism, as it has given the leisure viewpoint a whole new dimension. Wine tourism, a subset of food and beverage tourism, has piqued the interest of travelers seeking unique vacation experiences, including both wine aficionados and novices. Maharashtra is justifiably regarded as India's pioneer in the field of wine tourism and vineyard tourism. Although wine tourism in India is still in its infancy compared to its foreign equivalents, it is emerging as a kind of special interest tourism on a national level. A tourism location must be competitive in order to grow and survive in the long run. Several factors must be considered in order to create a competitive climate in Maharashtra that is suitable to long-term wine tourism growth.. The study evaluates and examines Maharashtra's competitiveness as a wine tourist destination mostly using secondary data. This is important for determining if the destination's growth is in line with global trends. In addition, the study aims to contribute to the literature on wine tourism in India.

**Key words:** Wine, Wine Tourism, Marketing, Competitive Analysis

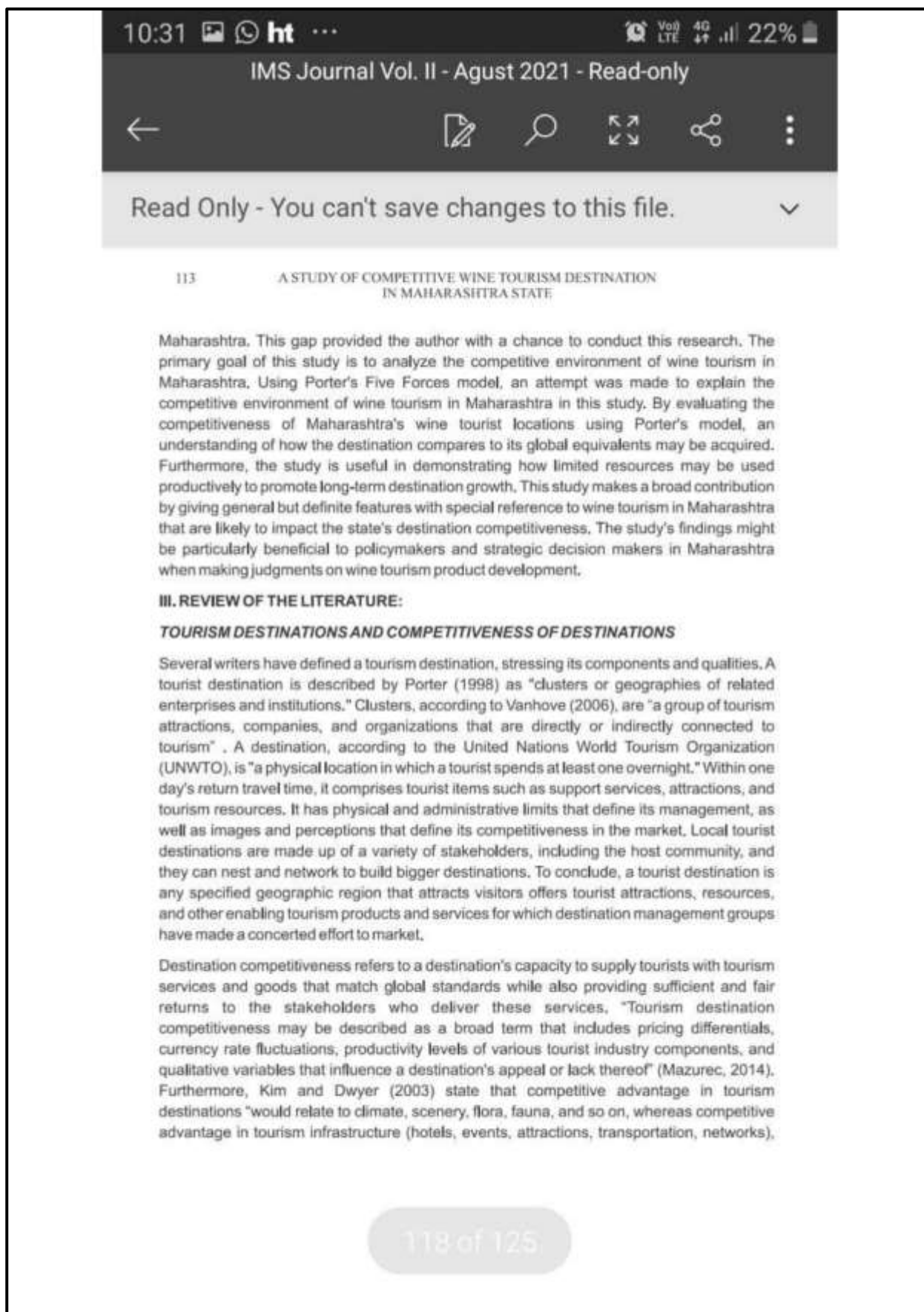
### II. INTRODUCTION

Maharashtra is the pioneer and market leader in India's wine tourism. The state, which has the most vineyards in India, offers a wide range of wine tourism products and services, including vineyard resorts, vineyard restaurants, wine festivals, vineyard-based events, and wine tours that include a variety of vineyard-based activities. Despite the fact that the state's wine tourism sector has not grown at the same rate as its wine industry, wine tourism continues to expand in minor but important ways. The pace of expansion has been modest nearly 16 years after organized wine tourism began in Maharashtra in 2000. Although some larger wineries have successfully delved into and turned wine tourism initiatives into profitable ones, many smaller vineyards have yet to do so. In order to discover chances for long-term growth, it is necessary to review and study the changes in light of the competitive landscape at this point. Despite the fact that, internationally, While there are several research on destination competition, there are few, if any, studies on wine tourism in

---

\* Research Scholar, Bharati Vidyapeeth, Pune. E-mail : harishkalan@gmail.com

\*\* Assistant Professor , New Arts commerce College, Parner. E-mail : bhushanbhalerao11@gmail.com



quality management, worker skills, government policy, and so on." "What makes a tourism destination truly competitive is its ability to increase tourism expenditure, to increasingly attract visitors while providing them with satisfying, memorable experiences, and to do so profitably, while improving the well-being of destination residents and preserving the natural capital of the destination for future generations," according to Crouch and Ritchie (2010). This concept encompasses all aspects of a competitive yet long-term tourist destination.

#### IV. MODELS OF TOURISM COMPETITIVENESS

Over the years, numerous academics have studied the notion of destination competitiveness in tourism. Some researchers looked at specific destinations' competitiveness, such as the United States (Ahmed and Krohn, 1990), South Korea and Australia (Kim et al., 2001; Kim and Dwyer, 2003), and Serbia (Dobrivojevi, 2013), while others looked at specific aspects of destination competitiveness, such as destination positioning, destination management systems (Baker et al., 19), and destination positioning (Chacko, 1998), among others (Hassan, 2000; Mihalic, 2000),

Package tours nature-based tourism (Huybers and Bennett, 2003), strategic management Their model also takes into account national and company competitiveness theories, as well as "the major aspects of destination competitiveness as presented by tourism scholars, as well as many of the variables and category headings described by Crouch and Ritchie.

Wine tourism in Maharashtra, like its parent business, the wine industry, is progressively progressing towards a growth stage in the product lifecycle. Wineries in Maharashtra are gradually realizing the benefits of incorporating wine tourism into their main wine business and are now willing to venture into wine tourism. Nashik region in Maharashtra, which is justifiably known as India's "wine bowl," is a natural home for all of the state's wine tourism activities. Despite the fact that Nashik has emerged as the state's wine tourism centre, with some of the state's most prominent vineyards such as Sula, York, Soma, Zampa-Grover, Vallonne, Reveilo, and Charosa, Pune and Sholapur are also competing with their own wineries, Four Seasons and Fratelli. Other significant districts of Ahmednagar and Sangli have a good chance of becoming wine tourist destinations.

#### V. RESEARCH METHODOLOGY

The goal of this study was to use Porter's Five Forces competitiveness model to explain the competitive environment of wine tourism in Maharashtra. The information utilized to back up the study is secondary in nature. To arrive at an appropriate model that may be used in this study, books, research papers, and articles relating to tourist destinations, destination competitiveness, and sustainability were evaluated. Porter's Five Forces competitiveness model was utilized in this study since it is the most widely used approach in determining a destination's competitiveness. Although Crouch and Ritchie's model is more thorough, given

the fledgling state of wine tourism in Maharashtra, it may be less appropriate for this research.

**Porter's Five Forces:** A set of five forces that shape a market. Four other supporting elements contribute to industrial competition or rivalry. The final outcome is determined by these factors. According to Bruton and Ahlstrom (2008), "Five Forces models are examined from the standpoint of how they are able to restrict industrial profits" for an industry. According to them, if all five factors are weak, the industry is likely to be appealing, with lucrative forms. Furthermore, if all of the pressures are strong, the industry is almost guaranteed to be profitable. They go on to say that even if all of the factors in an industry conspire to create an adverse environment, individual businesses in that industry can nevertheless make above-average profits. "Strategic decision makers can evaluate their opportunities and dangers that exist in the competitive environment" (Dobrivojevi, 2013) of an industry based on the examination of these five elements. The sections and table below detail all five forces affecting the Maharashtra wine tourism sector.

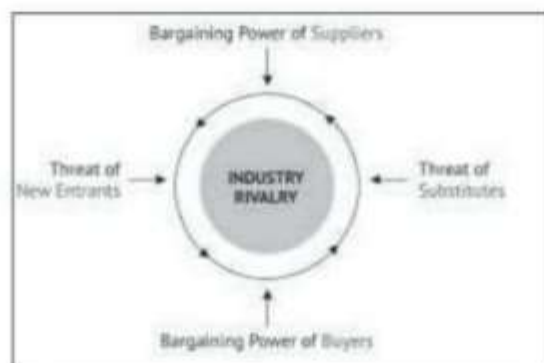


Fig: Porter's Five Forces model for destination competitiveness.

The amount of competition among competitors: "According to Porter, seven factors influence the level of rivalry among businesses in the same sector.

a) When there are many equally balanced competitors b) When demand for an industry's products declines and the company, in order to continue to grow, must win market share from competitors c) When companies use their full capacity due to the elimination of high fixed costs, forcing competitors to cut prices, thus strengthening the rivalry between them d) When there is a lack of product differentiation

e) When capacities are increased on a larger scale, which invariably leads to lower prices and more intense competition. f) Due to differences, it is difficult to predict how competitors will act in a given situation, especially when they are willing to sacrifice profitability in order to achieve a goal with high strategic stakes.

g) When there are significant exit barriers, that is, when businesses are willing to do business with a little profit or even a loss due to specific economic, strategic, and emotional factors" (Dobrivojevi, 2013).

## VI. ANALYSIS AND RESULTS

Michael E. Porter created the five forces model to analyze and evaluate the competitiveness of an industry's environment. Industrial Organization (IO) economics is the foundation of this concept. Porter outlined five competitive forces that define an industry in this model. "These factors influence the level of competition and, as a result, an industry's profitability and attractiveness. The goal of business strategy should be to enhance the position by modifying these competitive forces" (Recklies, 2001). The competitive environment is defined by the degree of competition among rivals in one area of business, entrance obstacles, customer bargaining power, supplier bargaining power, and the threat of alternative products and services, according to Porter's five forces.

Strategic decision makers can identify their opportunities and dangers in the competitive environment of a company" (Dobrivojevi, 2013) or industry at large based on the examination of these five variables. Complementary items are also included in this category. The threat of replacements is determined by reasons similar to the threat of new entrants.

- i) Customers' brand loyalty
- ii) Close customer connections
- iii) Customer switching costs
- iv) The comparable price for alternative performance
- v) Current trends

Many wineries are gradually recognizing the value of wine tourism in promoting their businesses. It is a wonderful marketing tool for connecting with potential customers as well as creating distinctive brand value for the vineyard. As a result of this advantage, several wineries are adding over-night accommodations, in-house restaurants, and wine events to attract tourists from both the local and foreign markets. This upward tendency would undoubtedly pose a threat to current market participants such as Sula, which has a bigger market share in Maharashtra's wine tourism. There is also rivalry from other types of tourism in the state, such as heritage tourism, adventure tourism, beach tourism, and so on, which may compete for tourists' attention.

## VII. CONCLUSION

The major goal of this paper is to examine and analyze the competitiveness of wine tourism in Maharashtra using Porter's Five Forces model. This helps the tourist destination to better understand its position. The industry can clearly understand the possibilities and threats it faces by using this approach to assess its competitive situation. The study's findings are crucial in making important decisions like as investment and expansion in Maharashtra's wine tourism industry the state of wine tourism destination competitiveness in Maharashtra in terms of Porter's Five Forces. Service providers in the wine tourism business benefit from a market environment in which the industry is now monopolized by one or a few service providers. This has created a market situation in which wineries that provide wine tourism products and services are better positioned in terms of pricing than wine tourists. Wine tourism is a particular interest tourism that attracts wine enthusiasts who make purchases depending on their areas of interest. As a result, in the case of wine tourism, the threat of replacement is relatively mild.


## References

- Arora, S. *Beyond Making and Selling Wine*; 2011. [www.indianwineacademy.com](http://www.indianwineacademy.com).
- Bruton, G. D.; Ahlstrom, D. O. (2008) K. Entrepreneurship in Emerging Economies: Where are We Today and Where Should the Research Go in the Future. *Entrepreneurship: Theory and Practice* 32(1), 1–14.
- Crouch, G. I. *Modeling Destination Competitiveness: A Survey and Analysis of the Impact of Competitiveness Attribute*. National Library of Australia Cataloguing in Publication Data. ISBN 9781920965389. 2007.  
[http://www.sustainabletourisonline.com/awms/Upload/Resource/bookshop/Crouch\\_model\\_DestnComp-web.pdf](http://www.sustainabletourisonline.com/awms/Upload/Resource/bookshop/Crouch_model_DestnComp-web.pdf).
- Dobrivojević, G. Analysis of the Competitive Environment of Tourist Destinations Aiming at Attracting FDI by Applying Porter's Five Forces Model. 2013.  
[https://zenodo.org/record/8651/files/1374391677\\_Dobrivojevic\\_342013\\_BJEMT\\_4180.pdf](https://zenodo.org/record/8651/files/1374391677_Dobrivojevic_342013_BJEMT_4180.pdf).
- Gomezelja, D. O. Mihalic, T (2008) Destination Competitiveness—Applying Different Models, the Case of Slovenia. *Elsevier Tourism Management*, 29, 294–307.
- Hande, Dr. Ministry of Agriculture, Maharashtra, Personal Communication, 2013.





## 15. A Comparative Study of Online Shopping in India.

<p>செப்டம்பர் 2021 Vol. 9 No. 3</p>	<p>செப்டம்பர் 2021 July - September 2021 ISSN : 2321-984X</p>
<p><b>Chief Editor</b> Dr. M. Sadik Batcha</p> <p><b>Advisory Editor</b> Dr. N. Chandra Segaran</p> <p><b>Editorial Board</b> Dr. MAM, Rameez Dr. Jeyaraman Dr. A. Ekambaram Dr. G. Stephen Dr. S. Chitra Dr. S. Senthamizh Paval Dr. Aranga. Pari Dr. A. Shunmughom Pillai Dr. P. Jeyakrishnan Dr. S. Easwaran Dr. Kumara Selva Dr. A. Palanisamy Dr. Ganesan Ambedkar Dr. Kumar Dr. S. Kalpana Dr. T. Vishnukumaran Dr. M. N. Rajesh Dr. M. Ramakrishnan Dr. Govindaraj Dr. Uma Devi Dr. Senthil Prakash Dr. M. Arunachalam Dr. S. Vignesh Ananth Dr. Pon. Kathiresan Dr. S. Bharathi Prakash</p>	<p><b>நவீனத் தமிழாய்வு</b> (தமிழ்நாட்டுக் கல்வியியல் ஆய்விதழ்)</p> <p><i>Journal of</i> <b>Modern Thamizh Research</b> (A Quarterly International Journal) Arts and Humanities (all), Language and Literary Theory, Tamil UGC Care Listed (Group-I) Journal</p> <p></p> <p><i>Published by</i> <b>RAJA PUBLICATIONS</b> No. 10 (Upstair), Ibrahim Nagar, Khajamalai, Tiruchirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241 Website : <a href="http://www.rajapublications.com">www.rajapublications.com</a></p> <p><b>29 பகுதி-2</b> <b>Part -2</b></p>

சென்னை - 600 033		ஆகஸ்ட்-செப்டம்பர் 2022	ISSN : 2321 - 984X
Vol. 9 No. 3		July - September 2021	
21. ச. பத்மசேகரன்	சமூகத்தில் அமைதியின் தீமை		369-372
22. VIKAS VILAS BARGE	OH PRATAPSIH MAHARAJ (THORALE) NAGARVACHANALAY, SATARA: A CASE STUDY		373-379
23. இல. மாலாஜி	பாடக இடைவெளியில் நேரணிக் குழுவிற்குப் பயிற்சி		380-387
24. C. BALAJI & G. MAHALAKSHMI	EFFECT OF CORE BOARD TRAINING ON SELECTED PERFORMANCE VARIABLES AMONG INTER-COLLEGIATE MALE HOCKEY PLAYERS		388-396
25. சி. சண்முகவேலு	தமிழ் இடைக்கலத்தில் இனமீகின் பங்கு		397-401
26. JOBY M ABRAHAM & F. X. LOVELINAUTLEFLOWER	INTERNAL MIGRATION AND HEALTH: A REVIEW ON HEALTH CHALLENGES OF INTERNAL MIGRANT LABOURERS IN INDIA		402-412
27. ஜோ. ஜெகதீசன் & பி. சித்ரன்முகேசன்	சேஷ்டாண்டி சமூகத்தின் "செந்தாமலை குழந்தைகள்" உருவம்		416-421
28. POOJA PRASHANT NARWADKAR	PUBLIC PERCEPTION OF DOMESTIC VIOLENCE AND BEHAVIOURAL CHANGE: A CHALLENGE		422-429
29. செ. மய்யாசுனி சந்திர & மு. சிவசுப்பிரமணியன்	தற்காலத் தமிழ் தலைநகர் கவிதைகளின் காலப்பெரும் பின் தலைநகர் ஆகும்		430-437
30. SAMHAJI M. KALE & SURESH B. SHINDE	HUMAN RIGHTS AND HEALTH POLICY		438-441
31. சி. தங்கவேலு & பி. சித்ரன்முகேசன்	பாடகரின் தனிப்பட்ட முயற்சிகள் பாடகரின் தொழில்		444-448
32. FEHMIVA FARVEEN & N. SHANMUGAVADIVU	A STUDY ON MENTAL HEALTH STATUS OF ADOLESCENT CHILDREN OF ALCOHOLICS		449-456
33. ஜி. ஜெயசிங்கம்	அகாலியாசனம் பாடகர் - அகாலி கவிதை குழுவின்		457-467
34. SELEENA M & T. LYSAMMAL	HISTORICAL BACKGROUND OF KULASHEPARAM IN KANYAKUMARI DISTRICT		468-474
35. டி. ஜெயசிங்கம்	சி. தொண்டர் அமைப்புகளின் விருப்பங்கள்		475-479
36. ATHOHPAL MARCONI SINGH	REVISITING STUDENT ACTIVISM IN GLOBAL PERSPECTIVE		480-494
37. பி. சிவசுப்பிரமணியன்	தமிழ் இடைக்கலங்களில் சென்னைக்குள் திரைப்படங்கள்		495-505
38. GULDASAD KIRAN DHONDIRAM	USERS SATISFACTION ON LIBRARY RESOURCES AND SERVICES BY STUDENTS OF DADAPATIL RAJALE COLLEGE ADINATH NAGAR: A STUDY		506-510
39. டி. சந்திரன் & சி. ஜெயசுந்தர்	சமூகத்தின் மீதான "செந்தாமலை குழந்தைகள்" தலைநகர் பாடகரின் தீமை		511-513
40. S. PRITHVIMUTHU	ART AND ARCHITECTURAL FEATURES OF BRIANDAL TEMPLE SRIVILLIPUTHUR		516-521
41. O. BAGYA & R. ANANDARASU	CONSTRUCTION AND STANDARDISATION OF 'QUESTIONNAIRE TO STUDY THE ENGLISH LANGUAGE TEXTBOOKS (QSELT)'		522-526
42. THOTAPALLY PRASAD	YOUTH EMPOWERMENT IN INDIA: STATE AND VOLUNTARY INITIATIVES		527-532
43. ALFONMARE SHIVAKUMAR & INDIRA VIJAYSIMHA	FACTORS INFLUENCING ACADEMIC ACHIEVEMENT OF SLUM AND NON-SLUM CHILDREN		533-544
44. M. EVANGELIN & V. SUNDARARAMAN	A CONTENT STUDY OF HEALTH-RELATED VIDEOS ON YOUTUBE		545-549
45. DANGE V. B.	PROFILE OF MANUDEVU FAIR IN YAWAL TAHSIL OF JALGAON DISTRICT - GEOGRAPHICAL ANALYSIS		550-556
46. ARUN MAHADEO RAKH	GLOBALIZATION AND DEVELOPMENT IN PARTICIPATORY DEMOCRACY AND INCLUSIVE GOVERNANCE		557-564
47. LAKSHMI S NAIR	'REYNO DA PIMENTA': LOCATING THE HISTORY OF VADAKKUMKOOR		565-574
48. MRIDUL DEKA	WATERCRAFTS OF MEDIEVAL ASSAM		575-580
49. SANJAY D RAIBOLE	IMPACT OF STUDENT'S LIBRARY EXPERIENCE ON THEIR ACADEMIC PERFORMANCE DURING COVID-19 PANDEMIC		581-589
50. YUVARAJ M. WAGHERE	A COMPARATIVE STUDY OF ONLINE SHOPPING IN INDIA		589-594
51. SABALE SHASHIKANT GOKUL LAUNI M.	TRIBAL REVOLUTIONARIES IN NASHIK DISTRICT		595-603
52. P. C. GANGURDE	TRANSGENDER HISTORY - DECONSTRUCTING THE GENDER SPECTRUM		606-614
53. MANU T & HASSAN J. & A. K. AMPOTTI	IMPACT OF NET IRRIGATED AREA ON THE GROWTH, SIZE AND SPATIAL DISTRIBUTION OF RURAL SETTLEMENTS IN NASHIK DISTRICT		615-621
54. R. KARTHIKEYAN	SUB-COMMUNITIES AMONG MUSLIMS: ETHNOGRAPHIC ACCOUNT OF KERALA		622-629
55. SACHIN VAIDYA	TRANSFORMING OUR WORLD, THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT AND ITS IMPLEMENTATION IN INDIA: WITH SPECIAL REFERENCE TO PERSONS WITH VISUAL DISABILITY		630-643
56. S. R. ARUMAI SAMASRANA & P. AMUTHALAKSHMI	RETRACTIONS IN ACADEMIC PUBLISHING: A REVIEW		646-655
57. M. GOPI & PSATHISKUMAR	BUSINESS AND HUMAN RIGHTS: THE CASTE LENS		656-663
58. M. KARUPPAIAH & M. SURESH KUMAR	EFFECTS OF AEROBIC AND CIRCUIT TRAINING ON FLEXIBILITY AND ANXIETY AMONG FOOTBALL PLAYERS		664-673
59. ASHOK LAXMAN PATHADE	EXAMINATION OF THE CHANGES ON SELECTED PERFORMANCE PARAMETERS IN RESPONSE TO CIRCUIT TRAINING AMONG KABADDI PLAYERS		674-680
60. RAMAKANT AMAR	PLAGIARISM AND COPYRIGHT: ISSUE		681-688
61. NAVDHARE & YOGESH PAREKH	DESIGN AND DEVELOPMENT OF INSTITUTIONAL DIGITAL REPOSITORY WITH DSPACE OPEN SOURCE SOFTWARE: A CASE STUDY		689-692
62. M. BALASUBRAMANIAN & V. DEEPTHI	THE CONDITION OF EDUCATION IN TIRUHELVELI DISTRICT SINCE INDEPENDENCE - A STUDY		694-700
63. S. SANJEEV & R. SELVARAJU	KALAKADU SATHYAVAGESWARAR TEMPLE - A HISTORICAL STUDY		701-707
64. A. MARIADRISAT ELSEEN	GLIMPSES OF KAYATHAR		708-714
65. R. BERSIA LOYISAL & A. THEEBA	LEGACY OF ROMAN CATHOLIC MISSIONARIES TO THE DEVELOPMENT OF EDUCATION IN THOOTHUKUDI		715-720
66. இல. சிவசுப்பிரமணியன்	சாதி சூழ்நிலை		721-724
67. சி. சிவசுப்பிரமணியன்	மாநகர் கவிதை குழுவின்		725-728
68. சி. சிவசுப்பிரமணியன்	தொண்டர் அமைப்புகளின் விருப்பங்கள்		729-734
69. சி. சிவசுப்பிரமணியன்	தமிழ் இடைக்கலங்களில் சென்னைக்குள் திரைப்படங்கள்		735-740
70. சி. சிவசுப்பிரமணியன்	சென்னைக்குள் திரைப்படங்கள்		741-746

Published by : Raja Publications, No. 10, Upstar, Ibrahim Nagar, Khajamalai, Tiruchirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241  
 Printed : The Printing House, Tiruchirappalli - 620 023, Tamil Nadu, India. Ph : +91 - 431-2420121

**A COMPARATIVE STUDY OF ONLINE SHOPPING IN INDIA**

**Dr. YUVARAJ M. WAGHERE**

H.O.D. and Assistant Professor in Commerce  
New Arts, Commerce and Science College, Parner Dist- Ahmednagar (MS), India.

**Abstract:**

India is a market where there are huge opportunities for trade. Many foreign traders have come to India for trade purposes since ancient times. There will be very few countries that have not traded in India. In the year 1991, Finance Minister of India Dr. Manmohan Singh opened the Indian market to the whole world. After that, a struggle against foreigners started in India. It is happening same these days. Consumers are attracted with a variety of discounts for the actual purchase of goods and services. Later on, home delivery service was started to the customers. From this concept of online shopping emerged and it took root. Today, along with urban consumers, people in rural areas are also taking the help of online shopping to enjoy goods and services. In a developing country like India, the concept of online shopping can be said to have started in 1995, but it is popular in the year of 1999-2000. After that today many online shopping stores like Amazon, Flipkart, Snapdeal, Jiomart, Ajio, Pepperfry.com, Shopclues, Croma, Firstcry, Homeshop18, Tatacliq, Paytmall, Lengkart, Nikaa are available in India. Since the majority of the people in India live in rural areas, the impact of online shopping has not yet spread across the country, but the concept of digital India has taking lead to a lot of online transactions in the country and then an innovative and fast way to buy and sell. Due to the global pandemic situation, Covid 19 in India in the year of 2020, people realized the importance of online shopping and then the concept began to spread widely in all countries.

This research is based on how online shopping has taken root in India and its impact on traditional practices. The research tries to present the history of online shopping in case of emergency, its advantages and disadvantages, as well as the problems.

**Keywords:**

Online shopping, Consumers, Electronic, India, Internet, Payment, Retailing, Society, Covid 19, CoD.

**Introduction:**

The Internet was first introduced globally in 1960 and then in 1986 for the first time in India. But it was not used as much as it should have been and the number of people using it was too small that count on finger. Videsh Samachar Nigam Limited is the first company to provide internet facility. The company is now known as Tata Teleservices Ltd and is one of the leading companies in the Tata group. Initially online shopping was more prevalent in the retail sector but gradually it increased in various fields like information technology, education, automotive, banking, transportation, insurance, and today we can avail amenities in almost all sectors through online.

Looking back over the last 10 years, between 2014 and 2024, online transactions have grown significantly from 1336 billion to 6388 billion. Apart from this, we see that various opportunities like business, job, employment have also been created due to online. So in the future, we will be able to avail all kinds of facilities through online

ಪೂರ್ಣ ಪರಿಷ್ಕರಣೆ (ಕೂಡಾ ಸಂಪನ್ಮೂಲಗಳನ್ನು ಸೇರಿಸಿ) ಅಧಿಕಾರವು ಸಂಪನ್ಮೂಲಗಳನ್ನು 9, ಸೆಪ್ಟೆಂಬರ್ 2021 0291-2321-0000  
Journal of Modern Turkish Research (A Quarterly International Arts and Humanities, Language) Vol.3, July - September 2021 0291-2321-0000

and it is safe to say that you will not have to go to the market to shop for it.

**Objectives of Study:**

- 1) To study the history of online shopping in worldwide
- 2) To study the evolution of online shopping in India
- 3) To study the fastest growth of online in India.

**Research Methodology:**

The research study is totally base on secondary data. The secondary data is collected specially reports of RBI and various websites including the official website of online shopping companies. The data already available may be inform of Research publication, Newspapers, Articles, periodicals, Government records, etc. are also use for the research purpose.

The table below shows which companies in e-commerce started their online business.

**Table No. 01**  
**Year wise Data of Worldwide e-Commerce**

1969	CompuServe Technology	Utilizing a dial-up connection
1979	electronic shopping	Connecting a modified TV via telephone line
1982	Boston Computer	Online marketing in use computer
1992	Book Stacks Unlimited	Online bookstore
1994	Netscape Navigator	Web browser
1995	Amazon	Ecommerce platform for books
1998	PayPal	Money transfer tool
1999	Alibaba	Online marketplace
2000	Google AdWords	Advertising tool
2004	Shopify	Online snowboarding equipment shop
2005	Amazon	Free two-day shipping for a flat annual fee
2005	Etsy	24/7 buying audience
2011	Google Wallet	Linking the digital wallet to a debit card or bank account
2011	Stripe	Payment processing company
2014	Apple	Mobile payment method
2017	Shoppable Instagram	Online shopping method

ಪ್ರಥಮ ಪರಿಚಯ (ಮೊಟ್ಟಮೊದಲನೇ ಬಾರಿಗೆ) ವಿದೇಶೀ ಅಧ್ಯಯನಗಳ ಸಂಶೋಧನೆ ಮತ್ತು ಅಭಿವೃದ್ಧಿ ಸಂಸ್ಥೆ 9, ನವೆಂಬರ್-ಡಿಸೆಂಬರ್ 2021 ISSN 2221-060X  
Journal of Modern Therich Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN 2221-060X

**Evolution of Online Shopping in India:**

Considering e-shopping in India, today in the last 2014 year, 54.4 million Indians were doing online shopping, which has increased to 3029.1 million after 10 years. Five friends from South India came together and started India Plaza.com business in June 1999. They started selling CDs through this business. Later They started selling books, watches, movie CDs., In the year of 2002 boys started offline store for this business. Since then many companies like eBay to filpkart have ventured into this online shopping business and are doing their business successfully today. Well-

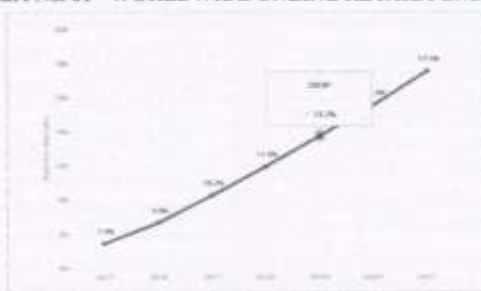
known companies like Tata, Ambani, Adani, Aditya Birla Infosys have also entered the online business. Companies like ola, uber zomato have shown that online business does not have to have huge capital. We can buy big items like electronics at home along with retail shopping today. Given the influx of online companies in India, Indian companies are also competing with foreign companies. So there will be a huge increase in online shopping business in the coming period.

The following table gives a brief overview of how companies started online business in India.

**Table No. 01**  
**Year wise Data of Online Shopping in India**

1999	Indian Plaza.Com	Online Departmental Store
2004	e-Bay	Retail Marketing an Shopping
2006	Myntra	Online Purchasing
2007	Filpkart	Online Purchasing
2010	Filpkart	CoD Online Shopping
2010	Myntra	Fashion and Life Style
2010	Snapdeal	Online Shopping (Incl. Fashion and Life Style)
2012	Flipkart	Online Payment mode Through Debit and Credit Card
2012	Jabong	Online Shopping (Incl. Fashion and Life Style)
2012	Amazon	Started Juglee.com (Started CoD)
2012	Filpkart and Jabong	Started Third party payment
2014	Filpkart	Takeover Myntra
2015 onwards	Jiomart, Ajo, Pepperfry.com, Shopclues, Croma, Firstcry, Homeshop18, Tatacliq, Paytm mall, Lengkart, Nika etc.	

**Chart No. 01 - WORLDWIDE ONLINE RETAIL PENDING**



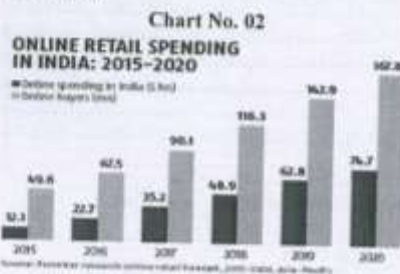
മിഷൻ പ്രസിദ്ധീകരിച്ച അന്താരാഷ്ട്ര പരിശോധന. വാണിജ്യ പരമ്പരയിൽ അന്താരാഷ്ട്ര പ്രസിദ്ധീകരണത്തിന് 9. 2021-2022. ISSN: 2321-894X  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN:2321-894X

Dr. YUVARAJ M. WAGHERE

592

The above chart shows the increase in online shopping globally from the year 2015 to 2021. If we consider this information, we can see that it has been steadily increasing from 2015 to 2021. This seems to be the same as it seems every year.

Due to the impact of Covid 19 in the year 2019, this increase should have been higher in the next year 2020 and 2021, but it does not look higher growth due to home quarantine. Originally, due to lockdown, everyone had to stay at home, so the consumption of goods and services should have increased through online, but since we have seen a good amount of online shopping in foreign countries, Covid 19 does not seem to have any effect on it.



Source: E-commerce in India - PHIRAPO

Retail sales in India are given in Chart No. 02. Looking at the growth from 2015 to 2020, it is clear that the growth between 2019 and 2020 is well visible. Looking at 2015, the difference between spending and buyers is not as great as it was between 2019 and 2020.

In other words, the proportion of shoppers in India and online shopping seems to have increased significantly during year of 2019 to 2020. This means that during the pandemic situation of Covid 19, many people in India prefer online shopping.

**Barriers to online shopping:**

There are lot of issue affected on online shopping India, some of important barriers to online shopping are given below.

**1) Internet facilities:** Internet facilities were introduced in the United States in 1952 and in India in 1995. In other words, internet facility was provided after a gap of 43 years. Today, 4G network is used in India, while 7G is being tested in countries like Japan.

**Fast service:** We have to admit that people in India are very careless in providing services. Fast service is not provided to the customers while making the actual purchase, so it usually takes 5 to 7 days for giving delivery of online shopping product. The business community gives first preference to provide fast services in developed countries.

**2) Inferior goods:**

Consumers' credibility is maintained only when they are provided the right quality of goods and services. The downside of online shopping is that you buy the item without touching it, so you can't guarantee that you have bought the right quality item until the item is not in your hand.

**3) Mental distress:**

Once we buy the product, but several questions comes in our mind, the item is good? is its price right? does it have a guarantee?. Many type of such questions arise later. In addition, some items will not be replaced, so many doubts come to mind regarding the items to be purchase online.

**4) Returning items:**

Another important challenge for online shopping is returning items. The item can be returned but it takes time and the money paid is not as simple. If the item is returned, it will take

മലയാള ഭാഷയിൽ (അല്ലെങ്കിൽ മറ്റ് ഭാഷകളിൽ) രചിച്ചിട്ടുള്ള പഠനങ്ങൾ പ്രസിദ്ധീകരിക്കുന്നതിനുള്ള മാസിക. 2021 ISSN 2321-984X  
Journal of Modern Thanzh Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN 2321-984X

at least 7 working days to return the money. If the payment is made online, the money is credited to your bank account, but if it is purchase by COD, you have to inform your bank details to get the money back.

**5) Issue of Fraud Payment:**

Nowadays, debit cards, credit cards, shopping cards etc. are used to purchase all consumer goods and services. Are using. This allows you to get the item home and get it without you. But if there are any mistakes while making this online payment, you have to face a loss. Sometimes payment is made but the seller does not get it. In such a case you have to inform the bank. On the other hand many frauds are done through internet the money can be stolen from your bank by taking your information. Therefore, you have to take this risk while making online payment.

**6) Issue of Fixture and Fitting:**

Fixture and Fitting is another important issue when shopping online. Items like electronics, furniture have to be fitted in those houses after purchase. For this you need the help of another service provider.

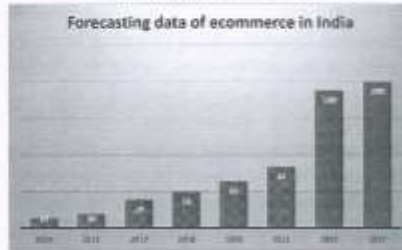
On the other hand, clothes have to be bought according to your size, but the fitting size of each company is different. So most of the time your size and the size of the company do not match. In that case you have to change the size again and if not then you have to cancel the order.

**7) Problem of Substitutions:**

Many time we order the product by checking its brand, features, uses, durability, but the seller send us the substitution due to unavailability of the product. Same thing happens in the replacement of the product. The dealer gives substitution if we request change for size, quality of the original product.

**Forecasting of ecommerce in India:**

**Chart No. 03**



Source: India: e-commerce market size 2020 | Statista

The above chart given growth of e-commerce size from year 2014 to 2027. The data has been given in the value of US Dollar (in billion). In India ecommerce trading has been done up to 14 billion US dollar in the year of 2014 after that, it has been continuously increasing. In the year of 2021 the growth rate is 7 time multiple as compare to the year 2014.

Indian people are aware about online shopping due to digital India concept introduce by central government. Actual impact of e-commerce effectively started from 2021 due to facing the pandemic situation. Another important factors are better internet connectively, high use of mobile are also gives strong support for the purchasing power of the online shopping. While considering the given factors, in the year of 2027 ecommerce trading can be increase up to 188 billion us dollar.

**Conclusion:**

It is true that people in India still place more importance on going to the market and buying and this will probably continue for the next few years. The main reason may be that they do not have proper knowledge about online shopping or lack the system to buy and sell online, illiteracy of

தமிழ் நவீனவியல் (தமிழ் மனநிலை, மனநிலை ஆய்வுகள்) ஆய்விதழ் 9, 2021, பக்கம் 593-600 | 2021 | ISSN: 2221-994X  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 | ISSN: 2221-994X

Dr. YUVARAJ M. WAGHERE

594

online shopping, lack of knowledge of payment methods, risk taking, low income.

On the other hand, the growing trend of consumers towards online shopping is also a significant factor. Therefore, in the near future, all transactions in a large market like India will be online, which will definitely have a positive effect on online shopping. Due to the highly sensitive effect of Covid 19, it is becoming common among the people of India that we can enjoy goods and services through online at home. Therefore, online buying and selling will increase significantly in the future.


**References:**

- 70 Best Online Shopping Sites in India - A List For 2021 (grabon.in)
- <https://www.livemint.com/Opinion/gzWbpGZVD83W3iq3uOLD7O>
- Online shoppers in India 2020 | Statista
- Online shopping - Wikipedia
- maharashtratimes.com
- The Evolution of Indian Shopping - from Markets to Online | Indian Fashion Blog (strandofsilk.com)
- Online Shopping, ecommerce, and Internet Statistics (2021) (webhostingsecretrevealed.net)
- E-commerce in India - PHIRAPO
- <https://www.proschoolonline.com/blog>
- [www.census.gov/retail/mrts/www/data/pdf/ec\\_current.pdf](http://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf)
- [en.wikipedia.org/wiki/E-commerce\\_in\\_India](http://en.wikipedia.org/wiki/E-commerce_in_India)
- [www.researchgate.net/publication/329238151\\_E-Commerce\\_in\\_India\\_Evolution\\_and\\_Growth](http://www.researchgate.net/publication/329238151_E-Commerce_in_India_Evolution_and_Growth)

- [www.shiprocket.in/mr/](http://www.shiprocket.in/mr/)  
[/ब्लॉग/ईकोमर्स-इतिहासाची-उत्क्रांती-टाइमलाइन/](http://ब्लॉग/ईकोमर्स-इतिहासाची-उत्क्रांती-टाइमलाइन/)
- Value e-commerce in India to touch USD 40 bn by 2030: Report - The Economic Times (indiatimes.com)
- What's stopping India from achieving the growth it wants | India Development Review (idronline.org)



## 16. New Trends in academic Libraries



**WESLEYAN JOURNAL OF RESEARCH**  
(UGC Care Journal)

**LOA** Date:-4/09/2021  
Ref: WJR/NRE/21/132

Dear authors,

It's my pleasure to inform that, after initial screening, the paper has been found suitable for possible publication in Wesleyan Journal of Research\* (ISSN: 0975-1386).

Article details are provided below:

Sl. No.	Title of the paper	Author Details
1.	<b>New Trends in Academic Libraries</b>	Bhausahab B. Shelke

Expected publication time: 05 to 08 days

**Mandatory Terms & conditions:**

- (i) Corresponding author should verify complete journal credentials & already published copy we are receiving from partner agency.
- (ii) Authors need to proofread article during publication process. Post publication any rectification will be considered as per agency policy.
- (iii) Authors need to maintain standard plagiarism policy suitable for academic documents.
- (iv) Corresponding author will bear complete responsibility on behalf of all authors.
- (v) After satisfying all requirements author can process for publication with us.

\*Authors need to verify journal credentials from his/ her side

Regards



**Editor in Chief**  
Wesleyan Journal of Research  
ISSN : 0975-1386

9.	S. L. Kadam <sup>1</sup> , M. A. Yewale <sup>2</sup> , R. B. Kharade <sup>3</sup> , R. B. Bhise <sup>4</sup>	Solid Plastic –Polymer Electrolyte for Rechargeable Lithium Ion Battery	<a href="mailto:mr.sukadeo@rediffm">mr.sukadeo@rediffm</a>
10.	Bhauasaheb B. Shelke	New Trends in Academic Libraries	<a href="mailto:bhauasaheb1shelke@">bhauasaheb1shelke@</a>

Date: 13/08/2021

Place: Parner

Convener

IQAC Coordinator

International Symposium NTST 2021

## New Trends in Academic Libraries

**Dr. Bhausaheb B. Shelke**  
**Librarian**  
New Arts Commerce and Science College,  
Parner, Dist.Ahmednagar  
E-Mail: [bhausabeb1shelke@gmail.com](mailto:bhausabeb1shelke@gmail.com) (9421331827)

---

### **Abstract:**

2021 was a very exciting year for library profession. We have seen many changes in our daily changes of library work. Now days we are living in an era of great technology and todays academic libraries have adopted modern forms of library techniques. Due to the literature explosion, the groups of library users have faced problems in identifying the appropriate Literature. Now it is possible because all the information resources are now available in digitized form. Multiple users can use same information at a time and it will save the prestigious time of user. This paper reflects the changing trends in Academic Libraries in Digital Environment.

**Keywords:** Recent Trends in Library Science, Academic Library.

---

### **Introduction:**

Change has been continual and far reaching in libraries, since the last 1980. The role of reference librarian in academic libraries have reflected this change, automation of information systems has been the driving force behind transformations both in the library environment and in reference service practices. The librarian must provide best practices to his user by adopting new trends of library science. Today traditional librarianship scenario is completely changed.

The ICT has made a major impact the acquisition of book to the dissemination of information. The advancement of ICT has made a major influence in the global information society, hand held smart phone. Information Communication Technology devices are pervasive in every walk of life throughout the world, in all countries and at all levels of societies Now, it has become very important to develop necessary Professional skill in order to harness these challenges.

**Best Practice:**

The concept of the best practice is not new to the libraries, the Five Law of Library science endowed with the philosophy of best practice and the catalogue code for instance may be considered as one of areas of best practices in Library and information Science. Though Best Practices, its tools like Benchmarking are more commonly employed in other areas and information science in one of them. The academic libraries in the country are on the threshold of facing big challenges more changes are due to globalization and liberalization trends in higher and professional education.

**Recent trends in LIS**

- |                                       |                               |
|---------------------------------------|-------------------------------|
| * Computer Technology                 | * Library 3.0                 |
| * Web 3.0                             | * Digital Library             |
| * E books & E-journals (e-collection) | * Web-OPAC                    |
| * M-OPAC                              | * Computerization             |
| * Software                            | * Smartcard                   |
| * Books Reader                        | * Scanning                    |
| * e-mail/SMS/WhatsApp                 | * Use Audio Visual material   |
| * Online purchasing                   | * Use mobile learning         |
| * Wi-Fi Technology                    | * RFID Technology             |
| * Social Networking                   | * e-Learning/ mobile learning |
| * QR code                             | * e clipping                  |
| * Kindle                              | * Eco. Alexa                  |

**Through this technology Librarian to optimize the use of ICT for user satisfaction**

1. To find capture, store, use & share or distribute the information.
2. To introduce & provide new service.
3. To utilize an update the staff for proving better information service.
4. To encourage networking and resource sharing at local level.
5. To have access a number of national & International e-journals.
6. To digitize the rare document
7. To support & improve the efficiency of Libraries
8. To access union catalogues
9. Find changing role of user & fulfill their needs with ICT.

**Need to Change the Role of Librarianship:**

Academic libraries are going through constant changing phases since last few decades due to adaptations of different management techniques and technology applications for providing better services to users with fast pace. The change is necessary to meet out with the users demand in available financial resources. The demand for change in academic libraries has been driven by three seemingly interrelated factors: the increasing use of electronic resources available outside the library, the decline use of print materials, need have pinpointed information Academic library users rely on electronic resources more and more the use of libraries, resulting in less use of the physical library. Because the electronic availability of resources like journals, books, theses, reports, databases etc. are the only which will be increased in digital era, and fear that at some point of time patrons may never have to enter academic libraries to make use of physical collections and becomes archives in nature, challenging and have to adjust with the change.

**Changing Role and Activities of Academic Librarians:**

- 1. Embedded Librarian:-**Embedded librarianship focuses on the client users. It Bring the library and the librarian to users in their work environment wherever they are office, laboratory or home.
- 2. Grant Development Librarian:** many different grants are available from public and private agencies at the national, state and local level. Librarians have the opportunity to become resources for information about available grants and can use their expertise in the grant writing process.
- 3. Systematic review Librarian:** A systematic review is a summary of literature that assesses and evaluates studies on particular issues. Recently a systematic review Librarian Position opens at the United States, Dept. Of Agriculture Centre. This position documents that the activity is needed and can constitute a fulltime role.
- 4. Emerging Technologies Librarian:-** The new role called Emerging Technologies Librarian focuses on the methods that libraries can use to deliver services and information with new technologies. In these roles the librarian design, develop & manage their library website. They integrate new library web applications, social media and mobile interface to support the ability to access information.

**Changing Trend in Librarianship in Digital Environment:**

Traditional librarianship is all about sitting down in the midst of books and expecting people to come and read. If they do not come then the librarian closes at the end of the day. This is the daily routine. But a modern era Librarian in the digital environment must be sound in the storage, retrieval and dissemination of information with the aid of information Communication Technology (ICT). This may be through Computer, Internet, E-mail, CD-ROM, Slides, Teaching Aids, Telephones, Including the global system of mobile telecommunications (GSM), fax machines, etc. Archival materials could be stored on CD-ROMs for easy retrieval and dissemination to prospective users. Librarians can now conveniently store archival materials on CD-ROMs. They are highly compatible with most computers; this means vital information can be preserved and retrieved easily when needed.

The modern trend is for role of the Librarian to move from that of a passive intermediary role responsible for guiding patrons to appropriate information resources, towards that of a much more proactive professional role which includes analyzing and repackaging information.

**Conclusion:**

Dynamic changes are come in academic libraries. They have adopted modern technique, tools and services in every operation of library such as information storage, retrieval and other such in housekeeping routines as acquisition, cataloguing, and serial control. Implication of these is that libraries now provide their users with much better and more efficient information services through the use of information technology. And the crush of this paper is that academic libraries are now fully modernized and user oriented.

To keep pace with the fact changing modern time the college librarian need reorganization the application of computers information retrieval is catching rapidly. The problem associated with computerization should be identified objective defined in view of the resources and needs. A well-organized information system, need to be provide to academic communities. In this way the recourses of Libraries will be used in an effective way. It will also be helpful in resource sharing & networking project like INFLIBNET. In this manner college libraries may be in a position effective teaching learning information support to college in future.

**References:**

- 1) Singh, D.K. Mohammad Nazim International CALIBER-2008.Impact of Information Technology and Role of Libraries in the Age of Information and Knowledge Societies.
- 2) Maitrayee Ghosh, P.K.Kelkar, Library, IIT Kanpur India (2002), Indian Academic library consortia (LALC): A proposal for electronic resource sharing, , pp4.
- 3) Dr.Harish Kumar Sahu, Asst. Professor Dept. Library & Information Science, Pt. Ravishankar Shukla University Role of Digital Library in the changing World of Education; Raipur (C.G.)
- 4) Debal C. Kar, Parha Bhattacharya and Subrata Deb., Library Networking in India for Resources Sharing: Present Status and Prospects Librarian National Institute of Technology, Vision and the Changing Roles of the Future Academic Library Professional in the E-Learning Environment: Challengers and Issues; Thamaraiselvi, Tiruchirappalli, Tamil Nadu, India. PP5.
- 5) Kumar, P.S.G, (2002) A Student manual of Library and information science. Delhi, B.R Publishing
- 6) Krishnan, Gopal., (2005), Digital Libraries in electronic information era, Dehli, Author press
- 7) Phadake, D.N, Computerizes Library and modernization, universal publication, Pune

.....

**17. Solid Plastic - Polymer Electrolyte for Rechargeable Lithium Ion Battery***Wesleyan Journal of Research*, Vol.14 No.25 (September 2021)ISSN – 0975-1386  
Research article: (Physics)**SOLID PLASTIC –POLYMER ELECTROLYTE FOR RECHARGEABLE LITHIUM ION BATTERY****S. L. Kadam**PG Department of Physics, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Maharashtra  
– 414 302, mr.sukadeo@rediffmail.com**R. B. Kharade**PG Department of Physics, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Maharashtra  
– 414 302**M. A. Yewale**

Department of Electrical and Biological Physics, Kwangwoon University, Seoul 01897, Republic of Korea

**R. B. Bhise**PG Department of Physics, Hon. Balasaheb Jadhav Arts, Commerce and Science College, Ale, Tal.Junnar, Dist.  
Pune, Maharashtra - 412 411

**Abstract:** Electrolyte is a medium for transfer of ions between cathode and anode. The process of transfer takes place during charging and discharging in an electrochemical cell. The electrolyte (along with the separator, as is the case with liquid electrolytes) acts as a mechanical separator between anode and cathode preventing the electrical shorting of electrodes. In a recently demonstrated promising soft matter solid plastic – polymer electrolyte ionic conductivity is useful for application in high rate capability rechargeable lithium ion battery. This ionic conductivity is discussed here. The plastic polymer composite electrolytes show liquid like ion transport in the solid state. Polymethyl methacrylate (PMMA) dispersed in the salt lithium bis-trifluoromethanesulphonimide (LiTFSI) – succinonitrile (SN) was chosen as the model system for the study. Different mol ratio of ionic liquid (N,N-methyl butyl pyrrolidinium-TFSI abbreviated as PY<sub>14</sub> TFSI) w.r.t. SN was added to LiTFSI-SN mixture. Mechanical strength and thermal stability of this polymer gel electrolyte is very high. Any aging effect on conductivity was not done by this electrolyte same as the conventional polymer electrolyte (e. g. high molecular weight polymer+salt+high dielectric constant molecular solvent).The concentration of conducting species does not influenced by disorder to a relative order. The polymer formation is still able to provide efficient pathways for fast ion transport.

**Keywords:** Ionic Conductivity; Lithium Ion Battery; Polymer Electrolyte.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: S. L. Kadam

---

[1]



## 1. Introduction

For the high energy and high power density lithium –ion batteries (1-2) much efforts are done worldwide to develop suitable electrolyte (3-4) materials. In addition to this, new materials are expected to increase safety of the cell and be environmental friendly (2). Solid soft matter ion conductors based on polymer (5,6), plastic crystals (7,8) and ionic liquids(9,10) have gained considerable importance over the traditional solid crystalline and liquid electrolytes for application in various electrochemical devices. This distinct class of electrolytes has high ambient temperature ionic conductivity in the solid state. The solid polymer electrolytes consisting of salt( e.g. LiX) solvated in a polyether(e.g. PEO matrix )is example of soft matter electrolytes. . It has shown that , it is useful to lower polymer crystallinity, as this enhances the polymer segmental motion, leading to higher mobility for the ether oxygen coordinated cation and thus higher ionic conductivities. In recent years research activity on low melting point solid electrolytes based on plastic crystal (10) and ionic liquids (11). The SN based electrolytes are highly conducting in the plastic phase of SN as ion transport is supposed to be considerably benefited by the solvent dynamics (8,11).

Depending on the preparation method, temperature and composition, polymer-salt complexes based on PEO can be obtained as amorphous or crystalline phases. Conductivity of crystalline polymer-salt complexes is much better than amorphous complexes above their glass transition temperatures. In this way polymer segmental motion has importance in ion transport. In polymer-salt complex electrolytes the segmental motion of polymer chains (above polymer glass transition temperature,  $T_g$ ) is essential for sustaining ion transport whereas in plastic crystalline electrolytes orientational disorder in a molecular group of the plastic solvent (above the normal to plastic crystal transition temperature,  $T_{sp}$ ) aid ion motion. Solvent dynamics is also correlated to the microstructure. Segmental motion of polymer chains is significantly larger in amorphous regions compared to crystalline counterparts and it has been generally observed that ionic conductivity of a polymer-salt complex electrolyte is a function of crystallinity(12). It is difficult to measure accurate and meaningful conductivity in polycrystalline materials. In ac method measurements are made over a wide range of frequencies. The information about electrode capacitance, grain boundary resistances and capacitances and the amount of electronic conductivity present can be obtained (13).

## 2. Materials and Methods

### 2.1. Synthesis of polymer gel electrolyte

Succinonitrile (SN, Aldrich) was sublimated twice to remove impurities before the preparation of electrolyte. The various molar ratios of lithium bis(trifluoromethanesulfonyl) imide (LiTFSI) salt was added to SN. This solution was stirred at 60°C for 30 min until homogeneous mixture was obtained. Different mol ratio of ionic liquid w. r. t. SN was added to SN-LiTFSI mixture and stirred until a clear liquid appearance obtained. N,N – Methyl butyl pyrrolidinium-TFSI (abbreviated as PY<sub>14</sub>TFSI, from Sigma Aldrich) was chosen as the ionic liquid used in this study. On addition of ionic liquid into waxy SN-LiTFSI system, liquid appearance has obtained depending on mole ratio of SN and ionic liquid. Only those mole ratio of SN and IL have been taken for which

[2]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

we got liquid appearance and highest conductivity to prepare gel polymer electrolyte. To synthesize gel polymer electrolyte using the above mentioned liquid solvent, a required amount of polymer poly(methyl methacrylate) (PMMA) (as per SN+IL weight) was dissolved in the above solvent and stirred at room temperature inside glove box (under Argon atmosphere) until we get homogeneous mixture. The mixture was then gelled in Argon filled glove box by heating at 60°C for 4 h in order to get solid flexible film of gel polymer electrolyte.

Similarly we have prepared the polymer/silica composite by using different weight ratio of silica w. r. t. polymer using the above mentioned method

## 2.2. Ionic conductivity measurement:-

AC-impedance spectroscopy (Novocontrol Alpha-A) was used to study Temperature dependent ionic conductivity.

The composite samples cut in circular disc shape and sandwiched between two stainless steel electrodes of an airtight home built glass cell. Temperature in the range (-20°C to 60°C) was controlled by inserting the cell and glass jacket combination in a thermostat (FP 50 MC Julabo). The equilibrium time 30 minutes have been given before each conductivity measurement and data have been collected under dynamic vacuum. AC-impedance measurements (Novocontrol Alpha-A) were performed in the frequency range 1Hz to 3 M Hz with signal amplitude of 0.05 V.

## 2.3. Thermal analysis

Thermal stability of the gel electrolyte was investigated with the help of thermogravimetric analysis (TGA, Mettler Toledo). TGA analysis done in the temperature range 25°C to 700°C in nitrogen atmosphere with a heating rate of 10 °C per min.

## 3. Results and discussion

### 3.1 Room temperature ionic conductivity of solvent

The ionic conductivity of different solvent at room temperature (25°C) has represented in Fig.1. The conductivities of solvents comprising different mole ratio of SN and IL have been shown in the plot. Salt concentration with respect to solvent (SN-IL) also was varied in the study.

For the solvent where the succinonitrile-ionic liquid mol ratio is 10:1 with salt concentration 0.5 mol, the ionic conductivity was found to be maximum ( $6 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$ ) and almost similar to liquid electrolyte (LiPF<sub>6</sub>-EC/DMC) used in lithium battery application. The above mentioned composition also has ionic conductivity even higher than SN-LiTFSI as well as IL-LiTFSI system. The solvent composition of highest conductivity is chosen as liquid solvent to prepare gel polymer electrolyte in these study.

### 3.2 Temperature dependent ionic conductivity of gel polymer electrolyte

The variation of ionic conductivity ( $\sigma$ ) of polymer gel electrolyte within temperature ranges 20°C to 60°C for the compositions X%(PMMA)+(100-X)%[0.5M LiTFSI-SN/IL] is shown in Fig.2, where X varies as 0,10,15,18 and 20 weight percent with respect to solvent weight.

[3]

Conductivity is maximum for X=0% and minimum for X=20% mol fraction of PMMA. Thus ionic conductivity decreases with increase in PMMA concentration due to increase in viscosity of the sample with addition of polymer. The highest room temperature (25<sup>o</sup>C) conductivity of  $7.8 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$  was observed for the sample X=0% i.e. for pure solvent, which is very close to the value of  $7.6 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$  for 10% PMMA. Thus it is clear that though the conductivity decreases with addition of polymer, no large drop in conductivity value is observed. Nature of curvature of temperature dependent ionic conductivity plots obtained for all the samples are characteristic features for amorphous ionic conductors.

### 3.3 Room temperature ionic conductivity of polymer/ silica composite electrolyte

The room temperature conductivity data of polymer electrolyte consisting of different oxide filler concentration has shown in figure 3.

The data reveals that how room temperature ionic conductivity of gel polymer electrolyte varies with weight percentage of added silica filler into polymer matrices. The silica added to the lowest conductive polymer electrolyte comprising 20 wt% of PMMA and silica concentration is represented in weight percent with respect to polymer. With addition of 1 wt % of silica the room temperature ionic conductivity enhanced to a value  $1.3 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$  from  $9.4 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$  where no filler have been added. After that conductivity value reached maxima at filler concentration 2 wt % and gradually decreases with increase of silica content further. Thus we could improve the conductivity of only 1.4 times for less conducting sample with addition of filler in this case.

### 3.4 Thermal Analysis

The thermal stability of one of the representative composition 20 % pmma of gel polymer electrolyte is shown in Fig.4.

The thermo gram shows that this polymer electrolyte begin to decompose at 350<sup>o</sup>C with 38 % weight loss which is completed at 700<sup>o</sup>C with total 98 % weight loss. Thus the synthesized polymer electrolyte is thermally stable up to 350<sup>o</sup>C and suitable for high temperature battery application. This implies that thermal safety issue of lithium ion battery comprising the electrolyte can be overcome.

### Acknowledgments

Author S. L. Kadam is thankful to Prof. Aninda J. Bhattacharyya, Head Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore, under whose supervision the work is carried out. Also author is grateful to Indian Academy Sciences, Bangalore for the award of summer research fellowship.

### References

- [1] Scrosati B. and Garche J., (2009) Review Lithium batteries: Status, Prospects and future, *J. Power Sources* 195, 2419-2430.
- [2] Armand M. and Tarascon J. M., (2008) Building better batteries, *Nature* 451, 652-657.
- [3] Pringle J. M., Howlett P. C., MacFarlane D. R. and Forsyth M., (2010) Organic ionic plastic crystals: recent advances, *J. Mater. Chem.* 20, 2056-2062.
- [4] Galinski M., Lewandowski A. and Stepniak I., (2006) Critical Review-Ionic liquids as

[4]

---

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

---

- Electrolytes, *Electrochimica Acta*.51, 5567-5580.
- [5] Croce F., Settini L. and Scrosati B., (2006) Superacid ZrO<sub>2</sub> -added, composite polymer Electrolytes with improved transport properties, *Electrochemistry Communications* 8, 364 - 368.
- [6] Appetecchi G.B., Aihara Y. and Scrosati B., (2004) Investigation of swelling phenomena in PEO-based polymer electrolytes II. Chemical and electrochemical characterization, *Solid State Ionics* 170, 63-72.
- [7] Abouimrane A. and Davidson I.J., (2007) Solid Electrolyte based on Succinonitrile and LiBO- interface Stability and Application in Lithium Batteries, *J. Electrochemical Society* 154(11), A1031-A1034.
- [8] MacFarlane D.R., Huang J. and Forsyth M., (2001) Plastic Crystal Electrolyte Materials: New Perspectives on Solid State Ionics, *Adv. Mater.*13, 957- 966.
- [9] Shin J. H., Henderson W.A. and Passerini S., (2003) Ionic liquids to the rescue? Overcoming the ionic conductivity limitations of polymer electrolytes, *Electrochem. Comm.*5, 1016 -1020.
- [10] Long S., MacFarlane D. R. and Forsyth M., (2003) Fast ion conduction in molecular plastic crystals, *Solid State Ionics* 161,105-112.
- [11] Patel M., Chandrappa K. G. and Bhattacharyya A. J., (2008) Increasing ionic conductivity and Mechanical strength of a plastic electrolyte by inclusion of a polymer, *Electrochimica Acta* 54, 209-215.
- [12] Bruce P. G., *Solid State Electrochemistry*, Scotland, (1995) published by Cambridge University Press, United Kingdom.
- [13] West A. R., *Solid State Chemistry and its Applications*, Aberdeen, (2014) published by John Wiley and sons Ltd, United Kingdom.

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

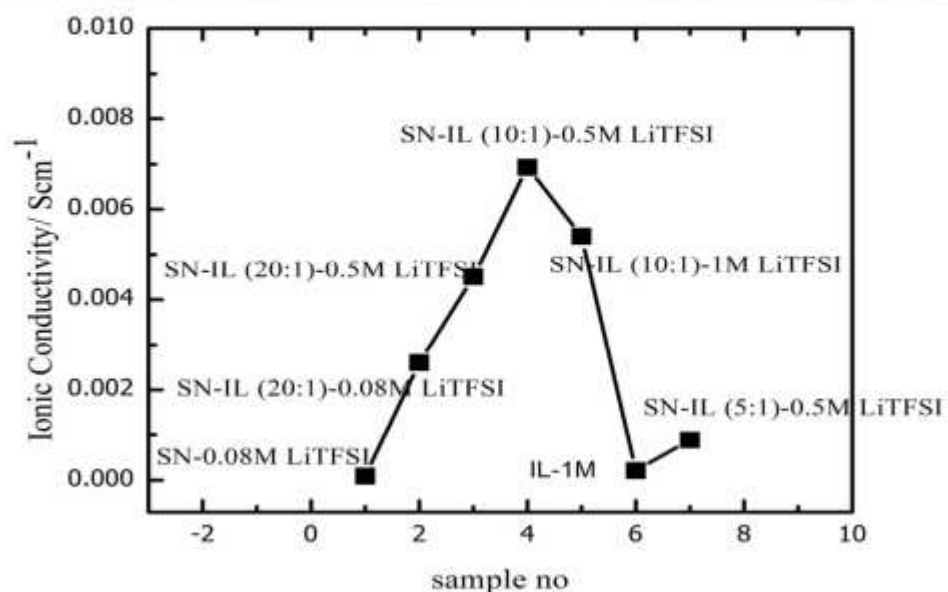


Fig. 1: Room temperature ionic conductivity of solvent

[6]

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

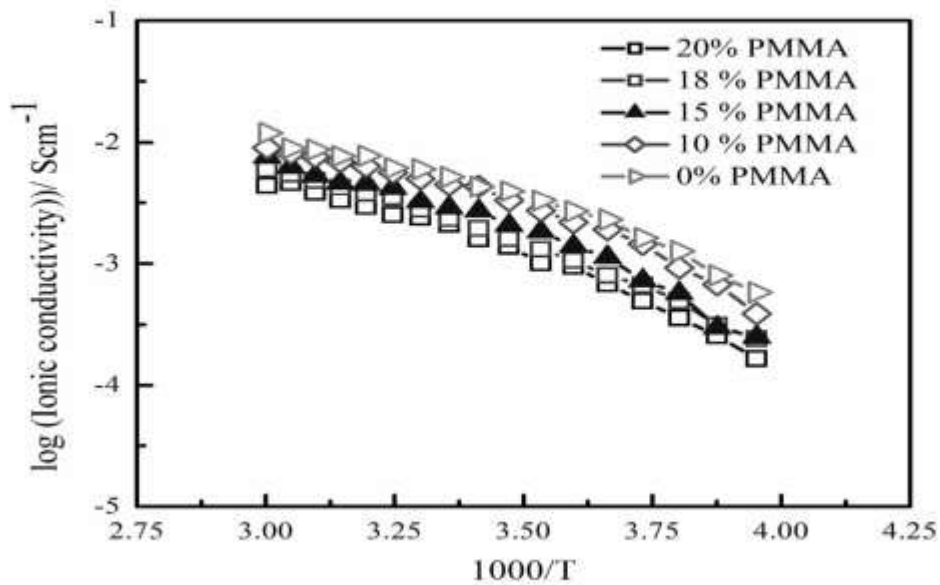
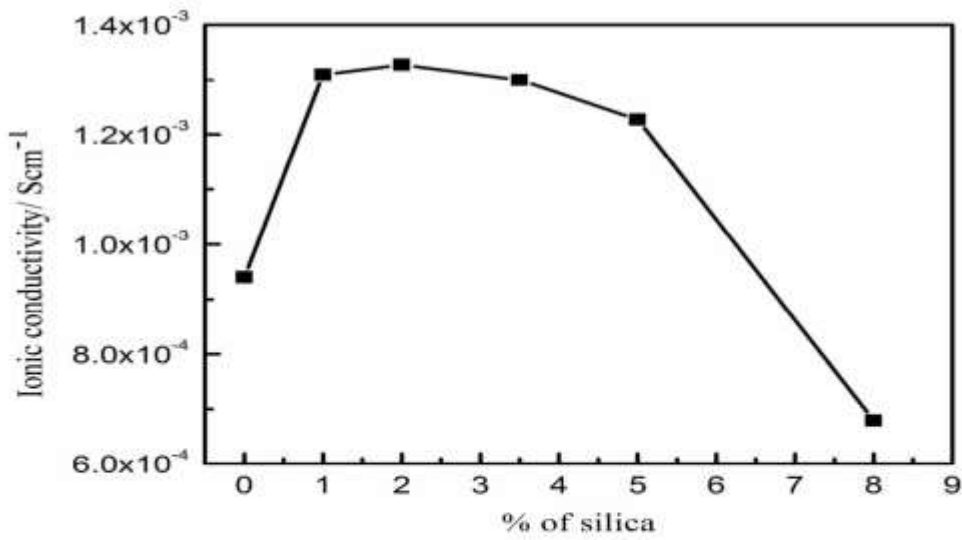


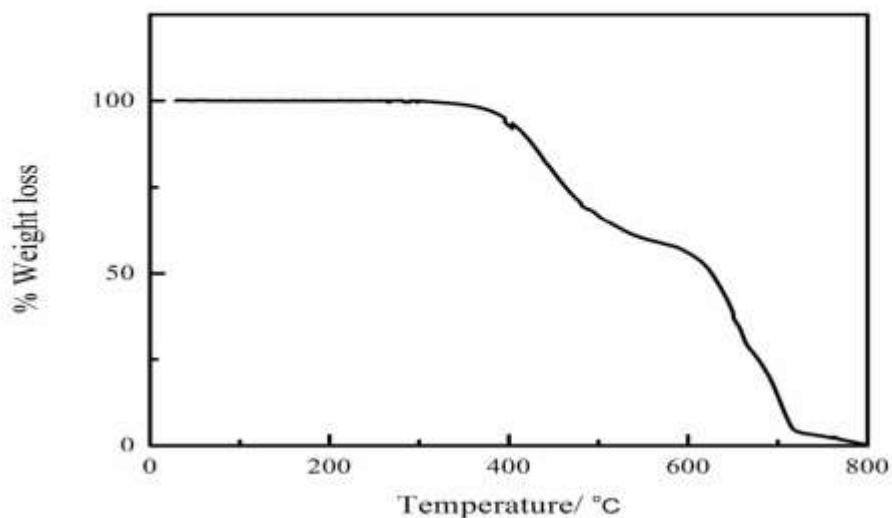
Fig.2: Ionic conductivity log ( $\sigma$ ) vs. temperature



[7]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

**Fig. 3: Ionic conductivity vs. different oxide filler concentration**



**Fig. 4: Thermogram of % weight loss vs. temperature**

[8]

## 18. Effect of Spent Wash on the Physico- Chemical Properties of Soil and Early Seedling Growth in Fenugreek(*Trigonella Foenum Graecum*)



Wesleyan Journal of Research, Vol.14 No.11 (November 2021)

ISSN – 0975-1386  
Research article: (Commerce)

### EFFECTS OF SPENT WASH ON THE PHYSICO-CHEMICAL PROPERTIES OF SOIL AND EARLY SEEDLING GROWTH IN FENUGREEK (*TRIGONELLA FOENUM GRAECUM*)

**Kulkarni S.D**

New Arts Commerce and Science College Ahmednagar (MS) - 414 001

**Dhawale V.P**

New Arts Commerce and Science College Parner, Dist. Ahmednagar (MS) - 414 302,  
[vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com).

**Aher S.K**

New Arts Commerce and Science College Parner, Dist. Ahmednagar (MS) - 414 302

**Zadage S.J**

New Arts Commerce and Science College Ahmednagar (MS) - 414 001

#### ABSTRACT

Distillery spent wash is an effective organic liquid manure derived from distillery industries. A laboratory work was undertaken to assess the effect of various concentrations viz., 2%, 5%, 7%, 10% and 15% on physical and chemical properties of soil, seed germination and root and shoot length of fenugreek (*Trigonella foenum graecum*). The high value of pH, EC, organic carbon, nitrogen, phosphorus, potassium indicated the high inorganic and organic load. Fenugreek grown in soil pot culture conditions with different rates of spent wash showed improvement in germination %, root length and shoot length over control (2%, 5% and 7%). Whereas, higher doses of spent wash (10% and 15%) decreased these parameters markedly. Findings indicated stimulatory effect of lower doses of spent wash (2%, 5% and 7%) on germination %, root and shoot length and inhibitory effect of higher doses (10% and 15%). Therefore, judicious application of spent wash will improve germination %, root length and shoot length and alleviate environmental pollution problems.

**Key Words:** Spent wash, soil fertility, germination percentage, seedling growth, *Trigonella foenum graecum*.

#### Article History

\* Received: 09/11/2021; Accepted: 29/11/2021

Corresponding author: Dhawale V.P

#### 1. Introduction

With the development of agriculture, agro-based industries have contributed enormously to boost economy of the nation. Distilleries are one of the most important agro-based industries in India. Production of ethyl alcohol in distilleries based on sugarcane molasses constitutes a major industry in Asia and South America.

[22]



*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

The world's total annual production of alcohol from sugarcane molasses is more than 13 million m<sup>3</sup>. The aqueous distillery effluent stream known as spent wash is a dark brown, highly organic effluent and is approximately 12-15 times by volume of product alcohol [5]. The disposal of distillery spent wash is of serious concern due to its large volume and high biological oxygen demand (BOD) and chemical oxygen demand (COD). The effluent is ideal for sugarcane, maize, wheat and rape seed production [8]. It has been reported that waste water from different industries produced continuously could cater the needs of irrigated crops [35]. Thus the distillery spent wash will not only prevent waste from being an environmental hazard but also served as an additional potential source of fertilizer for agricultural use. Diluted spent wash increased the growth of shoot length, leaf number per plant, leaf area and chlorophyll content of peas. It was also reported that the water holding capacity, cation exchange capacity, increases the availability of nitrogen, phosphorus, potassium, copper, zinc, iron, manganese; but with reduced biochemical oxygen demand (BOD) with addition of sewage sludge to a coarse textured sandy and calcareous soil [2]. An increase in the soil organic matter by 1% with sugar factory effluent applied to soils was observed in Cuba [36]. Many workers reported an adverse effect of higher concentration of different types of industrial effluents in the growth rate of different crops [30,9,14,17].

There have been studies related to the application of distillery spent wash to agriculture in India as well as other parts of the world. Sahai *et al.* reported distillery effluent application up to 5 percent increased root and shoot length, plant biomass, net primary productivity, chlorophyll content and seed output compared to the control [27]. Chandraju and Chidankumar worked on nutritional additives of distillery spent wash on the production of leafy medicinal plants in normal and spent wash treated soil [6]. Use of spent wash resulted in decrease in soil pH and increase in Electrical Conductivity of the soil. Application of spent wash increased organic carbon content from 0.2 to 1 percent. Pawar *et al.* found that addition of diluted spent wash decreased pH and Electrical Conductivity [26]. There were significant changes in exchangeable K, Ca and Mg content of soil. Baskar *et al.* found eco-friendly utilization of sugar factory effluent in agriculture may serve as nutrient management practices for enhancing crop yields besides reducing the costs of fertilizer [3]. Patil *et al.* worked on spent wash levels on soil fertility, uptake, quality and yield of fodder maize and observed significant increase in uptake of N, P, K nutrient by addition of spent wash @ 50m<sup>3</sup>/ha was observed over control [25]. Mukherjee and Sahai studied the effect of distillery waste 1-100% concentration on seed germination, seedling establishment and early seedling growth of *Cajanus cajan* L. The values for percentage germination, rate of germination, root length and seedling were highest in 5% effluent while shoot length was maximum at 2.5 percent effluent [19]. Salunke *et al.* worked on seed germination and early seeding growth in groundnut (*Arachis hypogea*) [28]. Parmila and Sanjeev Kumar worked on effect of industrial effluent on sugarcane on changes and level of chlorophyll, growth and yield of *Triticum aestivum* [23].

In present investigation, an attempt has been made to determine the nutrient composition of spent wash and their impact on physico-chemical properties of soil, germination percentage and early seedling growth of fenugreek (*Trigonella foenum graecum*).

## **2. Material and Methods**

The effluent was collected from the Dnyaneshwar Sahakari Sakhar Karkhana Ltd., Bhenda, Tal. Newasa, Dist. Ahmednagar (M.S.), India. The physico-chemical properties of the effluent were analyzed following the

[23]

procedure of APHA (1995). To bio-assay the concentration of the effluent, control (tap water), 2%, 5%, 7%, 10% and 15% concentrations were made by diluting the effluent with distilled water. Soil samples were collected from agricultural field up to 0-30 cm height for experiment.

The seeds of fenugreek (*T. foenum graecum*) cv Pusa Harit were procured from Department of Horticulture, College of Agriculture, M.P.K.V Rahuri, Ahmednagar. The seeds of uniform size, shape, colour and weight were selected. Seeds were sterilized by 0.1% of mercuric chloride solution to remove the microbes after thorough wash with water. Seeds were then spread on the sterilized Petri dishes lined with Whatman filter paper number 1 at  $26^{\circ}\pm 2^{\circ}\text{C}$ . The seeds were irrigated with equal volumes (15 ml) of different concentrations of spent wash effluent at an interval of 24 hours. For each treatment (2%, 5%, 7%, 10%, and 15% and distilled water as control), three replicates and in each replicate 100 seeds were taken for the germination experiment. The seeds germinated were counted and removed from the Petri dish until there was no further germination. Criterion for germination was visible protrusion of the seed coat and was expressed in percentage. Soil properties were analyzed before and after application of different concentrations of spent wash [12,21,33,22]. Five seedlings were taken randomly from each treatment and their root and shoot length (cm/seedling) were measured by using a scale and these values are recorded.

### 3. Results

The physico-chemical analysis of the spent wash is given in Table 1. It was reddish brown to dark brown in colour with unpleasant odour and acidic in nature (pH- 4.55). Electrical conductivity (43.3ds/m), BOD (600 ppm) and COD (28000 ppm) values are very high, however good amount of NPK was observed.

Characteristics of experimental untreated soils and treated soils with spent wash were tested. Values of pH, electrical conductivity, the amount of organic carbon, available nitrogen, phosphorus and potassium were analysed and tabulated in Table 2. The soil was tested after the harvest of crop, which shows that there is enrichment of the plant nutrients (NPK) in soil and no adverse effect on other parameters. Significant increase in organic carbon was recorded in soil irrigated with 10% (0.38) and 15% (0.42) spent wash.

Figure 1 shows germination percentage of *T. foenum graecum* at different concentrations of spent wash at different time interval. The germination percentage in 5% and 7% spent wash soil concentration was recorded to be 100%. However, 99%, 95% and 30% germination percentage was noted in 2%, 10% and 15% spent wash concentrations respectively. Germination percentage increased progressively from 2% to 7% spent wash concentrations. However, significant decrease in germination percentage was observed in 15% spent wash concentration (30%).

Effects of various concentrations of spent wash on root and shoot length of *T. foenum graecum* at time intervals of 5 days, 15 days and 25 days are enumerated in Table 3, Fig. 2, Fig. 3 and Fig. 4. It was found that 7% spent wash concentration caused maximum root length at 5.3 cm followed by 4.9 cm and 4.3 cm by the application of 5% and 2% spent wash concentration. Whereas further results indicated that, 3.2 cm and 2.7 cm root lengths was noted in 10% and 15% spent wash concentration respectively which was lower than control (3.8 cm) after 25 days. The results revealed that maximum shoot length at 12.2 cm was obtained with 7% spent wash concentration followed by 5% (10.7 cm) and 2% (8.9 cm). While 10% and 15% spent wash concentration produced 5.1 cm and

4.5 cm shoot length respectively which was found to be significantly less than that of control (7.4 cm) after 25 days.

#### **4. Discussion**

Distillery spent wash is the unwanted liquid waste produced during the production of alcohol and it is one of the most important environmental issues. The distillery spent wash with its characteristic unpleasant odour poses a serious threat to the water quality around the world [13]. The ever increasing amount of distillery spent wash and its disposal has stimulated the need for developing new technologies to process this effluent efficiently and economically including growth and yield of different crops in agriculture [18].

It was found that the early seedling growth and germination percentage in fenugreek (*T. foenum graecum*) showed an increasing trend over the control at specific concentrations of spent wash. The spent wash was acidic in reaction. The electrical conductivity being very high indicates presence of high concentration of dissolved salts. The BOD and COD contents of the spent wash are very high. This may be due to the soluble form of organic matter in the spent wash [20].

Physico-chemical characteristics of the soil treated with different concentration of spent wash show that, soil pH increased when irrigated with 2% and 5% spent wash than the untreated soils. However, under the treatment of 7%, 10% and 15% spent wash, the soil pH was lowered. Maximum reduction in soil pH was observed in the soil treated with 15% spent wash. Hati *et al.* also observed no appreciable changes in soil pH with the application of diluted spent wash [11]. Application of spent wash significantly increased the EC values of all doses of spent wash treated soils as compared to untreated soil which might be due to very high salt load of spent wash. This is consistent with the results of previous reports [24,4,11].

A slight increase in organic carbon content in all doses of spent wash treated soils was recorded as compared to untreated soils. The increase in organic carbon might be due to addition of organic matter by spent wash [11,16]. Among the nutrients, in the soil treated with spent wash, potassium was present in larger amount than nitrogen and phosphorous in general. Thus, these results are mostly in accordance with those previously reported [7,15,31].

Application of 7% spent wash dose show maximum promotion in comparison to other doses in seed germination, root length and shoot length. This promotion is possibly due to the presence of optimum level of plant nutrients in the spent wash [34]. An increase in the spent wash concentration (>7%) resulted in gradual decline in seed germination, root and shoot length. Higher concentration of spent wash interferes with absorption of water due to high concentrations of organic compounds resulting in deficiency of nutrients. Application of spent wash improves the physical characteristics of soil [32]. Irrigation with distillery waste water seems to be an attractive agriculture practice, which not only augment crops yield but also provides a plausible solution for the land disposable of the spent wash. The spent wash contained N, P, K, Ca, Mg and S and thus valued as a fertilizer when applied to soil through irrigation with water [29].

#### **5. Conclusion**

Distillery effluent, a waste water popularly called as spent wash is purely of plant origin containing a large quantity of soluble organic matter and plant nutrients. It does not contain any toxic element. The results indicated that application of spent wash caused improvement in the soil properties. The available potassium was increased

by increasing dose of concentration with slight decrease in soil pH and increase electrical conductivity and organic carbon. Available N and P content of soil were improved significantly with application of spent wash as compared to control.

The rate of germination percentage and seedling growth after treatment with spent wash on *T. foenum graecum* showed that, spent wash had beneficial effects on germination, root length and shoot length at 7% concentration. However germination percentage, root and shoot length decreased (10 and 15 %) considerably with increase in concentration of spent wash as compared with the control. The beneficial effect spent wash after diluting up to 7% concentration may be due to presence of available form and suitability to plant growth. The availability of nitrogen, phosphorus, and potassium as nutrient with pH showed major influence on the intake of plant nutrients in it. Thus the spent wash after diluting 7% can be used for irrigation as liquid fertilizer for better germination and seedling growth of vegetables and also decreases pollution load.

#### References

- [1] APHA, (1995) Standard methods. 19<sup>th</sup> Edition. American Public Health Association, Washington, DC.
- [2] Badawy S. H. & Elmataium, R. A. (1999) Effect of irradiated and non-irradiated sewage sludge application on some nutrient-heavy metal content of soil and tomato plant. 1st Congress on Recent Technology on Agriculture. Bulletin Faculty Agriculture. University of Cairo, Cairo, 728-744.
- [3] Baskar M., Kayalvizhi C. & M. Subash Chandra Bose. (2003) Eco-friendly utilisation of distillery effluent in agriculture - a review, *Agric. Rev.*, 24(1) 16-30.
- [4] Bhalerao V.P., Jadhav M.B. and Bhoi P.G., (2006) Effect of spent wash press mud compost on soil properties, yield and quality of seasonal sugarcane, *Indian Sugar*, 57-65.
- [5] Chakarbarti R.N., (1980) Management of sugar and alcohol industry wastes- pollution control and conservation of energy and fertilizer. Proc. Symp. Disposal of sugar and distillery waste, U. P. Water Pollution Control Board, Lucknow.
- [6] Chandraju S. & Chidankumar C.S., (2010) Distillery spent wash irrigation on the nutrients of banana (*Musa paradisiaca*) and Papaya (*Carica papaya*) fruits, *J. Phytol.*, 2: 28-33.
- [7] Chidankumar, C. S. & Chandraju, S., (2008) Impact of irrigation of distillery spent wash on the nutrients of pulses in untreated and treated soil, *Journal Sugar Tech.*, 10(4) 314-318.
- [8] Diangan Jr., M. Perez, T. & Claveria R., (2008) Analysis of land application as a method of disposal of distillery effluent, *Int. J. Env. Health*, 2: 258- 271.
- [9] Dutta S. K. and Boissya C. L., (1997) Effect of paper mill effluent on germination of rice (*Oryza sativa*. L var. masun ) and growth behaviour of its seedlings, *J. Ind. Pollut.*, 13 (1) 41-47.
- [10] Hati K. M., Biswas A. K., Bandyopadhyay K. K. & Misra, A. K., (2007) Soil properties and crop yields on a vertisol in India with application of distillery effluent, *Soil Tillage Res.*, 92: 60-68.
- [11] Hati K. M., Biswas A. K., Bandyopadhyay K. K., Mandal K. G. & Misra A. K., (2005) Influence of added spent wash on soil physical properties and yield of wheat under soyabean-wheat system in a vertisol of central India, *Env and Eco.*, 23(3) 631-634.
- [12] Jackson M.L., (1973) Soil Chemical Analysis. Prentice Hall of India, Hale Pvt. Ltd., New Delhi, India.

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

---

- [13] Joshi H. C., Karla N., Choudhury A. & Deb D. L., (1994) Environmental issues related with distillery effluent utilization in agriculture in India, *Asia Pacific Journal of Environment Development*, 1: 92-103.
- [14] Karunyal S., Renuga G. and Paliwal K., (1993) Effect of tannery effluent on seed germination, leaf area, biomass and mineral content of some plants, *Bioresource Technol.*, 47: 218-218.
- [15] Kaushik P. & Khan M. A. A., (2008) Fertigation of treated spent wash and its effect on sugarcane (*Saccharum officinarum* L.) and soil fertility: Sustainable technology option for reuse of waste water, *Crop Res.*, 35(3) 218-225.
- [16] Kaushik A., Nisha R., Jagjeeta K. & Kaushik C.P., (2005) Impact of long and short term irrigation of a sodic soil with distillery effluent in combination with bio amendments, *Bioresource Technology*, 96(17) 1860-1866.
- [17] Mathur A. C., Davis J. B., (1987) Palm oil mill effluent. A review of methods proposed for its treatment, *Trop. Sci.*, 2: 233-262.
- [18] Mohana S., Bhavik K.A., Madamwar D., (2009) Distillery spent wash: treatment technologies and potential applications, *J. Hazard Mater*, 163(1) 12–25.
- [19] Mukherjee U. & Sahai R. (1988) Effect of distillery waste on seed germination, seedling establishment and early seedling growth of *Cajanus cajan* L. (Var. 5-16), *Acta Bota. Indica*, 16(2) 182-185.
- [20] Nandy, T., Shastri S. & Kaul S.N., (2002) Wastewater management in a cane molasses distillery involving bioresource recovery, *Journal of Environmental Management*, 65 25-38.
- [21] Nelson D.W. and Sommer L.E., (1982) Total carbon, organic carbon and organic matter. In: *Methods of soil analysis, Part II*, Page, A.L. (Ed), Am. Soc. Agron. Inc. Soil Sci. Am. Inc. Madison, Wisconsin, USA, pp. 539-579.
- [22] Olsen S.R. & Sommers L.E., (1982) Phosphorus. In: Page, A.L., Ed., *Methods of Soil Analysis Part 2 Chemical and Microbiological Properties*, American Society of Agronomy, Soil Science Society of America, Madison, 403-430.
- [23] Parmila Rani and Sanjiv Kumar, (2010) Soil irrigation effect of sugarcane industrial effluent on changes of level of chlorophyll, growth and yield of *Triticum aestivum* cv. PBW-226, *Internat. Jr. Plant Sciences*, 5(1) 170-173.
- [24] Pathak H., Joshi H.C., Chaudhary A., Chaudhary R., Kalra N. & Dwiwedi M.K., (1999) Soil amendment with distillery effluent for wheat and rice cultivation, *J. Water, Air, Soil Pollu.*, 113(1-4) 133-140.
- [25] Patil G.D., Pingat S.M. & Yelwande A.J., (2000) Effect of spent wash levels on soil fertility, uptake, quality and yield of fodder maize, *Journal of Maharashtra Agricultural Universities*, 25 (2) 168-170.
- [26] Pawar R.B., Desai B.B., Chauhan U.D. and Naik R.M., (1992) Effect of spent wash on the physico-chemical properties of saline and calcareous soil, *J. Maharashtra Agric. Univ.*, 17(1) 1-3.
- [27] Sahai R., Jabeer S. & Saxena P.K., (1985) Nitrate reduction activity of *Vigna mungo* (L.) Hepper as affected by distillery waste, *J. Environ. Biology*, 116(3) 205-209.
- [28] Salunke K.J., P. Gopal Reddy & Salve A.W. (2010) Effect of sugar factory effluent on seed germination and early seedling growth in groundnut (*Arachis hypogea* L.) varieties, *Internat. Jr. of Plant Sciences*, 5(1) 313-315.

[27]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

[29] Samuel G., (1986) The use of alcohol distillery waste as a fertilizer, Proceeding of International American sugarcane seminar, 245-252

[30] Shomasheka R. K. & Siddaramaiah K., (1993) Effect of soap and detergents factory effluent on soils and crop plants, J. Ind. Pollut., 9(2) 77-84

[31] Sindhu S. K., Sharma A. and Ikram, S., (2007) Analysis and recommendation of agricultural use of distillery spent wash in Rampur district, India, Journal of Chemistry, 4(3) 390-396

[32] Singhandhupe R. B., Muduli S. D., Chakrabarty H. & Kumar A., (2009) Evaluation of distillery effluent for crop irrigation, JSIR., 68(4) 332-337.

[33] Subbiah B.V. and Asija G.L., (1956) A rapid procedure for the determination of available nitrogen in soil, Curr. Sci., 25:259-260.

[34] Subramani A., Sundaramoorthy P. & Lakshmanachary A.S. (1995) Effect of biologically treated distillery effluent on seed germination and seedling growth of green gram (*Vigna radiata*) Wilczek. Var (CO<sub>2</sub>), Poll. Res., 14: 37-41.

[ ] Swaminathan K. & Vaidheeswaran P., (1991) Effect of dyeing factory effluent on seed germination and seedling development of groundnut (*Arachis hypogea*), J. Env. Biol., 12(3) 253- 258.

[35] Valdes E., Obaya M.C. & Ramos, J., (1996) Ecology and the Sugar Industry, Revista, 30: 214-229.

**Table 1. Properties of spent wash used for application of fenugreek.**

Properties	Spent wash
Colour	Reddish brown to dark brown
Odour	Unpleasant smell
PH	4.55
EC (ds/m)	43.3
COD (ppm)	28,000
BOD (ppm)	600

**Table 2: Physico-chemical characteristics of the soil treated with different concentration of spent wash**

Properties	Characteristics of untreated soil	Characteristics of treated soil				
		2% Conc.	5% Conc.	7% Conc.	10% Conc.	15% Conc.
pH	6.92	7.2	7.1	6.8	6.3	5.4
EC(ds/m)	0.69	0.73	0.78	0.88	1.18	1.69
Organic carbon %	0.25	0.27	0.28	0.30	0.38	0.42
Major nutrients (kg/ha)						
N	24	26	25	30	32	36

[28]

Wesleyan Journal of Research, Vol.14 No.11 (November 2021)

P	43	47	51	67	71	79
K	181	202	213	278	306	379

**Table 3: Change in root and shoot length (cm) of *T. foenum graecum* exposed to spent wash.**

Treatment	5 <sup>th</sup> day		15 <sup>th</sup> day		25 <sup>th</sup> day	
	Root length (cm) (%Change)	Shoot length (cm) (%Change)	Root length (cm) (%Change)	Shoot length (cm) (%Change)	Root length (cm) (%Change)	Shoot length (cm) (%Change)
Control	1.1 ±0.08	2.3 ±0.13	2.3 ±0.12	4.3 ±0.740	3.8 ±0.198	7.4 ±0.257
2%	1.2 ±0.09 (9.090)	2.7 ±0.15 (17.39)	2.9 ±0.22 (26.08)	5.8 ±0.772 (34.88)	4.3 ±0.231 (13.5)	8.9 ±0.272 (20.27)
5%	1.4 ±0.07 (27.27)	3.1 ±0.17 (34.78)	3.3 ±0.28 (43.47)	6.9 ±0.831 (25.56)	4.9 ±0.273 (28.94)	10.7 ±0.310 (44.59)
7%	1.6 ±0.04 (45.45)	3.6 ±0.22 (56.52)	3.7 ±0.162 (60.86)	8.2 ±0.867 (90.69)	5.3 ±0.384 (39.47)	12.2 ±0.298 (64.86)
10%	1.3 ±0.06 (18.18)	3.2 ±0.18 (39.13)	2.2 ±0.10 (-4.34)	4.1 ±0.703 (-4.65)	3.2 ±0.183 (-15.78)	5.1 ±0.361 (-31.08)
15%	1 ±0.05 (-9.09)	2.4 ±0.14 (-4.347)	1.9 ±0.05 (-17.39)	3.8 ±0.629 (-11.62)	2.7 ±0.153 (-28.98)	4.5 ±0.520 (-39.18)

Values are arithmetic mean ±S.D. and % change of seedling growth (cm)

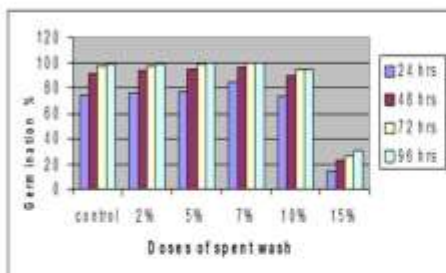


Figure 1. Germination % of *T. foenum graecum* at different doses of spent wash

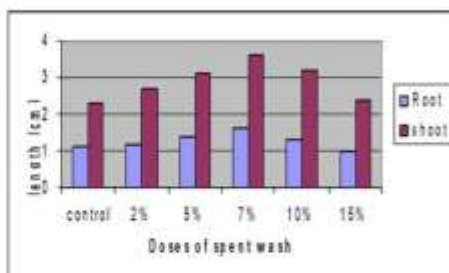


Figure 2. Root and shoot length of *T. foenum graecum* after 5 days

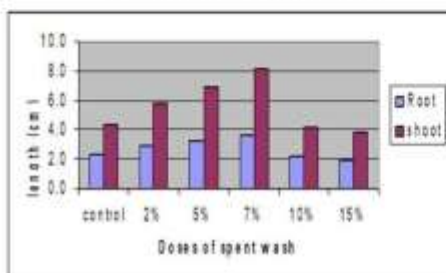


Figure 3. Root and shoot length of *T. foenum graecum* after 15 days

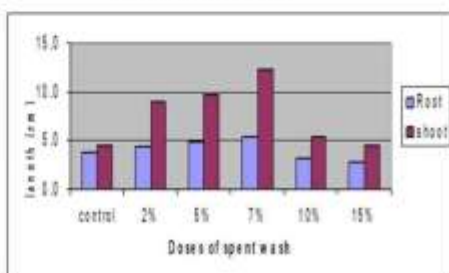


Figure 4. Root and shoot length of *T. foenum graecum* after 25 days



## 19. Low-Density Teos-based Silica Aerogels Prepared at Supercritical Drying Using Ethanol as the Preparative Solvent



Wesleyan Journal of Research, Vol.14 No.11 (November 2021)

ISSN – 0975-1386  
Research article: (Physics)

### LOW-DENSITY TEOS-BASED SILICA AEROGELS PREPARED AT SUPERCRITICAL DRYING USING ETHANOL AS THE PREPARATIVE SOLVENT

**Nilesh A Pawar**

Post Graduate Department of Physics, New Arts, Commerce and Science College, Parner, Maharashtra-414302, India, [napawar9@gmail.com](mailto:napawar9@gmail.com)

**N B Chaure**

Department of Physics, Savitribai Phule Pune University, Pune-41100, Maharashtra, India

**S M Rathod**

P. G. and Research Department of Physics, Abasaheb Garware College, Pune-30, Maharashtra, India

**Abstract.** Highly transparent silica aerogels based on the tetraethoxysilane (TEOS) precursor were prepared by two-step (acid-base) sol-gel process. The hydrolysis and condensation reactions of TEOS proceeded in ethanol solvent with hydrochloric acid (HCl) and ammonium hydroxide (NH<sub>4</sub>OH) as the catalysts, respectively. The wet gels were Supercritically dried using ethanol. The aerogels were characterized by transmission electron microscopy (TEM) and measurements of optical absorption and transmission, bulk density, and porosity. Monolithic silica aerogels with high optical transmission (~85%), low density (~0.062 g/cm<sup>3</sup>), and minimum volume shrinkage (~10%), were obtained. The aerogels were prepared for different concentration of NH<sub>4</sub>OH by keeping the volume ratio of TEOS:EtOH:HCl is 14.92:74.62:10.44 respectively.

**Keywords:** Silica aerogels, TEM, sol-gel process.

#### Article History

\* Received: 09/11/2021; Accepted: 29/11/2021

Corresponding author: Nilesh A Pawar

#### 1. Introduction

Silica aerogels are the porous nano-structured form of silicon dioxide. They are open cell inorganic polymers with an intricate internal structure, resulting in an extremely high surface area (~1000 m<sup>2</sup>/g). Due to their highly porous and nanostructured nature, they exhibit remarkable electrical, thermal and acoustic insulating properties. These properties of the aerogels make them prime candidates for a variety of scientific and technological applications such as Cerenkov radiation detectors in high energy physics, thermal and acoustic super insulators in window systems, low dielectric constant, heterogeneous catalyst supports, storage media for liquid rocket propellants and radio luminescent devices, etc. However, the high cost of the aerogels prevents their widespread applications in various fields. It is well known that tetramethoxysilane (TMOS) gives better quality

[16]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

aerogels in terms of high optical transmission (~90%), low density (~0.05 g/cm<sup>3</sup>), faster gelation (~30 min) and negligible volume shrinkage (2 to 5%), as compared to the aerogels produced using tetraethoxysilane (TEOS) precursor. However, TMOS is five times costlier than the TEOS and also it is highly toxic, the fumes of which can cause blindness. Therefore, TEOS can be used as a cost effective and environmental friendly precursor for the production of silica aerogels. In general, only acid catalysts are used to produce the aerogels using the TEOS precursor. But the TEOS based, acid catalyzed (single step) aerogels possess the disadvantages such as higher densities (~0.2 g/cm<sup>3</sup>), lower optical transmission (~60%), larger volume shrinkage (~30%) and longer gelation times (~3 days). A few reports are available on the production of low-density TEOS-based silica aerogels using a two-step sol-gel process [1-2].

Here, we have reported the synthesis of TEOS based silica aerogels by the two-step sol-gel process. However, in the present studies, using ethanol as the solvent we could produce the TEOS based silica aerogels with increased optical transmission (~85%) and low density (~0.062 g/cm<sup>3</sup>). The slightly different processing conditions of the two-step sol-gel process impart slight but important changes in the physical properties of the final aerogel product, as it allows an excellent control over the rates of hydrolysis and condensation reactions.

## **2. Materials and Methods**

### **2.1 Chemicals**

All chemicals, Tetraethylorthosilicate (TEOS) hydrochloric acid (HCl) Ethanol and ammonia solution (NH<sub>4</sub>OH) were purchased from sigma Aldrich of purity at least 99.9% used as received. Ethanol was used throughout the experiments as a solvent.

### **2.2 Preparation of aerogels**

TEOS was used as a precursor for silica Aerogels. HCl and NH<sub>4</sub>OH were used as catalyst to allow the reaction fast. In order to obtain good quality silica aerogels, the volume ratios of TEOS:EtOH:HCl 14.92:74.62:10.44 was kept constant and concentration NH<sub>4</sub>OH was systematically varied from 2.5 to 5.5 ml. We synthesize the silica aerogel by two step sol-gel method. The wet gel was prepared by diluting TEOS in EtOH solution. The solution is stirred for 15 minute at room temperature, which allows the clear transparent sol. In the next step HCl was added into the TEOS and EtOH solution and stirred again for 2 hours [1]. And finally NH<sub>4</sub>OH was added. The resulting silica sols were stirred for 30 min, and then kept for gelation at room temperature. After ageing for three days, the aerogels were supercritically dried in a 600 ml autoclave (Parr Instruments Company, Moline Illinois, USA). The conditions above the critical temperature (241 °C) and the critical pressure (63 bar) of ethanol solvent were achieved in three hours of heating time, using a PID temperature controller.

### **2.3 Characterization**

The microstructure of the aerogels was studied with the help of Transmission Electron Microscopy (TEM, Tecnai G2). The optical absorption and transmittance measurements of the prepared aerogels (sample thickness of ~3mm) were measured by using UV-Vis spectrophotometer (JASCO V-670). The bulk densities and volume shrinkage of the aerogels were calculated from their weight to volume ratios.

[17]

### 3. Results and discussion

To study the effect of  $\text{NH}_4\text{OH}$ , the concentration of was varied from 2.5 to 5.5 ml. However, for less than 2.5 ml concentration of  $\text{NH}_4\text{OH}$ , the alcosols did not set. The bulk density of the aerogels increased from 0.062 to 0.084  $\text{g}/\text{cm}^3$ , with increase in  $\text{NH}_4\text{OH}$  value from 2.5 ml to 5.5 ml. Table 1 summarizes the values of density and volume shrinkage of silica aerogels prepared with different concentrations of  $\text{NH}_4\text{OH}$ .

Figure 1 shows the optical absorption spectra of prepared aerogels with various concentration of base catalyst. Figure 2 shows the optical transmission spectrum of prepared aerogels with various concentration of base catalyst. The optical transmission was found to be in the range of 70 to 85 % with different concentration of  $\text{NH}_4\text{OH}$ . Optical transmittance decreases with increasing concentration of  $\text{NH}_4\text{OH}$  [3]. It is also observe that, the optical transmission decreased with decrease in the incident wavelength. This is because the Rayleigh scattering becomes more effective at shorter wavelengths and thereby reducing the optical transmission.

Figure 3 shows the TEM image for the silica aerogels prepared with different concentration of  $\text{NH}_4\text{OH}$ . It is clearly seen that the aerogel with 3.5 ml  $\text{NH}_4\text{OH}$  concentration has compact network with a mostly smaller pores and particles compared to 5.5 ml  $\text{NH}_4\text{OH}$  concentration, which is due to resulting in higher volume shrinkage and hence higher density [1].

Figure 4 shows the photographs of TEOS based aerogels prepared by two-step sol-gel process, using HCl and ammonium hydroxide. The prepared aerogels with higher optical transmission were observed. The enhancement in the optical transmission of aerogels derived by the two- step sol-gel process is because of the smaller and uniform silica particles formation may be due to faster gelation.

### 4. Conclusions

Two step sol- gel method was successfully employed to synthesize the silica aerogel. The optical transmittance was measured ~85% with density ~0.062  $\text{g}/\text{cm}^3$ . The compact network with a mostly smaller pores and particles observed in TEM analysis.

### Acknowledgments

Author N.A.Pawar is thankful to Prof N.B.Chaure, Department of Physics, Savitribai Phule Pune University, Pune, under whose supervision the work is carried out.

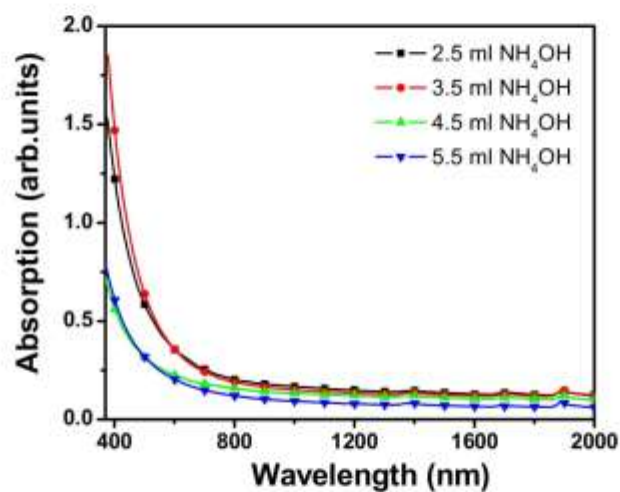
### References

- [1] S. D. Bhagat, (2007), *Journal of Materials Science*, 42, 3207-3214
- [2] A. Venkateswara Rao , S.D. Bhagat , H.Hirashima G.M. Pajonk, (2006), *Journal of Colloid and Interface Science* 300 279–285
- [3] H.temon, T. Kitamura, and M.Okazaki , (1998), *journal of colloid and interface science* 197, 353–359

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

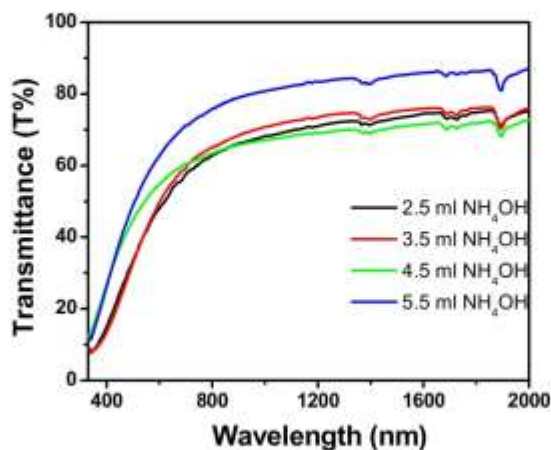
Bjb	TEOS (ml)	Ethanol (ml)	HCl (ml) (0.01M)	NH <sub>4</sub> OH (0.1M)	Density (gm/cm <sup>3</sup> )	Volume Shrinkage (%)
1	5	25	3.5	2.5	0.0626	11%
2	5	25	3.5	3.5	0.0673	16%
3	5	25	3.5	4.5	0.0789	20%
4	5	25	3.5	5.5	0.0840	22%

**Table 1.** A Summary of Values of Density And Volume Shrinkage of Silica Aerogels With Various Concentration of NH<sub>4</sub>OH.

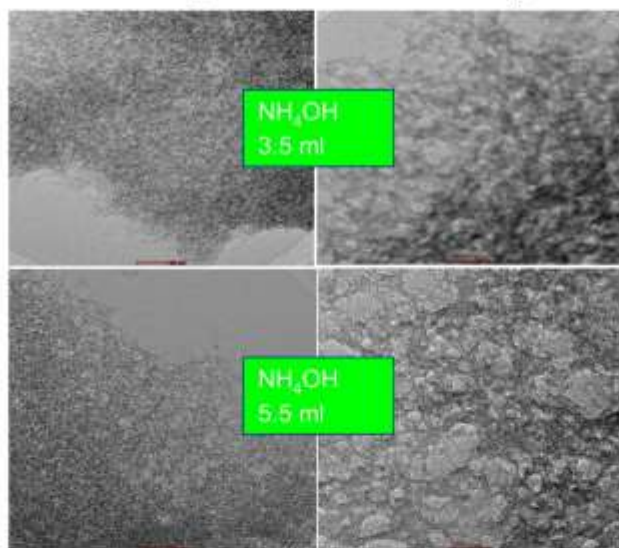


**Figure .1** Optical Absorption Spectra of the TEOS Based Aerogel With Various Concentration of NH<sub>4</sub>OH.

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*



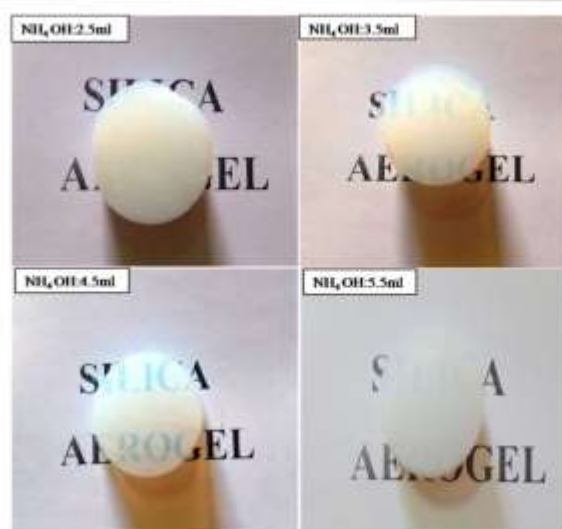
**Figure .2** Optical Transmission Spectra of The TEOS Based Aerogel With Various Concentration of NH<sub>4</sub>OH.



**Figure 3.** A Typical TEM Image Of Silica Aerogels Prepared At Different Concentration Of NH<sub>4</sub>OH

[20]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*



**Figure 4.** Photographs of aerogels prepared with different concentrations of  $\text{NH}_4\text{OH}$

## 20. Biochemical alteration in healthy and affected leaves of sorghum due to *Sphacelotheca reiliana*



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Botany)

### BIOCHEMICAL ALTERATION IN HEALTHY AND AFFECTED LEAVES OF SORGHUM DUE TO *SPHACELOTHECA REILIANA*

**Rangnath Aher**

Department of Botany, New Arts, Commerce and Science College, Parner, Dist- Ahmednagar, Maharashtra, India., [rkaher69@gmail.com](mailto:rkaher69@gmail.com)

**Sajan Khapake**

Department of Botany, New Arts, Commerce and Science College, Parner, Dist- Ahmednagar, Maharashtra, India.

#### ABSTRACT

Sorghum is an important food and fodder crop of India. It is a major staple food in India. Grain mould in sorghum is caused by *Sphacelotheca reiliana*. In the present studies post inflectional changes in sugars and free amino acids in healthy and infected leaf of sorghum were investigated. Gradual reductions in sugar contents were observed in grains of sorghum affected with grain mould. Eight amino acids were detected in healthy leaves.

**Key words:** Sugar, Amino acids, Sorghum, *Sphacelotheca*

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Rangnath Aher

#### INTRODUCTION

Grain mould is a major disease of sorghum (*Sorghum bicolor* (L.) Moench) that affects grain production and quality of crop. The disease is particularly important on improved, short and medium-duration sorghum cultivars that mature during the rainy season. Photoperiod-sensitive cultivars that mature after the rains often escape mould infection. Sorghum cultivars more vulnerable to grain mould than others. Grain mould can be broadly defined as pre harvest grain deterioration caused by several fungal species interacting parasitically and saprophytically with developing grain (1).

Grain weathering, on the other hand, is a post physiological maturity problem when grain turn discoloured and tissues are damaged by fungal infection due to wet weather. One of the first visible symptoms is colour changes of the lemma, glumes, and lodicules. Depending on the fungal infection, the grain maturity stage and severity of infection, the symptoms could be highly variable. Severely infected grain is fully covered with mould; partially infected grain may look normal and discoloured. Grain sorghum can be affected by a wide variety of diseases, which can cause serious losses of production (12).

[17]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

The fungal spores live in the soil in dormant stage and germinate in the spring. Spores will actively invade the sorghum plant in the nodal region of the shoot apex. The disease will continue to grow in the plant, actively destroying the reproductive tissues. A black mass of spores replaces some or completely all of the sorghum head. When grains are infected, some hybrids are dwarfed and will tiller profusely. Spores move with wind, water or any other means to the soil and serve as inoculum for the next year. Since each infected plant produces huge amount of spores, the threat of infection for the next year is increased. Head smut spores can remain viable for years in the soil (14). Changes in free amino acids, amides and carbohydrates and free sugars have been reported by various workers as a result of disease caused by fungi (2 and 7).

Grain mould, the most important and widespread disease of sorghum worldwide, is a major constraint to sorghum productivity. Grain mould development is particularly severe in the short duration hybrid cultivars and varieties that are grown during the rainy season under warm and humid conditions. It is caused by a number of unspecialized fungal pathogens that severely affect grain mass, seed viability, grain quality and market price. In the present studies post inflectional changes in sugar and free amino acids caused by the infection grain mould and healthy plant material are reported here.

#### **MATERIAL AND METHODS**

The leaves of healthy and infected grains were dried at 80°C and powdered. Equal quantities of samples were extracted with 70 per cent alcohol for 24 hrs. at room temperature. The filtrates were then evaporated at 80°C to almost dried and dissolved in 1 ml of ethanol. These were spotted on Whatman No.1 filter paper sheet in equal quantities in triplicate along with known sugars. Descending chromatography method (6) using n-butanol, acetic acid and distilled water the ratio of 4:1:15 as solvent was employed. After air drying, chromatograms were sprayed with Benzidine reagent, air dried and then kept at 90°C for 5 minute for detection of spots. The intensities of the spots were compared visually and according to their concentration were graded in five categories in Table 1. Free amino acids were also detected by chromatography techniques and result put in Table 2.

#### **RESULTS AND DISCUSSION**

The aim of present investigation was to detect by visual observations the relative concentrations of individual free sugars and free amino acids. During this investigation it was observed that healthy inflorescence had monosaccharides glucose and ribose in moderate quantities whereas sugar like arabinose was more. The disaccharide comparatively lactose was less. In grain mould the monosaccharides glucose and ribose as well as disaccharides lactose completely disappeared and only very little amount of arabinose was left. It may be because the related fungus utilized these sugars for its growth and sporulation in the host body. The disaccharide lactose must be split up into glucose and galactose and must be utilized by the fungus during infections. The healthy leaves had more amount of the glucose and lactose. The rust fungus utilized only small amount of glucose whereas arabinose and lactose remained the same observed during study.

Continuous reductions in sugar contents were detected in plant material of *Sorghum vulgare* affected with *Sphacelotheca*. The degree of reduction varies in different sugars. It is observed that in diseased leaves all the sugars, glucose, raffinose, rhamnose and sucrose were reduced considerably (10). It is also noticed that sucrose, glucose and fructose and malic acid were present both in the healthy and infected plant material. Marked



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

differences were noticed in their intensities in certain cases of plants. The concentration of sucrose was considerably reduced in the infected fruits tissues (8 and 11). This may be attributed to sugar consumption by the pathogen or to its hydrolysis into the component sugars, glucose and fructose by the enzyme produced by the fungus (16). These observations do not agree with those reported by (6) and (7) also observed metabolic alterations in *Sorghum* varieties.

It can be assumed that, from the results obtained that most of monosaccharides are utilized by phytopathogens and saprophytes for their growth and establishment in the host tissue. Among these some are capable of splitting up disaccharides also and use them for their growth and sporulation.

Eight amino acids i.e cysteine, lysine, arginine, aspartic acid, alanine, tryptophan, methionine and phenylalanine were detected in healthy leaves of sorghum. Aspartic acid and phenylalanine were more in concentration. Due to infection by *Sphacelotheca* some quantitative and qualitative changes in amino acids were noticed. While alanine was almost utilized in the diseased material, cysteine, arginine, tryptophan, methionine and phenylalanine were considerably reduced in their quantities. The remaining amino acids lysine and aspartic acid were also reduced in some extent due to fungal infections. The seedling growth and changes in reducing sugars and free amino acids were determined during germination of low and high tannin seeds of sorghum. Accumulation of reducing sugars, free amino acids, and degradation of starch were considerably low in seeds (5). It also found that enzymes involved in amino acids are activated as a result of infection in plants consequently leading to decrease of free amino acids and amides (9).

#### REFERENCES

1. Aher R K and L N Nair. (2003). Biochemical changes in sorghum due to *Sphacelotheca sorghi*. Asian journal of microbiology biotechnology and environmental sciences, 5 (3): 150-153.
2. Ange P T., Benoit B K and M Gudapati. (2019). Free sugars and non-starch polysaccharides-phenolic acid complexes from bran, spent grain and sorghum seeds. Journal of Serial Science 87: 131-137.
3. Bharathi Bhat (2003). Sorghum grain mold: Resistance stability in advanced B-line. International Sorghum and Millet Newsletter. 44:108-112.
4. Block R J., E C Durrum and G. Zweig.(1955). A manual for paper chromatography. Academic Press Publication.
5. Chavhan J K ., S S Kadam and D K Salunkhe. (2020). Changes in Tannin, Free Amino Acids, Reducing Sugars, and Starch During Seed Germination of Low and High Tannin Cultivars of Sorghum. Jr of Food Science. 20(1): 118-122.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

6. Deshmukh R. N., Laware S. L., K. N. Dhumal. (2001). Metabolic alterations in *Sorghum bicolor* under water-stress. *Journal of Maharashtra Agricultural Universities*, 26(3):50-53.
7. Khapke S L., S L Laware, R K Aher, K N Dhumal, (2004). Screening of drought stress tolerance in soybean (*Glycine max L.*) cultivars. *Asian journal of microbiology biotechnology and environmental sciences* 6 :57-60.
8. Mpfu Leo T. and Neal W. McLaren. (2014). Ergosterol concentration and variability in genotype-by-pathogen interaction for grain mold resistance in sorghum. *Planta.*; 240(2): 239–250.
9. Rudolph K. 1963. Weiter biochemieUntersuchung. *Phytopath.* 46.: 276-290.
10. Sriivastava, M. P. and R. N. Tandon. (1966). Free amino acid spectrum- of healthy and infected "Moshambi" fruit. *Naturwissenschaften*, 19 : 508-509.
11. Singh B P and R N Tandon. (1970). Post inflectional changes in sugars and organic acid contents of orange fruits. *Indian Phytopathology*, XXIII : 728-729.
12. Thakur R P, Rao V P, Navi S S, Garud T B, Agarkar G D and Bharathi Bhat. (2003)b. Sorghum grain mold: Variability in fungal complex. *International Sorghum and Millet Newsletter*. 44:104-108.
13. Thakur R P, Rao V P, Krishnappa K, Agarkar G D, Solunke R B and Bharati Bhat. (2005). Variability among the sorghum grain mold fungi. Invited paper presented at the National Symposium on "Crop Disease Management in Dry land Agriculture" an Annual meeting of Indian Phytopathological Society, New Delhi, held at MAU, Parbhani.
14. Thakur R P, Reddy B V S, Indira S, Rao V P, Navi S S, Yang X B and Ramesh S. (2006). Sorghum Grain Mold. *Information Bulletin No. 72. International Crops Research Institute for Semi-Arid Tropics. Patancheru 502324, Andhra Pradesh, India: 32.*
15. Vasanthi S and R V Bhat. (1998). Mycotoxins in food. Occurrence, health and economic significance and food control measures. *Indian Journal of Medical Research*. 108:212-222.
16. Williams R J and Mc D Donald. (1983). Grain molds in the tropics: problems and importance. *Annual Review of Phytopathology*. 21:153-178.

[20]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

**Table 1: Sugar content in healthy and infected grains of sorghum**

Plant Material	Glucose	Lactose	Arabinose	Ribose	Rhamnose
Control Healthy Grains	++	+	+++	++	-
Grain smut	--	--	+	--	--

**Table 2 : Free amino acids in healthy and infected plant part of Sorghum**

Amino Acids	Plant Material	
	Healthy	Infected
Cysteine	4	2
Lysine	4	3
Arginine	4	2
Aspartic acid	3	2
Alanine	4	0
Tryptophan	4	2
Methionine	4	2
Phenylalanine	3	1

Quantitative amino acids determination based upon intensity of chromatogram spots and size: O- Absent, 1- Trace, 4- Abundant

[21]

## 21. Investigation of Biocomponents Over Groundnut Crop Fields at Ahmednagar

**Special Issue**

*Chief Editor*  
Dr. M. Sadik Batchu

*Advisory Editor*  
Dr. N. Chandra Segaran

*Editorial Board*  
Dr. MAM. Rameez  
Dr. Jeyaraman  
Dr.A. Ekambaram  
Dr. G. Stephen  
Dr. S. Chitra  
Dr. S.Senthamizh Paval  
Dr. A. Shunmughom Pillai  
Dr. P. Jeyakrishnan  
Dr. Seetha Lakshmi  
Dr. S. Easwaran  
Dr. Kumara Selva  
Dr. Ganesan Ambedkar  
Dr. Krishanan  
Dr. Kumar  
Dr. S. Kalpana  
Dr. T. Vishnukumar  
Dr M. N. Rajesh  
Dr. Govindaraj  
Dr. Uma Devi  
Dr. Senthil Prakash  
Dr. Pon. Kathiresan  
Dr. S. Vignesh Ananth  
Dr.M. Arunachalam  
Dr. S. Bharathi Prakash

20-22 ஜூன் 2021  
3<sup>rd</sup> to 5<sup>th</sup> June 2021

ISSN : 2321 - 984X

**நவீனத் தமிழாய்வு**  
(மலர்மலர்மலர்மலர் மலர் மலர்மலர்)

*Journal of*

**Modern Thamizh Research**  
(A Quarterly International Multilateral Thamizh Journal)  
Arts and Humanities (all), Language  
Literature and Literary Theory, Tamil  
UGC Care Listed (Group-I) Journal

Multi-Disciplinary International Webinar -2021  
**P.G. & RESEARCH DEPARTMENT OF HISTORY**  
Special Issue : **C. ABDUL HAKEEM COLLEGE (Autonomous)**  
(Affiliated to Thiruvalluvar University Serkkaadu- 632115, Villupuram.)  
Melvisharam, Ranipet District, Tamilnadu.

**THE IMPACT OF LIBERALIZATION, PRIVATIZATION AND GLOBALIZATION [ICLPG-2021]**

*Special Issue Editors*

<p><b>Mr. J. BENET RAJADURAI</b> Assistant Professor</p> <p><b>Prof. S.C. ANDREW MICHAEL</b> Assistant Professor</p>	<p><b>Dr. P. KUMARAN</b> Assistant Professor</p> <p><b>Dr. K. M. A. MOHAMED OMER FAROOQUE</b> Assistant Professor</p>
--	---

**Dr. NISHA JOLLY NELSON**  
Head & Assistant Professor

**Published by**  
**RAJA PUBLICATIONS**  
10, (Upstair), Ibrahim Nagar, Khajamalai,  
Tiruchirappalli - 620 023, Thamizh Nadu, India.  
Mobile : +91-9600535241  
website : rajapublications.com

21 பகுதி-4  
Part -4

Scanned with CamScanner

## INVESTIGATION OF BIOCOMPONENTS OVER GROUNDNUT CROP FIELDS AT AHMEDNAGAR

S.K. AHER

V.P. DHAWALE

New Arts Commerce and Science College Parner,  
Dist. Ahmednagar - 414 302 India

### Abstract:

An extramural survey of airborne microbial components over groundnut fields was undertaken for two consecutive summer crop seasons at Ahmednagar (M.S.), to study a definite correlation between the air borne micro organisms, meteorological parameters, growth stages of the crop plants and their impact in bringing about the disease incidence to the crop plants. Ground nut (*Arachis hypogaea* L.) is a major oil yielding crop in India and is affected by different airborne diseases. During the present study, different air borne components such as fungal spores, pollen grains, hyphal fragments, insect parts, etc. have been recorded. Among them the common fungal spores were *Cladosporium*, *Alternaria*, *Fusarium*, *Albugo*, *Claviceps*, *Bispora*, *Helminthosporium*, rust spores, smut spores, etc. were observed and were responsible for causing number of diseases over groundnut crop. The total 77 fungal spore types and 5 other types were found. The group Deuteromycotina dominated the airspora having highest concentration (74.10% and 70.39%) followed by Ascomycotina (11.78% and 14.27%), Phycomycotina (6.22% and 7.11%), other type (5.95% and 5.46%), Basidiomycotina (1.81% and 2.16%) and Myxomycotina (0.01% and 0.57%) in the first and second summer seasons respectively. This data may be useful in formulating basis for disease forecasting when studied in relevance to meteorological parameters.

**Key words:** Ground nut crop, air sampler, fungal spores, disease incidence, meteorology.

### Introduction

Groundnut (*Arachis hypogaea* L.; Family Fabaceae) is annual herb growing up to 30 to 50 cm. It is an important oilseed crop in tropical and subtropical regions of the world. In Maharashtra, the crop is grown in kharif and summer seasons. About 75 million hector of land is under groundnut cultivation and the production is about six million tones. It is the third most important source of vegetable protein. Groundnut kernel contains up to 50% of non-drying oil and 35% proteins. Groundnut have many uses, they can be eaten raw, roasted or with various recipes. Groundnut oil is often used in cooking. It is healthier and contains high energy. However the crop is susceptible to a may kind of air borne, soil borne and seed borne diseases caused by fungi, bacteria, nematodes and viruses results into low yield of kernel and poor quality of fruits. Some of the important and major fungal diseases of groundnut crop are early leaf spot (*Cercospora arachidicola*); late leaf spot (*Cercospora personata*); Rust disease (*Puccinia arachidis*); root rot (*Macrophomina phaseolina*); collar rot or seedling blight (*Aspergillus niger*), viral diseases are rosette (groundnut rosette assistor virus); groundnut bud necrosis disease disease (groundnut bud necrosis virus), etc. However,

தமிழ்நாடு பல்கலைக்கழக அறிவியல் மற்றும் தொழில்நுட்ப அமைச்சு, தமிழ்நாடு அரசு (2021 - சிறப்பு இதழ்) (ISSN 2321-984X)

Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)

Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [ICLPG-2021]"

Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

during present investigation more trace has been given to the fungal components of airspora.

Aerobiology deals with the study of microorganisms which are present in the atmosphere. According to modern concept, it includes dispersion of insect population, bacteria, fungal spores, pollen grains, molds, viruses, bacteria and all forms of life, both plants and animals that are borne and transported partially or wholly by the atmosphere (Jacobs, 1951). All these component of biological origin occur in the air and constitute the 'airspora'. The studies of airborne biocomponents except fungal spores are known as 'Other biocomponents'. In many earlier aerobiological surveys the emphasis was given to the fungal spores and pollen grains due to their importance in various aspects (Mali et al., 2006; Tilak, 1984; Aher et al., 2002; Mali and Gaikawad, 2011; Aher, 2017; Krishnamurthi and Vitthal, 1983; Thakur and Jite, 2015; Kadam et al., 2008; Mahajan and Pande (2002), Ghuge et al., 2020; Aher and pande, 2004). The fungal aerobiocomponents play an important role as pathogenic organisms as well as aeroallergens similar to pollen grains.

The present study was undertaken to elaborate and accumulate the information regarding the airborne concentration of the pathogen and its role in causing the disease and its ultimate disease incidence in relation with the meteorological factors.

**Material and Methods**

The present aerobiological investigations were carried out over ground nut fields at Walunj, Ahmednagar, India with a view to study qualitative and quantitative assessment of airspora with the help of Tilak continuous air sampler (Tilak and Kulkarni, 1970). The sampler continuously runs with 320V current and the drum

present inside the sampler completes one rotation in eight days. The sampler was operated over the groundnut fields for two consecutive summer seasons i.e. first season from 12th May 1990 to 31st August 1990 (summer season I) and second season from 5th My 1991 to 20th August 1991 (summer season II). Regular visits to the field were arranged.

The culture plates were also exposed periodically for the study. In order to understand the exact morphology of the fungal spores, the petriplates of PDA media were exposed at every eight days interval for 15 minutes, at the sampling site. Thus the reference slides were prepared for comparative study of the fungal spores.

The meteorological data was maintained throughout the period of investigation. Scanning and detailed calculations were obtained by using same method described earlier (Tilak and Srinivasulu, 1967). Identification of fungal spores was accomplished with the help of visual identification and literature after Ellis (1971), Barnet and Hunter (1972), Tilak (1989) and Nair et al. (1986).

**Result and Discussion**

During the period of present investigation an exploration of airborne microbes was done in extramural atmosphere over groundnut (*Arachis hypogea* L.) Var. SB 11, for two summer crop seasons using continuous volumetric Tilak air sampler, in order to study the correlation between airborne microbial components, weather parameters, growth stages of the crop plants and subsequently their effect on disease incidence on the crop. All the trapped airborne mycofloral types have been categorized as 'spore types'. In addition, hyphal fragments

தமிழ்நாடு ஆய்வு (அனைத்துமுகப்படுத்தப்பட்ட) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-8940)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-8940)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (CLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvishram, Ranipet District, Tamilnadu.

INVESTIGATION OF BIOCOMPONENTS OVER GROUNDNUT CROP FIELDS AT AHMEDNAGAR 1079

insect parts, pollen grains and unidentified spore types were also trapped and were considered under an artificially formed group 'Other type'.

Totally 82 types of airborne components were reported of which 1 belonged to Myxomycotina, 4 to Phycomycotina, 25 to Ascomycotina, 3 to Basidiomycotina, 44 to Deuteromycotina and 5 to Other types.

In the first summer crop season 1990, Deuteromycotina contributed with the highest percentage (74.10%) to the total airspora followed by Ascomycotina (11.78%), Phycomycotina (6.22%), Other types (5.95%), Basidiomycotina (1.81%) and Myxomycotina (0.01%). In the second summer crop season also Deuteromycetes stood first in contribution, contributed 70.39% to the total airspora, followed by Ascomycotina 14.27%, Phycomycotina 7.11%, Other types 5.46%, Basidiomycotina 2.16% and Myxomycotina 0.57% (Fig. 1).

The airborne spore types like *Cladosporium*, *Aspergillus*, *Alternaria*, *Rhizopus*, *Curvularia Sordari*, Hyphal fragments, *Haplosporella*, *Cunninghamella*, *Nigrospora*, *Ascotricha*, *Amphisperella*, smuts, *Cercospora*, *Periconia* etc. contributed significantly to the total airspora in both the summer seasons.

During the period of investigation, the ascospores were trapped only when the environmental conditions were favourable for their formation and liberation into the air. About 25 ascospores were identified. The group Ascomycotina stood second in order of dominance, contributed 11.78% and 14.27% to the total airspora (Fig. 1).

The smut spores and rust spores (including urediniospores and teleutospores) the

representatives of group Basidiomycetes, occurred with meagre concentration. The members of the Basidiomycotina contributed 1.81 and 2.16% to the total airspora in first and second summer seasons (Fig. 1).

The biggest contingent toll of 44 airborne types, belonging to the group Deuteromycotina, contributed 74.10% and 70.39% to the total airspora during first and second summer crop seasons. The most regularly occurring spore types which contributed in the considerable number were *Alternaria*, *Aspergillus*, *Cladosporium*, *Curvularia*, *Haplosporella*, *Helminthosporium*, *Nigrospora*, etc.

Monthly percentage contribution of each spore group showed that, the Myxomycotina showed their appearance only in the month of May during first summer season and in the month of June, July and August during second summer season. However, members of the group Phycomycetes, Ascomycetes, Basidiomycetes, 'Other types' and Deuteromycetes showed their appearance during all the months of study period (Table 1).

In addition to the scientifically formed spore groups, 'Other types', an artificially formed group, ranked fourth in the order of dominance, contributed 5.95 and 5.46% to the total airspora (Fig. 1). The group, being heterogenous in composition, comprised of hyphal fragments, insect parts, plant parts, pollen grains and unidentified spore types.

During the period of investigations in both the summer crop seasons, the total airspora was found to be rich during intermittent rainy periods. Concentration of the total catches (119364/m<sup>3</sup> of air) in the second summer crop

நவீனத் தமிழ் ஆய்வுகள் (அண்மைக் காலம் முதல், தமிழ் அறிவியல் கல்வித் துறை) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-984X)

Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)  
Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [ICLPG-2021]"  
Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

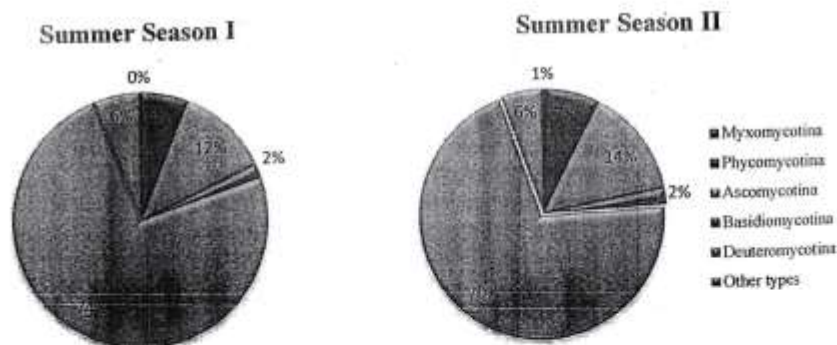
S.K. AHER & V.P. DHAWALE

1080

season was found to be more as compared to the total concentration (92862/m<sup>3</sup> of air) of the catches in the first season (Fig. 1). In the first summer crop season 1990, from the total airspora maximum spore load (33866 m<sup>3</sup> of air) was observed in the month of June followed by July and August, whereas in the second summer it was 40502 m<sup>3</sup> of air in the month of August 1991, followed by July and August 1991. The lowest incidence (14812 and 15106 m<sup>3</sup> of air) was observed in the month of May 1990 and 1991 respectively. Thus, it can be concluded that the absence of suitable substrate, insufficient moisture and vegetation had declining effect on composition and concentration of airspora. An adequate range of temperature, high percentage humidity and precipitation had

profound effect not only on the growth and development of hosts but also on increase on microbial population. This probably justifies high incidence of spores in rainy period and low incidence in dry periods. Fluctuations in the humidity occurring during night and early morning hours, affected the liberation of airborne components (Gregory, 1961; Meredith, 1962). Gregory (1961) stated that where there are more fluctuations in weather parameters then accordingly atmospheric microbial population also fluctuates. The findings correlates with a Janaki Bai and Subba Reddy (1982), Sonawane et al. (2017), Patil (1985), Jogdand (1987), Arsule and Pande (2012), Karne (2013), Ghuge (2020), Aher (2017; 2019) and many more.

Figure 1: Total airspora and percentage contribution of each spore group for two consecutive summer seasons (summer season I and summer season II).



தமிழ்நாடு பல்கலைக்கழகங்களின் இணைந்து ஆய்வுகள் (தமிழ்நாடு) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-984X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [CLPG-2021]"  
 Organized by: P.G. & Research Department of History, C. Abdul Halim College (Autonomous), Melvisham, Ranipet District, Tamilnadu.



INVESTIGATION OF BIOCOMPONENTS OVER GROUNDNUT CROP FIELDS AT AHMEDNAGAR 1081

Table 1: Monthly percentage contribution of each spore group for two crop seasons (summer season I and summer season-II).

Spore Group/Class	May		June		July		August	
	Season I	Season II	Season I	Season II	Season I	Season II	Season I	Season II
Myxomycotina	100	---	---	42.85	---	48.97	---	8.16
Phycomycotina	10.41	13.01	31.23	29.48	33.65	32.12	24.69	25.37
Ascomycotina	10.10	11.17	40.53	16.92	32.73	26.21	16.62	45.68
Basidiomycotina	27.50	24.32	10.83	31.89	26.66	35.67	35.00	8.10
Deuteromycotina	17.01	11.91	37.58	26.37	26.39	27.94	19.04	33.77
Other types	14.46	22.23	29.18	25.53	26.80	22.74	19.54	29.39

References

Aher S.K. (2017) "Aerobiological studies with special reference to ascospores over groundnut field at Ahmednagar, Maharashtra", Adv. Plant. Sci., 30(1): 93-96.

Aher S.K. (2019) "Environmental monitoring of other bioparticles in the airspora over groundnut fields", International Journal of Research and Analytical Reviews. 6(2): 149X-151X.

Aher S.K. and Pande B.N. (2004) "Aerobiological approach to pathogenic fungal spores over groundnut field", Eco. Env. and Cons., 10 (1):57-59.

Aher S.K., Thite S.V. and Pande B.N. (2002) "Fungal airspora of a groundnut field", Eco. Env. and Cons., 8(3):283-288.

Arsule, C.S. and Pande, B. N. (2012) "Aeromycology of *Cercospora* on groundnut at Newasa (M.S.)", Internat. J. Plt. Protection, 5(1): 8-11.

Barnett H.L. and Hunter B.B. (1972) "Illustrated genera of Imperfect Fungi", 3rd ed. Burgess Publishing company. Minneapolis, Minnesota.

Ellis. M.B. (1971) "Dematiaceous Hyphomycetes", Common Wealth Mycological Institute, Kew, Surrey, England.

Ghugre A.S., Mandge S.V., Chate D. B. (2020) "Study of air-spores over the ground field at Manwath", Journal of Emerging Technologies and Innovative Research, 7(4): 409-415.

Gregory P.H. (1961) "The microbiology of the atmosphere", Leonard Hill (Books) Limited. Inter Science Publisher. INC New York. pp1-205.

Jacobs W.C. (1951) "Aerobiology in compendium of meteorology", American Meteorological Society, Boston, pp 1103-1111.

Janaki Bai, A. and Subba Reddy (1982) "The fungal aerospora of Vishakhapatnam", Proc. Indian Nat. Sci. Acad. B., 47: 731-747.

Jogdand, S.B. (1987) "Airspora at Aurangabad", Ph. D. Thesis, Marathwada University, Aurangabad.

Kadam R.M., Reddy N.J.M., Jadhav B.S. and Nagpure V.S. (2008) "Aerobiological approach to leaf spot and rust disease of groundnut (*Arachis hypogea* L.)", Internat. Jr. Plant Protection, 1(2): 63-65.

புதிய தமிழ்ச் சஞ்சிகை (சமீப காலத்தில் வெளியான) (தமிழ்) 3-5 ஜூன் 2021 - சிறப்பு இதழ் (ISSN 2321-984X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [ICLPG-2021]"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

S.K. AHER & V.P. DHAWALE

1082

Karne A.V. (2013) "Aeromycological investigations in the ambient air over some crop fields in context to pathogenic and allergenic fungal bioaerosols", *Nature Environment and Pollution Technology*, 12(4): 695-698.

Krishnamoorthi K. and Vittal P.B.R. (1983) "A survey of airborne fungi and pollen in the city Madras (India)" *Abst. Int. Aerobiol. Newslett*, 17: 51-54.

Mahajan M.C. and Pande B.N. (2002) "Atmospheric incidence of rust spores over groundnut fields", *Eco. Env. and Cons.*, 8(3): 257-259.

Mali N.S. and Gaikawad Y.B. (2011) "Studies in pathogenic airspora and epidemiology of groundnut crop at Solapur during two kharif seasons", *Bioscience Discovery*, 2(1): 113-116.

Mali V.P., Aher S.K., Sonawane V.V. and Pande B.N. (2006), "Relevance of rust spore load over Bajara field", *International Journal of Plant Sciences*, 1(2): 214-216.

Nair P. K. K., Joshi A.P. and Gangal S.V. (1986) "Airborne pollen, spores and other plants materials India - A. survey", CSIR Centre for Biochemicals and National Botanical Research Institute, Lucknow.

Patil B.Y. (1985) "Aerobiological studies at Aurangabad", Ph.D. Thesis, Marathwada University, Aurangabad.

Sonawane B. N., Arsule C. S. and Pande B. N. (2017) "A survey of bioaerosols over groundnut fields at Newasa, Dist. Ahmednagar (M.S.)" *International Journal of Recent Scientific Research*, 8(8): 18954-18958.

Titakur V.A. and Jite P.K. (2015) "Circadian periodicity studies in the incidence of airborne spores of *Leptosphaeria* and *Didymosphaeria*". *Internat. Jr. of Curr. Res. and Academic Review*, 3(4): 185-189.

Tilak S.T. (1989) "Airborne pollen and fungal spores", *Vaijayanti Prakashan, Aurangabad*.

Tilak S.T. and Kulkarni R.L. (1970) "A new airsampler", *Experientia*, 26: 443-444.

Tilak S.T. and Srinivasulu B. (1967) *Indian J. Microbio.*, 7: 167 - 743.

Tilak S.T. (1984) "Aerobiology and cereal crop diseases", Ed.S.P. Ray Chaudhari. *Rev. Trop. Plant Path.*, 1: 239-354.

□□□

Modern Tamilizh Research (A Quarterly International Multilateral Tamilizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-9841)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Haqem College (Autonomous), Melvishram, Ranipet District, Tamil Nadu

## 22. Performance of Soybean Mutants for Yield and Yield Components

J. Soils and Crops 31 (1) 127-130, June 2021

ISSN 0971-2836 (Print)  
ISSN 2582-2756 (Online)

### PERFORMANCE OF SOYBEAN MUTANTS FOR YIELD AND YIELD COMPONENTS

Vaishnavi Deshmukh<sup>1</sup>, M. P. Meshram<sup>2</sup> and R. N. Deshmukh<sup>3</sup>

#### ABSTRACT

The present investigation was taken to study the "Performance of soybean mutants for yield and yield components". The experimental material comprised of 20 soybean mutant lines along with 2 checks TAMS-38 and JS-335. The experiment was conducted at Shankar nagar, Research field of Agricultural Botany Section, College of Agriculture, Nagpur during *kharif* 2019. Mutant lines with checks were evaluated for days to 1<sup>st</sup> flower, days to 50% flowering, days to maturity, plant height, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, 100 seed weight, oil content and seed yield plant<sup>-1</sup>. Mutant line number 10 (T2/2/1-1) and mutant line number 14 (T2/5/1-1) were isolated as superior lines over all the mutant lines compared with checks for further soybean breeding programme.

( Key words : *per se* performance, mutant line, breeding )

#### INTRODUCTION

Soybean is also known as "Gold of soil" due to its various qualities such as ease in cultivation, less requirement of fertilizers and labor resulting in high cost:benefit ratio. *Glycine max* is probably polyploid in its origin although the exact nature of its origin is yet to be understood (Darlington and Janaki Ammal, 1945). It is categorized as an oilseed rather than a pulse, despite being the rich source of protein and used as food and feed by the human as well as livestock across the globe.

This soybean has grown within China used for more than 4000 years (Hymowitz, 1970). Soybean being predominantly self-fertilized, inherent variability in this crop may not be sufficient to develop new varieties possessing different desirable characters. It carries a very high nutritional value which contains about 40% proteins, possessing high level of essential amino acids except methionine and cystine, 20% oil rich in polyunsaturated fatty acids specially omega-6 and omega-3 fatty acids, 6 to 7% total minerals, 5 to 6% crude fibre and 17 to 19% carbohydrates (Chauhan *et al.*, 1988).

Besides, it has a number of nutraceutical compounds such as tocopherol, iron, vitamin B-complex, lecithin and isoflavones such as daidzein, genistein of glycitin made it one of the most valuable agronomic crops in the world (Khan and Tyagi, 2013). Yield and related characters are controlled by the polygenic system. Under such situation, mutation breeding is now playing an

important role in developing new genetic resource and breakage of unwanted linkages.

The cultivar TAMS-38 was taken for the study because this cultivar is recommended as high yielding, better adoptable into the area of Vidarbha but highly susceptible to root rot and moderately susceptible to YMV (Yellow mosaic & virus). This situation heads breeders on to new breeding technologies. The breeding objective in soybean is to develop varieties with high yield, early maturity, disease, and insect resistant. To achieve these objectives and bring about desired genetic improvements in the crop, the induced mutation is proved to be most effective. Therefore, it is our prime need to develop high yielding cultivar. Putting this view, the present work was framed and was implemented by selecting the high yielding mutants in M<sub>1</sub> generation.

#### MATERIALS AND METHODS

The experiment was conducted at Research field of Agril. Botany Section, College of Agriculture, Nagpur during *kharif* 2019. In replicated trial using Randomized Block Design replicated thrice in *kharif* 2019-20 all the harvested seed from each (20) mutants of M<sub>1</sub> generation along with 2 checks (TAMS-38 and JS-335) were sown to raise M<sub>1</sub> generation. All the recommended cultural practices were followed to raise a good crop.

The data on days to first flower, days to 50 % flowering, days to maturity, plant height (cm), number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, 100 seed weight

1. P.G. Student, Agril. Botany Section, College of Agriculture Nagpur, Maharashtra
2. Asst. Professor, Agril. Botany Section, College of Agriculture, Nagpur
3. Head, Dept. of Botany, NAC&S College, Parner, Maharashtra

(g), oil content (%) and seed yield plant<sup>-1</sup>(g) were recorded. Analysis of variance (Table 1) for these characters worked out and *per se* performance (Table 2) evaluated, as per the methodology suggested by Panse and Sukhatme (1954).

## RESULTS AND DISCUSSION

The mean sum of squares due to genotypes were highly significant for all the characters studied (Table 1). This reveals that the genotypes had significant amount of genetic variability among themselves for seed yield plant<sup>-1</sup> and other yield components, which allow the further estimation of different parameters for all nine characters.

Overall mean performance i.e. *per se* performance (Table 2) showed significant difference between characters. Average mean of days to 1st flower was 39.61, days to 50% flowering (47.34), days to maturity (99.60), plant height (58.90 cm), number of branches plant<sup>-1</sup> (2.78), number of pods plant<sup>-1</sup> (56.99), 100 seed weight (14.24g), oil content (18.05%), seed yield plant<sup>-1</sup> (13.43g). Mean performance taken into the consideration two mutant lines were isolated as promising genotypes over the best check i.e. TAMS-38 (seed yield plant<sup>-1</sup> 13.36 g, plant height 51.86 cm, number of branches plant<sup>-1</sup> 3.06 and number of pods plant<sup>-1</sup> 54.86. Mutant line number 10 was found to be significantly superior over mean for seed yield plant<sup>-1</sup> (16.79 g), plant height (64.93) cm and at par for number of branches plant<sup>-1</sup> (3.06). Mutant line number 14 was found to be significantly superior over mean for seed yield plant<sup>-1</sup> (16.92 g), number of pods plant<sup>-1</sup> (73.60) and plant height (60.86 cm).

Considering all the characters studied for M<sub>1</sub> mutant lines of soybean, mutant line number 10 (T2/2/1-1) and mutant line number 14 (T2/5/1-1) (Plate 1 and 2) respectively, showed significant superior mean for identification, purification and multiplication and as promising breeding parents (donors) in soybean breeding programme. Bisane *et al.* (2019) stated that analysis of variance indicated that the mean square due to between family were highly significant for all traits revealed the presence of significant genetic variability between the families, 141 mutants were selected from TAMS-38 variety

treated with different doses of gamma rays (T1= 200 Gy, T2 = 250 Gy and T3= 300 Gy). Individual plants from 41 families selected in M<sub>1</sub> generation were suggested to be raised in progeny rows for one more generation so as to attain homozygosity. Lande *et al.* (2018) reported that chlorophyll mutants, early flowering, late flowering, early maturing, late maturing, dwarf, tall, increased root length, increased 100 seed weight, more branched mutants isolated as ecological and morphological mutants from variety TAMS-38. High yielding mutant with 12 g to 17 g yield as against 4.40 g in control were isolated mutants evaluated for their breeding behaviour in further generation and their utilization in improvement in soybean.

Koraddi and Basavaraja (2019) studied variability, heritability and genetic advance in 13 genotypes of soybean for yield and yield component traits. Observations on 11 characters were recorded. Analysis of variance revealed highly significant differences among the genotypes for the all characters, the range was maximum for plant height (39.27-77.73) followed by number of pods plant<sup>-1</sup> (35.87-61.40). Malek *et al.* (2014) studied genetic variability and genetic diversity among 27 soybean mutants and four mother genotypes. Analysis of variance revealed significant differences among the mutants and mothers for nine morphological traits. All the nine morphological traits showed highly significant (50CÚ d<sup>o</sup> 0.01) variations indicating the presence of sufficient amount of genetic variability among the mutants for all the studied traits.

Akram *et al.* (2011) investigated and carried out at the experimental farm of Sakha Research Station, Kafr El-Sheikh, during 2009 and 2010 seasons to study the performance of 15 soybean genotypes for yield and its related traits and reported highly significance between plant height, days to maturity, number of branches plant<sup>-1</sup>, 100 seed weight and number of pods plant<sup>-1</sup>. Arshad *et al.* (2006) evaluated thirty three soybean genotypes for days to flowering, days to maturity, pod length, number of branches, number of unfilled, filled pods and total pods, 100 seed weight and seed yield. Grain yield (kg ha<sup>-1</sup>) was estimated on the basis of 12 m<sup>2</sup> plot size, analysis of variance and mean performance for yield and its components revealed significant differences among all the genotypes for all the characters.



Plate 1. Mutant line number 10 (T2/2/1-1)



Plate 2. Mutant line number 14 (T2/5/1-1)

**Table 1. Analysis of variance (mean sum of squares) for different characters under study in soybean**

Sources of variation	D.F <sup>o</sup>	Mean sum of squares							Seed yield plant <sup>-1</sup> (g)	
		Days to 1 <sup>st</sup> flower	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches plant <sup>-1</sup>	No. of pods plant <sup>-1</sup>	100 seed weight (g)		Oil content (%)
Replications	2	0.060	3.469	4.606	1.302	0.132	49.783	1.414	0.005	4.841
Treatments	21	7.420 <sup>**</sup>	7.126 <sup>**</sup>	15.290 <sup>**</sup>	92.152 <sup>**</sup>	0.637 <sup>**</sup>	111.691 <sup>**</sup>	1.616 <sup>**</sup>	1.818 <sup>**</sup>	10.907 <sup>**</sup>
Error	42	3.040	3.056	4.129	11.732	0.061	41.477	0.458	0.001	3.851

\*Significant at 5% level, \*\*Significant at 1% level.

**Table 2. Mean performance of selected 20 mutant lines along with 2 checks for various characters**

Mutant line no.	Pedigree	Days to 1 <sup>st</sup> flower	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches plant <sup>-1</sup>	Number of pods plant <sup>-1</sup>	100 seed weight (g)	Oil content (%)	Seed yield plant <sup>-1</sup> (g)
1	T2/5/8-1	41.00	47.33	99.33	53.06	2.80	52.73	12.90	19.73	13.56
2	T2/19/2-1	39.67	45.66	96.00	52.20	3.40	52.93	14.16	19.43	13.55
3	T2/5/4-1	36.00	45.33	98.33	62.20	3.70	63.26	14.43	18.07	14.28
4	T2/20/6-1	37.33	46.00	97.00	55.26	2.76	59.80	14.27	17.47	15.48
5	T2/20/7-1	40.67	46.66	101.33	61.53	2.73	52.86	14.72	18.04	13.38
6	T2/20/6-1	40.00	46.33	98.66	62.26	2.20	62.46	15.21	17.70	14.42
7	T2/5/3-2	39.33	45.66	96.66	65.20	2.33	57.53	15.04	17.21	15.02
8	T2/20/12-1	39.67	46.33	101.66	66.13	2.86	61.66	13.87	18.56	14.72
9	T2/21/6-1	40.67	47.66	101.00	62.46	1.40	57.46	13.50	18.10	13.64
10	T2/21/1	40.33	49.00	98.66	64.93	3.06	59.60	15.01	16.95	16.79
11	T2/18/2-1	41.67	49.66	99.00	61.60	2.66	59.80	14.79	16.43	14.98

12	T2/23/5-1	40.33	48.33	102.33	62.86	3.20	47.13	14.70	18.24	11.54
13	T2/20/10-1	38.67	47.00	99.00	64.46	2.86	57.93	14.55	18.41	12.02
14	T2/5/1-1	37.67	45.66	100.00	60.86	2.73	73.60	13.12	18.03	16.92
15	T2/23/5-3	39.33	47.66	99.33	59.66	3.13	58.73	13.84	17.65	13.45
16	T2/19/4-2	40.67	49.00	100.33	54.40	3.00	53.00	13.84	17.41	10.86
17	T2/5/5-1	36.67	46.00	98.00	58.60	2.40	50.26	13.85	18.33	10.60
18	T2/20/11-1	38.33	45.66	100.66	53.60	2.93	45.73	12.91	18.42	10.74
19	T2/20/4-1	40.33	48.00	98.00	57.00	2.73	59.13	14.12	17.51	13.37
20	T2/21/15-1	41.67	50.00	97.33	61.46	2.66	61.20	14.53	17.81	12.80
TAMS-38	Check	40.00	48.66	103.66	51.86	3.06	54.86	15.72	18.62	13.36
JS-335	Check	41.33	50.00	105.00	44.20	2.53	52.06	14.15	19.10	9.90
Mean		39.61	47.34	99.60	58.90	2.78	56.99	14.24	18.05	13.43
S.E(m) ±		1.010	1.00	1.17	1.97	0.14	3.71	0.39	0.02	1.13
CD (5%)		3.06	2.98	3.34	5.64	0.40	10.61	1.11	0.07	3.23

## REFERENCES

- Akram, R.M., W.M. Fares, H.S.A. Fateh and A.M.A. Rizk. 2011. Genetic variability, correlation and path analysis in soybean. *Egypt. J. Plant Breed.* **15**(1) : 89-102.
- Bisane, R. D., S. R. Kamdi, R. D. Deotale, M. P. Meshram, S. R. Patil, V. S. Pawar and P. P. Bambodkar. 2019. Genetic studies in M<sub>1</sub> population of soybean cultivar TAMS-38. *J. Soils and Crops*, **29** (2): 354-359.
- Chauhan, G. S., N. S. Verma and G. S. Bains. 1988. Effect of extrusion processing on the nutritional quality of protein in rice-legume blends. *Nahrung*, **32**(1): 43.
- Darlington, C. D. and E. K. J. Ammal, 1945. Chromosome atlas of cultivated plants. George Allen and Unwin Ltd., London, pp.397.
- Hymowitz, T. 1970. On the domestication of the soybean. *Econ. Bot.* **24**(4):408-421.
- Khan, M. H. and S. D. Tyagi. 2013. A review on induced mutagenesis in soybean. *J. Cereals Oilseeds*, **4**(2): 19-25.
- Komaddi, Shruti and G.T. Basavaraja. 2019. Genetic variability studies on yield and yield component traits of soybean. *Int. J. Curr. Microbiol. and App. Sci.* **8**(2).
- Lande, N. H., S. K. Dhapke, S. R. Patil, R. A. Sayyad, K. N. Ukey, V. S. Jayade and G. A. Kankal. 2018. Genetic variability induced by gamma rays in M<sub>1</sub> generation of soybean (*Glycine max* (L.) Merrill). *J. Soils and Crops*, **28** (1) 177-184.
- Malek, M. A., M. Y. Rafii, S. A. Sharmin, U. K. Nath and M. M. A. Mondal. 2014. Morphological characterization and assessment of genetic variability, character association, and divergence in soybean mutants. *Sci. World J.* **11**(2).
- Punse, V. G. and P. V. Sukhatme. 1954. Statistical method for agriculture worker I.C.A.R. publications, New Delhi, 2<sup>nd</sup> edn. pp.63-66.

Rec. on 10.11.2020 & Acc. on 25.11.2020

**23. Tagetes patula linn., a fungicidal, ornamental species of asteraceae family**

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

ISSN – 0975-1386

Research article: (Botany)

**TAGETES PATULA LINN., A FUNGICIDAL, ORNAMENTAL SPECIES OF ASTERACEAE FAMILY.****Kadlag, S. D**

Principal: Nutan Arts, Commerce and Science College Rajapur Tal. Sangamner, Dist. Ahmednagar (MS).

**Varpe S.N**

Nutan Arts, Commerce and Science College Rajapur Tal. Sangamner, Dist. Ahmednagar (MS).

**Gadakh V.D**

Nutan Arts, Commerce and Science College Rajapur Tal. Sangamner, Dist. Ahmednagar (MS).

**Deshmukh R.N**

New Arts Commerce and Science College Parner.

[kadlagsubhash@gmail.com](mailto:kadlagsubhash@gmail.com)**Abstract**

Plants produce varieties of chemicals as secondary metabolites. These natural chemicals produced by the plants when secreted in the environment either promote or inhibit growth of other plants and even microbes. They are called allelochemicals which are eco-friendly i.e. biodegradable and are abundantly available. Inhibitory allelochemicals could be used as biocides in controlling fungal diseases of crops. Laboratory bioassay work was done for finding out allelopathic potentials of a common ornamental herb *Tagetes patula* Linn. of Asteraceae family. In the present work it was found out that the fresh leaf extracts of *Tagetes patula* Linn. of various concentrations inhibited mycelial growth of *Fusarium oxysporum* f. sp. *lentis* Schl. .

**Key words:** *Tagetes patula* Linn. , antifungal, *Fusarium oxysporum* f. sp. *lentis* Schl.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Deshmukh R.N

**Introduction**

Allelopathy, a current area of research, may be useful in agriculture to controlling diseases of crops. Plant- produced chemicals are good botanical source of biocides are eco-friendly i.e. biodegradable, renewable and abundantly available. Therefore, there is a vast scope for research in Allelopathy and crop diseases. Molisch (1937), father of Allelopathy introduced the word "Allelopathy" for beneficial as well as harmful (detrimental)

[66]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

reciprocal biochemical interactions among plants including microorganisms. The present paper focuses on the aspects of Allelopathic fungicidal potentials of an ornamental species *Tagetes patula* Linn of Asteraceae family collected from the study area of Ahmednagar district, one of the largest districts of Maharashtra state. The district is located between 18<sup>02</sup>' and 75<sup>05</sup>' North latitude and 70<sup>09</sup>' and 75<sup>05</sup>' East longitude.

#### **REVIEW OF LITERATURE**

Rice (1984) recorded that the plant species of Asteraceae family contain antimicrobial Polyacetylenes like a-terthienyl in *Tagetes erecta* L. Singh and Tripathi (1993) recorded that *Launaea aspenifolia* (Willd.) Hook. f. strongly inhibit mycelial growth of *Fusarium oxysporum* f. sp. *lentis* Schl. Arora and Kaushik (2003) recorded that the extracts of *Conyza bonariensis* (L.) Crong., *Erigeron karvinskianus* DC., were potential in inhibiting soybean fungal pathogens viz., *Colletotrichum truncatum* (Schwein) Andrus & Moore, *Fusarium oxysporum* Schl. ex Fr. and *Macrophomina phaseolina* (Tassi) Goid. Chuihua *et al.* (2004) recorded that a common species of Asteraceae family viz, *Ageratum conyzoides* L., contains allelopathins like 3-caryophyllene, p-bisabolene and p-farnescene that could exert synergistic inhibitory effect on test plants. This plant species is herbicidal as well as fungicidal. Mandavia *et al.* (2000) worked on inhibitory effects of phenolic compounds on fungal metabolism in host-pathogen interactions in *Fusarium* wilt of cumin.

#### **MATERIAL AND METHOD**

*Tagetes patula* Linn.: Annual, cultivated as an ornamental herb; leaves pinnately divided; heads solitary, involucre gland dotted, ray florets yellow with red markings.

*Fusarium oxysporum* f. sp. *lentis* Schl.: It is classified in form-family Tuberculariaceae of order Moniliales (Class: Hypomycetes) and subdivision Deuteromycotina.

**EXTRACT BIOASSAY:** Experiments were conducted in the Research laboratory of Botany Department New Arts, Commerce and Science College, Ahmednagar at room temp (25 to 28<sup>0</sup>c) during the year 2014-2015.

Plants materials were collected from in and around Ahmednagar city. Stock solutions of the fresh leaf samples were prepared. Aqueous as well as methanolic extract solutions of 10%, 20%, 30% concentration were obtained by crushing leaves in a mortar and pestle (Narwal & Tauro, 1994).

Preparation of PDA medium : 200 g peeled pieces of potato tubers (*Solanum tuberosum*) were boiled in distilled water and filtered through muslin cloth in 100 ml conical flask. 15 g dextrose was added in it and then 15 g agar was added slowly while stirring it. Final volume 1000ml was made. This PDA medium was then autoclaved and used for culturing fungi in sterile petridishes.

*Fusarium oxysporum* f. sp. *lentis* Schl. procured from the Departmental laboratory was inoculated in agar medium under sterile conditions. Petridishes of 11cm diameter containing freshly prepared PDA medium were used and allowed the fungus to grow. Many such plates were prepared. With the help of cork borer wells per petriplate were prepared. Leaf extracts of 10, 20 and 30 % concentration were added separately in separate dishes. In control plates sterile distilled water was added in the wells. Six replicates of each treatment were maintained. Readings were taken after five days. Extracts inhibited the fungus around the wells. Inhibition zones around wells were measured randomly by taking at least 24 readings per treatment. Results obtained were

[67]



*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

analyzed by single factor ANOVA multiple range test followed by CD at 0.05 % and Tukey's test by using Microsoft Excel program.

#### **Observation and Results**

**Effect of aqueous and methanolic extracts of *Tagetes patula* Linn.on mycelial growth of *Fusarium oxysporum* f. sp. *lentis* Schl. :**

[Refer table No1,Graph No 1]

In the present work it was found out that the fresh leaf extracts of *Tagetes patula* Linn. of various concentrations inhibited mycelial growth of the fungus *Fusarium oxysporum* around the wells prepared in the agar plates. The inhibition went on increasing with increase in leaf extract concentrations. The inhibitory zones were measured. About 24 readings were taken randomly. Aqueous as well as methanol extracts of *Tagetes patula* more or less equally inhibited mycelial growth of *Fusarium*.

#### **Summary and conclusion**

*Tagetes patula* Linn.of Asteraceae family is a common ornamental plant. In the present work it was found out that the fresh leaf extracts of various concentrations inhibited significantly mycelial growth of a common saprophytic fungus *Fusarium oxysporum* f. sp. *lentis* Schl. The inhibition was concentration correlated. *Tagetes* proved its fungicidal potential. It can be further used to find out its fungicidal potential against other fungi that cause varieties of crop plant diseases. Plant species of Asteraceae family contain antimicrobial Polyacetylenes (Rice, 1984). Antifungal activities of *Tagetes* might be due to the presence of such compounds.

There are abundant species of Asteraceae family that could be tried to find out effect on not only saprophytic but **phytopathogenic fungi that cause fungal diseases on agricultural crop plants**. Instead of using non-biodegradable synthetic agrochemicals to control fungal diseases of crops that also cause severe pollution why not to use plant originated biodegradable fungicides to control diseases of crop plants? Efforts are to be done to work out fungicidal properties of plant species of Asteraceae.

#### **ACKNOWLEDGMENTS**

I should not miss this opportunity to express my heart –felt gratitude and regards to the Management of Ahmednagar Jilha Maratha Vidya Prasarak Samaj, Ahmednagar and Principal Dr. Zaware B.H., ,HOD Dr Patil B.A.,New Arts Commerce & Science College, Ahmednagar; Dr Zaware B.N. and Dr.Khose R.G. for continued encouragement and kindly allowing me to undertake this work and Hon. Management of Pragatik Shikshan Sanstha Rajapur Tal.Sangamner Dist.Ahmednagar.

#### **REFERENCES**

- 1) Arora Charu,Kaushik R.D.,Kumar K.,Garg G.K (.2003) Fungicidal potential of Kumaon and Tarai region plants against mushroom fungal pathogens. *Allelopathy Journal* **11**(1):63-70.
- 2) Chuihua Kong,Fei Hu, ,Wenju Liang ,Wang Peng and Yong Jiang (2004)

[68]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

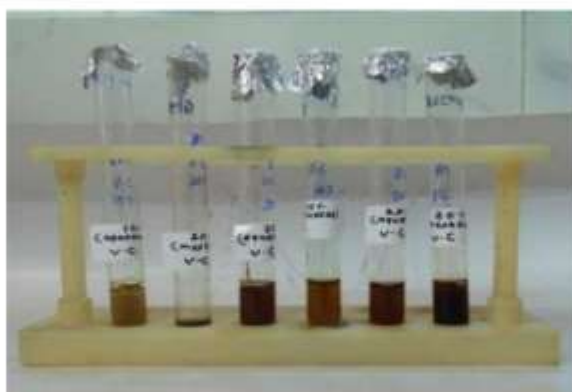
Allelopathic potential of *Ageratum conyzoides* at various growth stages in different habitats  
*Allelopathy Journal*13(2):233-240.

- 3) Molisch, Hans (1937), "*The Influence of one plant on another*". Allelopathy. Edited by Narwal S.S., Translated by L.J. La Fleur & M.A. Bari Malik. (2001), Scientific Publishers, Jodhpur (India).
- 4) Mandavia M.K., Khan N.A., H.P. Gajera, J.H. Andharia and M. Parameswaran (2000) Inhibitory effects of phenolic compounds on fungal metabolism in host-pathogen interactions in *Fusarium* wilt of cumin *Allelopathy Journal*7(1):85-92
- 5) Narwal, S.S. & Tauro, P. (1994) Allelopathy in Agriculture and forestry Scientific Publisher, Jodhpur (India).
- 6) Rice E.L. (1984) Biological control of selected plant diseases by microorganisms *Allelopathy Journal*1(2):77-88.
- 7) Singh Jaspal & Tripathi N.N. (1993) Efficacy of plant extracts against *Fusarium oxysporum* f.sp. *Lentis* on *Lens esculenta* *J. Indian Bot. Soc.* 72 : 51-53.



1) *Tagetes patula* Linn.

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)



2) Leaf Extracts.

Table No 1: Effect of aqueous and methanolic leaf extract of *Tagetes patula* Linn.on growth of *Fusarium oxysporum*

Sr No	Extract	conc	Inhibition zone (in mm)	P-value	CD at 0.05%
1	Aqueous	control (DW)	0.00a ±0.00	1.67E-12	0.026
		10%	0.044b ±0.007		
		20%	0.14c ±0.019		
		30%	0.144d ±0.020		
2	Methanolic	control (DW)	0.00a ±0.00	3.7E-12	0.029
		10%	0.077b ±0.01		
		20%	0.108c ±0.013		
		30%	0.190c ±0.026		

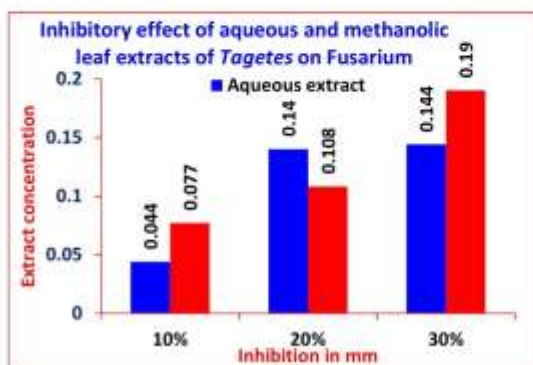
Data presented are means of six replicates; values within the same column with different letters a(a,b,c,d)are significantly different at 0.05% P-level by Single factor ANOVA test followed by CD & Tukeys test.,

[70]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

±Standard error of means. In above table, Q values are more than 'q' critical Value '3.68'. Hence means are significantly different.

**Graph No 1: Effect of aqueous and methanolic leaf extract of *Tagetes patula* Linn.on growth of *Fusarium oxysporum***



[71]

**24. Recent Studies on Physiological Traits to Improve Drought Tolerance in Wheat.***Wesleyan Journal of Research*, Vol.14 No.25 (September 2021)

ISSN – 0975-1386

Research article: (Botany)

**RECENT STUDIES ON PHYSIOLOGICAL TRAITS TO IMPROVE DROUGHT TOLERANCE IN WHEAT.****Ms. Sawant K.S.**

Research Student, Department of Botany and Research Centre, New Arts, Com &amp; Sci. College, Parner, Ahmednagar, Maharashtra. kalpanasawant2009@gmail.com

**Dr. Deshmukh R.N**

Research Guide, Department of Botany and Research Centre, New Arts, Com &amp; Sci. College, Parner, Ahmednagar, Maharashtra.

**Abstract**

A major limitation to most of the agricultural crops grown in tropical and sub-tropical areas is global Climate change. Drought stress is one of the effect of climate change that has a negative impact over growth and yield of crop. Previously, many researchers were proposed models to predict climate change and drought occurrences and it is important to enhance essential crops to meet the challenges of drought stress which limits crop productivity. Most of the people around the world use wheat crop for consumption. Wheat crop is prone to drought stress. Improving drought stress tolerance is a challenging task for scientists and wheat researchers. The progress made in understanding drought tolerance shows developments in main research areas such as physiology, biochemistry, breeding, and genetic research. Research in physiology focused on the physiological pathways that plants use when it comes under drought stress. Drought tolerant wheat genotypes are produced through breeding and making crosses from promising drought-tolerant genotypes and selecting among their progeny. This review showcases latest advances in physiology areas to improve drought tolerance in wheat.

**Keywords:** Drought; Physiological changes; Stress; Wheat**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Ms. Sawant K.S

**1. Introduction –**

Drought stress could be a scarcity of water which induces dramatic morphological, biochemical, physiological, and molecular changes. All of those changes reduce plant growth and crop production. Wheat (*Triticum aestivum* L.) is among the foremost important cereal crops and huge portions of human populations in many parts of the planet rely on wheat as a source of food and animal feed. Wheat is grown

[78]

in an huge selection of agro-climatic environments, however, many of those environments have drought stress united of the key challenges to their production and productivity. It noted in 2013, near about 65 million ha of wheat production was tormented by drought stress [1]. Warming and global climate change will increase the frequency of drought, hence causes loss of agricultural crop productivity. Looking on the local environment drought stress can occur at any growth stage. Hence, it's necessary that genotypes could also be tested for their tolerance to drought at relevant and often different stages of growth because some genotypes may tolerate drought at the seedling or germination stage, but they'll be very sensitive to drought at the flowering stage or the other way around. Drought tolerance is identified by determining a trait that will be wont to measure the effect of drought stress on plants. Those traits should discriminate susceptible and tolerant genotypes. In any drought experiment, it's important to see the suitable trait(s) that are tolerant to drought. Moreover, yield and drought tolerance should be improved in parallel because it's the need of farmers to cost-effectively produce their agricultural products under drought stress. Previously, drought tolerance in wheat has been studied by many researchers, except for many reasons the enhancement of this crop for drought tolerance is prohibited. Firstly, drought may cause theatrical changes within the physiological parameters of the plant which require to be measured and understood. Second, the selection is tormented by genotypic  $\times$  environment (GE) interaction. Third, drought may be a complex polygenic trait, most of the genes which make a small genetic contribution, but to improve drought tolerance genetically these genes are important. Other factors like the structure and complexity of the wheat genome also are associated with crops. In several aspects drought stress may be studied i.e. physiological, morphological, biochemical, breeding, genetics studies. When exposed to drought stress plants physiologically change to tolerate this stress. From physiological point of view, a drought needs context-dependent view to know the flexibility of plants to form important changes that ease the effect of drought stress [2]. It's reported in drought-tolerant plants that they fight to possess less reduction in membrane stability, water content, and photosynthetic activity. Drought tolerant plants try to accumulate soluble sugars, proline content, amino acids, chlorophyll content, and enzymatic and non-enzymatic antioxidant activities [3]. Physio-morphological traits of plants are vital for selection during a breeding program to boost drought tolerance because of their reference to the adaption for future climate scenarios [4]. Moreover, identifying the genes controlling these physiological changes may cause rapid genetic improvement for drought tolerance in an exceeding plant [25]. Research in plant breeding is very important to supply new drought-tolerant wheat cultivars. Breeders can use any trait (morphological or physiological or yield related-trait) to enhance drought tolerance but there must be some trait(s) that will differentiate between drought susceptible and drought-tolerant lines, have high estimates of heritability, and together with a positive significant correlation with final grain yield [5]. Gathering the knowledge from the various research areas like physiology, biochemistry, breeding, and genetics may help to spot the foremost drought-tolerant genotypes having the very best number of genes controlling drought tolerance. This review explores the recent studies on physiological responses under drought stress for improving drought tolerance.

**2. Physiological Changes-**

There are many important physiological traits that reduce the effect of drought stress on wheat plants. Genes controlling these physiological changes are important for breeders and geneticists as they're useful sources to genetically improve drought tolerance through a breeding program.

**2.1. Photosynthetic Pigments -**

Photosynthetic pigments are differentially tormented by drought looking on crop species studied. The chlorophyll content is differentially littered with variations in genotype. Positive correlations of grain yield in wheat with chlorophyll content, grain filling period, and also the number of grains per spike were reported [15]. Genotypes with high chlorophyll content resulted in better seed yield under water-deficit conditions [14]. Furthermore, the tolerant wheat cultivars enhanced total chlorophyll at pre-and post-anthesis stage in the midst of a more stable photosynthetic rate, while susceptible cultivars reduced both traits for both stages [6]. Chlorophyll plays a significant role in plant energy production, thus the susceptible plants suffer from insufficient energy needed for normal growth [25]. The reduced chlorophyll contents under drought or salinity stress may trigger the inactivation of photosynthesis. Moreover, drought or salinity induced reduction in chlorophyll content is contributed to excessive chloroplast swelling, loss of chloroplast membranes, the appearance/development of intracellular lipid droplet, and distortion of lamellae vesiculation [28]. It should be preferred to pick the wheat cultivars which are ready to withstand photosynthetic apparatus and photochemical efficiency under a scarcity of water to reinforce the yield of the crop. Carotenoids play a crucial role as a precursor in signaling during plant development under abiotic/biotic stress [25]. Growth improvement in plants under stressful environments has been widely reported to flow from the many roles of zeaxanthin in alleviating oxidative damage to membranes [27]. Anthocyanin, as a water-soluble pigment that belongs to the family of phenolic compounds, is usually rather proof against drought [26] that's associated with superoxide radical scavenging activity and of anthocyanins ability to stabilize the water potential.

**2.2. Photosynthesis -**

The role of photosynthesis is very important in grain yield and plant growth. to work out the extent of photosynthesis in plants grown under water stress conditions variation in photosynthetic pigment contents is that the key indicator [25]. It's popular that drought decreases the photosynthetic rate of cereals [6]. The limiting factor to photosynthetic rate is that the CO<sub>2</sub> diffusional limitation because of early stomatal closure as a response to the drought-induced loss of turgor, reduced activity of photosynthetic enzymes, the biochemical components associated with the triose-phosphate formation, and decreased the photochemical efficiency of photosystem II [7]. In photosynthetic activity, metabolic alterations can be thanks to an imbalance between captured light and its utilization [8], reduced activity of Rubisco, loss of chloroplast membranes [9], the structure of chloroplast degraded and photosynthetic apparatus, photo-oxidation of chlorophyll, destruction of chlorophyll substrate, inhibition of chlorophyll biosynthesis, and also the increased activity of chlorophyllase [10]. However, the drought-induced limitations of photosynthesis through metabolic distortions are more complex than stomatal limitations which mainly occur through the reduced synthesis of photosynthetic pigments [11].

### 2.3. Water Relations

Plant water relations were influenced by some important characteristics i.e. water loss rate, relative water content, water content, excised leaf water retention, and residual transpiration rate. Relative water content (RWC) may be a measure of plant water status, reflecting the metabolic activity in tissues and used because of the most meaningful index for dehydration tolerance [25]. A decrease within the RWC in response to drought stress has been noted in a very large choice of plants [16]. The change in water loss in terms of excised leaf water loss may estimate the plant's leaf water relations, especially when comparing fully hydrated leaves to those under deficit irrigation and it's presumably an indirect measure of cuticular thickness and cuticular transpiration [17]. The genotypes with reduced excised leaf water loss are believed to be more drought tolerant, less littered with evapotranspiration water losses, therefore able to conserve their water content [18]. Drought stress enhanced excised leaf water retention (ELWR) which reflect the water retention mechanism within the leaf under stress that will be ascribed to leaf rolling or decrease in exposed leaf area, hence the rise in ELWR may well be a superior indirect selection criterion for drought tolerance resulting in higher grain yield [19]. A big correlation was found between relative water content and grain yield under drought stress during the reproductive stages in wheat and barley. Therefore, RWC and leaf rolling can be used for selection in breeding programs to enhance drought tolerance during a combination with high yielding [20,21] to regulate the water loss related to epidermal conductance, plants developed epicuticular waxes which are the organic compounds of the cuticle which covers the outer surface of plant tissues [25]. Epicuticular wax could be a very important attribute in drought-tolerant genotypes because they developed more epicuticular wax on leaves which reduced the loss of water from the plant leaf surface [22]. Reduction of residual transpiration rate related to the drought tolerance in crop plants and has been used as a range criterion in wheat and barley breeding programs [23]. Agronomic parameters like photosynthetic rate, RWC, and stomatal conductance show strong positive correlations with water use efficiency, whereas transpiration rate expresses correlational statistics with WUE under drought [24]. Leaf waxiness and trichome density may lessen water loss and protect against drought for extended periods. Moreover, crops or genotypes ascertained low ELWL, low residual transpiration rate, and high ELWR under drought have the next capacity to preserve water balance in their leaves reflects their drought stress tolerance, thereby higher yield stabilization.

### 2.4. Gaseous Exchange

Stomatal closure limits transpirational water loss and aids plants to conserve water status under drought stress. Nonetheless, closure of stomata, in turn, ends up in decreased CO<sub>2</sub> availability for photosynthetic carbon metabolism, declines net CO<sub>2</sub> assimilation rate, and prohibits plants ability for dry matter accumulation [13]. Stomatal and mesophyll conductance to CO<sub>2</sub> often decrease in response to drought [12].

**Acknowledgement-** We are thankful to Principal Dr. R. K. Aher, and Trustee New Arts, Com & Sci. College, Parner, for their continuous support and help rendered during this work.

### References-

1. FAO World Food and Agriculture. Statistical Yearbook. Available online: <http://www.fao.org/3/i3107e/i3107e.pdf> (accessed on 4 August 2021).



2. Vinocur, B.; Altman, A. (2005) Recent advances in engineering plant tolerance to abiotic stress: Achievements and limitations. *Curr. Opin. Biotechnol.*, 16, 123–132.
3. Abid, M.; Tian, Z.; Ata-Ul-Karim, S.T.; Cui, Y.; Liu, Y.; Zahoor, R.; Jiang, D.; Dai, T (2016). Nitrogen Nutrition Improves the Potential of Wheat (*Triticum aestivum* L.) to Alleviate the effects of Drought Stress during Vegetative Growth Periods. *Front. Plant Sci.*, 7, 981.
4. Bowne, J.B.; Erwin, T.A.; Juttner, J.; Schnurbusch, T.; Langridge, P.; Bacic, A.; Roessner, U.; Alia; Saradhi, P.; Mohanty, P.; et al. (2012) Drought responses of leaf tissues from wheat cultivars of differing drought tolerance at the metabolite level. *Mol. Plant*, 5, 418–429.
5. Reynolds, P.; Ortiz-Monasterio, J.; McNab, A.; Reynolds, E.M.; Reynolds, M. Application of Physiology in Wheat Breeding. Available online: <https://books.google.com.hk/books?hl=zh-TW&> (accessed on 4 August 2021).
6. Dawood, M.F.A.; Abeer, A.H.A.; Aldaby, E.E.S. (2019) Titanium dioxide nanoparticles model growth kinetic traits of some wheat cultivars under different water regimes. *Indian J. Plant Physiol.*, 24, 129–140.
7. Pandey, V.; Shukla, A.(2015). Acclimation and Tolerance Strategies of Rice under Drought Stress. *Rice Sci*, 22, 147–161.
8. Foyer, C.H. (2000) Bundle sheath proteins are more sensitive to oxidative damage than those of the mesophyll in maize leaves exposed to paraquat or low temperatures. *J. Exp. Bot.*, 51, 123–130.
9. Amirjani, M.R.; Mahdiyeh, M. (2013) Antioxidative and biochemical responses of wheat. *J. Agric. Biol. Sci*, 8, 291–301.
10. Kabiri, R.; Nasibi, F.; Farahbakhsh, H. (2014) Effect of Exogenous Salicylic Acid on Some Physiological Parameters and Alleviation of Drought Stress in *Nigella sativa* Plant under Hydroponic Culture. *Plant Prot.*, 50, 43–51.
11. Rama, R.; Nagaraja, R.; Ragimasalawada, M.; Sabbavarapu, M.M.; Nadoor, S.; Patil, J.V (2014). Detection and validation of stay-green QTL in post-rainy sorghum involving widely adapted cultivar, M35-1 and a popular stay-green genotype B35. *BMC Genomics*, 15, 909.

12. Centritto, M.; Lauteri, M.; Monteverti, M.C.; Serraj, R. (2009) Leaf gas exchange, carbon isotope discrimination, and grain yield in contrasting rice genotypes subjected to water deficits during the reproductive stage. *J. Exp. Bot.*, 60, 2325–2339.
13. A, M.M.C.; B, J.P.M.; A, J.S.P. (2003) Understanding plant responses to drought from genes to the whole plant. *Funct. plant biol.*, 239–264.
14. Alaei, Y. (2011) The Effect of Amino Acids on Leaf Chlorophyll Content in Bread Wheat Genotypes under Drought Stress Conditions. *Middle-East J. Sci. Res*, 10, 99–101.
15. Kiliç, H.; Yağbasanlar, T. (2010) The Effect of Drought Stress on Grain Yield, Yield Components and some Quality Traits of Durum Wheat (*Triticum turgidum* ssp. durum). *Cultivars*, 38, 164–170.
16. Allahverdiyev, T.I. (2015) Effect of drought stress on some physiological parameters, yield, yield components of durum (*Triticum durum* desf.) and bread (*Triticum aestivum* L.) wheat genotypes. *Ekin J.Crop Breed. Genet*, 1, 50–62.
17. Clarke, J.M.; McCaig, T.N. (1982) Evaluation of Techniques for Screening for Drought Resistance in Wheat. *Crop Sci.*, 22, 503.
18. Izanloo, A.; Condon, A.G.; Langridge, P.; Tester, M.; Schnurbusch, T. (2008) Different mechanisms of adaptation to cyclic water stress in two South Australian bread wheat cultivars. *J. Exp. Bot.*, 59, 3327–3346.
19. Lonbani, M.; Arzani, A. (2011) Morpho-physiological traits associated with terminal drought- stress tolerance in triticale and wheat. *Agronomy Research*, 9, 315–329.
20. Tahara, M.; Carver, B.F.; Johnson, R.C.; (1990) Smith, E.L. Relationship between relative water content during reproductive development and winter wheat grain yield. *Euphytica*, 49, 255–262.
21. Teulat, B.; Monneveux, P.; Wery, J.; Borries, C.; Souyris, I.; Charrier, A.; This, D. (1997) Relationships between relative water content and growth parameters under water stress in barley: a QTL study. *New Phytol.*, 137, 99–107.
22. Ahmed, M.; Asif, M.; Goyal, A. (2012) Silicon the Non-Essential Beneficial Plant Nutrient to Enhanced Drought Tolerance in Wheat; Goyal, A., Ed.; Intech Open: London, UK,.

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

---

23. Balota, M. (2008) Excised-leaf water status in Romanian and foreign winter wheat cultivars. I. The physiological and environmental effects on excised-leaf water loss. *Rom. Agric. Res*, 3, 69–76.
24. Akrami, M.; Yousefi, Z. (2015) Biological Control of Fusarium wilt of Tomato (*Solanum lycopersicum*) by *Trichoderma* spp. as Antagonist Fungi. *Biol. Forum – An Int. J.*, 7, 887–892.
25. Ahmed Sallam , Ahmad M. Alqudah , Mona F. A. Dawood , P. Stephen Baenziger and Andreas Börner (2019), Review Drought Stress Tolerance in Wheat and Barley. *Advances in Physiology, Breeding and Genetics Research, Int. J. Mol. Sci.*, 20, 3137;
26. Zali, A.G. (2018); Ehsanzadeh, P. Exogenous proline improves osmoregulation, physiological functions, essential oil, and seed yield of fennel. *Ind. Crop. prod.*, 111, 133–140.
27. Isaksson, C.; Andersson, S. (2008), Oxidative stress does not influence carotenoid mobilization and plumage pigmentation. *Proc. R. Soc. B. Biol. Sci.* 275, 309–314.
28. Ying Ma, Maria Celeste Dias and Helena Freitas (2020) Drought and Salinity Stress Responses and Microbe-Induced Tolerance in Plants, *Front Plant Sci*, Nov 13;11:591911.

## 25. Impact of PEG-6000 Induced Water Stress on Seed Germination Parameters of Wheat Cultivars.



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Botany)

### IMPACT OF PEG-6000 INDUCED WATER STRESS ON SEED GERMINATION PARAMETERS OF WHEAT CULTIVARS.

**Ravindra Deshmukh**

Research Guide and Research Student, Department of Botany, sorghumws@gmail.com

**Tukaram Thopate**

Prof., Department of Chemistry, New Arts, Commerce and Science College Parner, Ahmednagar, 414 302.

**Kalpana Sawant**

Research Guide and Research Student, Department of Botany,

**Anil Bhalerao**

Asst. Prof., Department of Botany S. S. and L. S. Patkar and V. P. Varde College Goregaon West, Mumbai 400 062.

**Kadlag, S. D**

Nutan Arts, Commerce and Science College Rajapur Tal. Sangamner, Dist. Ahmednagar (MS).

**Abstract:** Amongst all the natural climatic hazards, drought is the single most important disaster affecting food production throughout the world. In the present investigation seven wheat cultivars B-288-18; NI-5434; Vijay; Motiya; Gulab; NI-59 and Kenphad of wheat were preliminary screened thoroughly under PEG-6000 induced drought stress during seed germination parameters. The results on seed germination percentage, root and shoot length as well as FWt. and DWt. were correlated. In all the cultivars of wheat percentage and seed germination was reduced and the degree of reduction was intensified with increasing stress level. At extreme water stress (-8bar) the cultivar Kenphad and B-288-18 showed seed germination. All the promising cultivars were highly sensitive towards all the levels of water stress as observed from percentage inhibition in root and shoot length. The cultivar Kenphad and B-288-18 showed better performance for in root length as well as shoot length. The cultivar Vijay and NI-5434 showed moderate performance regarding seed germination parameters. The wheat cultivars NI-59, Motiya and Gulab showed very poor performance to seed germination parameters.

On the basis of all above parameters the cultivar Kenphad and B-288-18 was ranked at number one position for showing comparatively better survival at different levels of PEG induced water stress so they may be called as drought tolerant, next to it at second position wheat cultivar was Vijay and NI-5434 so may be called as moderately drought tolerant and at last position NI-59, Motiya and Gulab may be called as drought susceptible wheat cultivars.

**Key Words:** PEG- 6000, Wheat, Seed germination, FWt, Dwt.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Ravindra Deshmukh

**1. Introduction**

Wheat is mainly a rabi seasonal crop in India. Wheat is grown in a various soils of India. Soils with a clay loam, good structure and moderate water holding capacity are suitable for wheat cultivation. Care should be taken to avoid very porous soils. Wheat is belonging from Family Gramineae. Its botanical name is *Triticum aestivum*. The Soft Wheat (Bread wheat) is originated at Hindukush mountainous regions adjoining to India and Afganistan. Wheat species distinct to three groups diploid, tetraploid and hexaploid in according to chromosome number in their reproductive cells 7, 14 and 21 respectively. India has largest area under wheat in the world and wheat is grown under diverse environment.

Wheat is sown in September or October after the summer monsoon rains are over. Wheat requires a well crushed but compact soil for good and uniform seed germination. Wheat responds well to the commercial fertilizers.

**2. Materials and Methods**

In the present investigation, the seed germination experiments were conducted at the Department of Botany and Research Centre, New Arts, Commerce and Science College, Parner. The authentic seeds of seven cultivars of wheat (B-288-18; NI-5434; Vijay; Motiya; Gulab; NI-59 and Kenphad) were procured from the Agricultural Research Station, Niphad, Dist. Nashik, (MS) for preliminary screening. The seven cultivars of wheat were screened for their drought tolerant abilities by applying PEG-6000 induced water stress at seed germination level (-2 to -8 bar).

The healthy and uniform seeds of selected cultivars of wheat were washed thoroughly in water, surface sterilized with 0.1% HgCl<sub>2</sub>, and washed with distilled water for 3-4 times. These seeds were kept for germination on germination paper in sterilized petri plates, containing different concentrations of PEG-6000 solutions such as 0 bar (distilled water), -2 bar, -4 bar, -6 bar and -8 bar. The method described by [9] was followed to prepare the different solutions of PEG -6000 (Table 1).

Five ml of PEG-6000 solution of respective concentration was added in each petri plate. The control was maintained with distilled water. All the sets were arranged in triplicate under uniform conditions in seed germination chamber. Observations on following different parameters were recorded on seventh day.

**Germination percentage:-**

Germination percentage was determined on seventh DAS [7]

**Length of plumule and radicle:-**

On 7th day of sowing, 10 seedlings from each replication and treatment were randomly selected for measuring the root and plumule length.

**Fresh and dry weight:-**

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

On 7th day ten seedlings were randomly selected for recording fresh weight. These seedlings were kept in an oven at 60 °C, till constant dry weight was obtained. The total dry weight of seedlings from control and each treatment was recorded

**3. Results and Discussion****Effect of PEG-6000 induced water stress on seed germination parameters****a) Seed germination:**

The effect of PEG 6000 induced water stress on seed germination in different cultivars of wheat recorded in Table 2 and shown in photo plate 1 and 2 revealed that in all the cultivars with increase in PEG induced water stress seed germination was drastically reduced from -2 to -8 bar. In all the cultivars of wheat at control and -2 bar solution 100% seed germination was recorded. At -4 bar NI-5434 and Kenphad 100% seed germination was noted which was followed by B-288-18 (90%), Motiya and NI-59 (80%) and Gulab (70%). At -6 wheat variety Kenphad showed 100% seed germination which was followed by Vijay (90%), NI- 5434 (80%), B-288-18, Motiya and NI-59 (70%) and Gulab (60%). At higher water stress (-8 bar) B-288-18 and NI-59 showed 70% seed germination which was followed by Kenphad (50%) and NI- 5434 (30%). Wheat variety Vijay, Motiya and Gulab showed very poor performance (00%) regarding seed germination it indicate that these cultivars may be drought susceptible. The cultivar Kenphad showed better performance regarding seed germination as compared to others.

**b) Root length:-**

The root length in all the cultivars decreased from -2 to -8 bar PEG induced water stress. The maximum root length was recorded in wheat cultivar B-288-18 (11.69 cm), Kenphad (11.39 cm), Vijay (11.13 cm), NI-5434 (11.01 cm), NI-59 (9.91 cm), Motiya (6.8 cm) and Gulab (6.38 cm) at control condition. With increase in water stress in all the cultivars root length were decreased. At -4 bar water stress wheat cultivar NI-5434 showed better performance regarding root length, in this cultivar root length 4.68 cm which was followed by Kenphad (4.55 cm), Vijay (2.86 cm), B-288-18 (2.18 cm), NI-59 (1.19 cm), Gulab (0.86 cm) and Motiya (0.78 cm). At -6 bar water stress wheat cultivar Kenphad showed better performance regarding root length in this cultivar root length 1.52 cm which was followed by NI-5434 (0.72 cm), Vijay (0.45 cm), B-288-18 (0.18 cm), Motiya and Gulab (0.15 cm) (Table 2 and shown in photo plate 1 and 2).

**c) Shoot length:-**

The shoot length was also decreased with increase in water stress. The maximum plumule length at -2 bar PEG induced water stress was recorded in NI-5434 (3.75 cm) and it decrease to 0.03cm in -8 bar which was followed by cultivar B-288-18 3.35cm at -2 bar and it decrease to 0.06cm at -8 bar, NI-59 2.64cm at -2 bar and it decreases to 0.04cm at -8 bar, Cultivar Gulab 1.38cm at -2 bar and it decreases to 0.06 cm at -6 bar and in this cultivar there is no plumule formation is noted at -8 bar. Very poor performance regarding shoot length was recorded in wheat cultivar Vijay followed by Motiya it means that these two cultivars are may be susceptible the water stress.

**d) Fresh Weight:-**

The seedling FWt in all the cultivars of wheat was decreased with increase in PEG-6000 induced water stress. In all the cultivars of wheat from -2 bar to -8 bar fresh weight was decreased. The best results were noted in wheat cultivar B-288-18 {-2 bar ( 2.06gm) and at -8 bar (1.29 gm)} which was followed by NI-59 {-2 bar ( 2.0gm) and at -8 bar (1.21 gm)}, Vijay {-2 bar ( 1.97gm) and at -8 bar (1.63 gm)}, Motiya {-2 bar ( 1.63gm) and at -8 bar

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

(1.14 gm)}, Kenphad {-2 bar ( 1.76gm) and at -8 bar (1.18 gm)}, NI-5434 {-2 bar ( 1.51 gm) and at -8 bar (1.11 gm)} and Gulab {-2 bar ( 1.44 gm) and at -8 bar (1.1 gm)} .

**e) Dry Weight:-** The seedling dry weight in four cultivars of wheat was increased with increase in PEG-6000 induced water stress and only in three cultivars with increasing water stress slight decrease in dry weight was noted. The four cultivars of wheat showed increase in weight is Vijay {-2 bar ( 1.27gm) and at -8 bar (1.28 gm)}, B-288-18 {-2 bar ( 0.96 gm) and at -8 bar (1.01 gm)}, Gulab {-2 bar ( 0.86 gm) and at -8 bar (0.98 gm)} and NI-5434 {-2 bar ( 0.80 gm) and at -8 bar (0.92 gm)}. The three cultivars of wheat showed slight decrease in weight is NI-59 {-2 bar ( 1.12 gm) and at -8 bar (1.04 gm)}, Motiya {-2 bar ( 1.07 gm) and at -8 bar (0.95 gm)} and Kenphad {-2 bar ( 0.99 gm) and at -8 bar (0.97 gm)}.

Our results were confirmed with the many workers, the two different levels of PEG-6000: 0% and 10%. PEG stress significantly reduced percent germination, shoot length and root length. PEG stress significantly increased dry weight in twenty two wheat cultivars (11). Seed germination and vigor index of twenty wheat genotypes were reduced with the increment of water stress induced by PEG. Shoot and root lengths and seedling dry weight of 10 days old seedlings were found to be reduced due to the increment of water stress [8]. Seed germination percentage, root and shoot length and root shoot ration decrease with increases in PEG 6000 induced water stress in ten barley cultivars [2]. The linear correlation between water stress and slight increase in dry matter accumulation in *Triticum* sps. [4].

In sorghum and wheat seedlings under PEG-6000 induced water stress the root and shoot length, root: shoot ratio was reduced with increased level of water stress [6]. In four genotypes of sorghum namely M35-1, SPV-86, CSH-1 and CSH-8R under manitol induced water stress germination percentage was decreased with increasing water stress from 2.5 to 10 atmospheres. The plumule and radicle lengths were progressively decreased with increase in osmotic tension. The radicle length was affected more than plumule length [1].The germination percentage was decreased with increasing concentration of PEG, in eleven different sorghum cultivars [10].

**References**

1. Gill P. K., A. D. Sharma., P. Singh and S. S. Bhullar. (2002). Osmotic stress induced changes in germination, growth and soluble sugar content of *Sorghum bicolor* (L.) Moench seeds. *Bulg. J. Plant Physiol.* **28** (3-4), 12-25.
2. Hellal F. A., H. M. El- Shabrawi, M. Abd El- Hady, I. A. Khatab, S. A. A. El- Sayed and Chedly Abdelly (2018) Influence of PEG induced drought stress on molecular and biochemical constituents and seedling growth of Egyptian barley cultivars. *Jr. of Gen. Eng. And Biotech.* 16, 203-212
3. Joshi M.W. and B. B. Jadhav. (1992). Effect of osmotic potential on germination of sorghum. *Ann. Plant Physiol.* **6**(2), 285-287.
4. Kameli A. and D. M. Losel. (1996). Growth and sugar accumulation in durum wheat plants under water stress. *New Phytol.* **132**:57-62.
5. Lad S. K. (1986). Effect of different osmotic media of manitol and polyethylene glycol- 4000 on germination and early seedling growth of sorghum variety M 35-1. *Sorghum News Lett.* **29**: 90.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

6. Meena R. K., T. R. Meena, R. Ganesh, A. Joshi, K. B. Shukla and P. N. Mathur. (2003). Effect of polyethylene glycol induced water stress on grain water uptake and growth of seedlings in cultivars of wheat and jowar. National Seminar on Plant Physiology held at Tirupati. **S1-P5: 60.**
7. Prado F. E., C. Boero., M. Gallardo., and J. A. Gonzalez. (2000). Effect of NaCl on germination, growth and soluble sugar content in *Chenopodium quinoa* wild seeds. *Bot. Bull. Acad. Sin.* 41: 27-34.
8. Rana M.S., M.A. Hasan\*, M.M. Bahadur and M.R. Islam (2017) Effect of Polyethylene Glycol Induced Water Stress on Germination and Seedling Growth of Wheat (*Triticum aestivum*). *The Agriculturists* 15(1): 81-91.
9. Sairam R. K. and S. Kumari. (1998). Measurements of water potential, relative water content and membrane stability. A short course on "Physiological analysis of yield in crop plants". ICAR, IARI, New Delhi. 131-137.
10. Scarascia M. E. V., M. D. Lucia, M. Mastrorilli and S. M. E. Venezian. (1979). Germination of sorghum seeds under conditions of simulated water stress. *Ann Sperimentale Agronomica*. **10:** 119-133.
11. Shatabdi Ghosh, Md. Abu Shahed, Arif Hasan Khan Robin (2020) Polyethylene Glycol Induced Osmotic Stress Affects Germination and Seedling Establishment of Wheat Genotypes. *Plant Breed. Biotech.* 8(2):174-185

**Table 1: The quantity of Polyethylene glycol (PEG)-6000 (g L<sup>-1</sup>) for different water stress treatment(s) at different room temperature range.**

Stress (- bars)	Temperature °C				
	15	20	25	30	35
2	105	112	119	128	137
4	161	169	178	188	199
6	204	214	224	235	247
8	241	251	262	278	287



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

Table 2:- Effect of PEG-6000 induced water stress on seed germination parameters on wheat cultivar.

Wheat Cultivars	PEG-6000 Water Stress	Seed Germination Parameters				
		Root Length (cm)	Shoot Length (cm)	Fresh weight (gm)	Dry weight (gm)	Seed Germination (%)
B-288-18	Control	11.69 (SD± 3.205)	9.91(SD± 2.903)	3.55(SD± 0.29)	0.853(SD± 0.05)	100 (SD± 0.026)
	-2 Bar	7.18(SD± 1.075)	3.53(SD± 1.679)	2.06(SD± 0.032)	0.96(SD± 0.086)	100 (SD± 0.026)
	-4 Bar	2.18(SD± 0.848)	0.22(SD± 0.301)	1.963(SD± 0.20)	1.05(SD± 0.01)	80 (SD± 0.015)
	-6 Bar	0.18(SD± 0.078)	0.08(SD± 0.037)	1.24(SD± 0.120)	1.021(SD± 0.012)	70 (SD± 0.026)
	-8Bar	0.1(SD± 0.081)	0.06 (SD± 0.021)	1.29(SD± 0.41)	1.009 SD±(0.002)	60 (SD± 0.026)
NI - 5434	Control	11.01(SD± 2.252)	9.71(SD± 1.91)	2.59(SD± 0.1)	0.688(SD± 0.044)	100 (SD± 0.0264)
	-2 Bar	8.11(SD± 1.875)	3.75(SD± 2.157)	1.51(SD± 0.060)	0.806(SD± 0.024)	100 (SD± 0.0264)
	-4 Bar	4.68(SD± 15.00)	0.26(SD± 0.126)	1.22(SD± 0.11)	0.899(SD± 0.044)	100 (SD± 0.0264)
	-6 Bar	0.72(SD± 0.250)	0.11(SD± 0.051)	1.44(SD± 0.072)	0.898(SD± 0.044)	80 (SD± 0.015)
	-8Bar	0.04(SD± 0.057)	0.03(SD± 1.69)	1.11(SD± 0.060)	0.920(SD± 0.01)	30 (SD± 0.021)
Vijay	Control	11.13(SD± 1.48)	10.77(SD± 1.97)	4.48(SD± 0.224)	1.036(SD± 0.018)	100 (SD± 0.026)
	-2 Bar	4.68(SD± 2.14)	1.7(SD± 2.15)	1.97(SD± 0.116)	1.274(SD± 0.087)	100 (SD± 0.026)
	-4 Bar	2.86(SD± 1.248)	0.19(SD± 0.126)	2.02(SD± 0.052)	1.251(SD± 0.025)	90 (SD± 0.025)
	-6 Bar	0.45(SD± 0.452)	0.12(SD± 0.051)	1.94(SD± 0.100)	1.333(SD± 0.11)	90 (SD± 0.025)
	-8Bar	0(SD± 0.00)	0(SD± 1.6)	1.63(SD± 0.106)	1.284(SD± 0.142)	0 (SD± 0.0)

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

<b>Motiya</b>	Control	6.8(SD± 2.305)	6.69(SD± 2.29)	3.52(SD± 0.219)	0.854(SD± 0.068)	100 (SD± 0.0264)
	-2 Bar	3.08(SD± 1.711)	0.39(SD± 0.409)	1.63(SD± 0.005)	1.007(SD± 0.058)	100 (SD± 0.0264)
	-4 Bar	0.78(SD± 0.629)	0.13(SD± 0.047)	1.93(SD± 0.105)	0.981(SD± 0.21)	80 (SD± 0.015)
	-6 Bar	0.15(SD± 0.121)	0.08(SD± 0.037)	1.19(SD± 0.106)	0.951(SD± 0.115)	70 (SD± 0.026)
	-8Bar	0(SD± 0.00)	0(SD± 0.00)	1.14(SD± 0.075)	0.952(SD± 0.026)	00 (SD± 0.0)
<b>Gulab</b>	Control	6.23(SD± 1.246)	6.84(SD± 1.142)	3.38(SD± 0.14)	0.942(SD± 0.120)	100 (SD± 0.0264)
	-2 Bar	3.56(SD± 1.460)	1.38(SD± 1.032)	1.44(SD± 0.120)	0.859(SD± 0.280)	100 (SD± 0.0264)
	-4 Bar	0.86(SD± 0.340)	0.13(SD± 0.106)	1.34(SD± 0.170)	1.015(SD± 0.008)	70 (SD± 0.026)
	-6 Bar	0.15(SD± 0.197)	0.06(SD± 1.52)	1.16(SD± 0.083)	0.982(SD± 0.142)	60 (SD± 0.026)
	-8Bar	0(SD± 0.00)	0(SD± 0.00)	1.1(SD± 0.057)	0.981(SD± 0.132)	00 (SD± 0.0)
<b>NI-59</b>	Control	9.91(SD± 1.023)	11.51(SD± 2.133)	4.19(SD± 0.080)	1.068(SD± 0.039)	100 (SD± 0.0264)
	-2 Bar	6.97(SD± 1.154)	2.64(SD± 1.623)	2(SD± 0.060)	1.125(SD± 0.071)	100 (SD± 0.0264)
	-4 Bar	1.19(SD± 0.859)	0.1(SD± 0.0462)	1.51(SD± 0.105)	1.142(SD± 0.072)	80 (SD± 0.015)
	-6 Bar	0.44(SD± 0.292)	0.1(SD± 0.053)	1.34(SD± 0.121)	1.13(SD± 0.068)	70 (SD± 0.026)
	-8Bar	0.07(SD± 0.095)	0.04(SD± 0.00)	1.21(SD± 0.1050)	1.04(SD± 0.0120)	60 (SD± 0.026)
<b>Kenph ad</b>	Control	11.39(SD± 1.726)	9.32(SD± 1.112)	3.95(SD± 0.125)	0.849(SD± 0.174)	100 (SD± 0.0264)
	-2 Bar	6.3(SD± 2.206)	1.18(SD± 0.436)	1.76(SD± 0.125)	0.996(SD± 0.11)	100 (SD± 0.0264)
	-4 Bar	4.55(SD± 1.151)	0.19(SD± 0.110)	1.602(SD± 0.101)	1.073(SD± 0.037)	100 (SD± 0.0264)
	-6 Bar	1.52(SD± 0.922)	0.12(SD± 0.0421)	1.38(SD± 0.141)	0.99(SD± 0.135)	100 (SD± 0.0264)

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

-8Bar	0.05(SD± 0.00)	0.05(SD± 0.00)	1.18(SD± 0.098)	0.979(SD± 0.125)	50 (SD± 0.01)
-------	-------------------	-------------------	--------------------	---------------------	------------------

**Photoplate-1:-** Effect of PEG-6000 induced water stress on seed germination parameters on *B-288-18; NI-5434 and Vijay* wheat cultivar

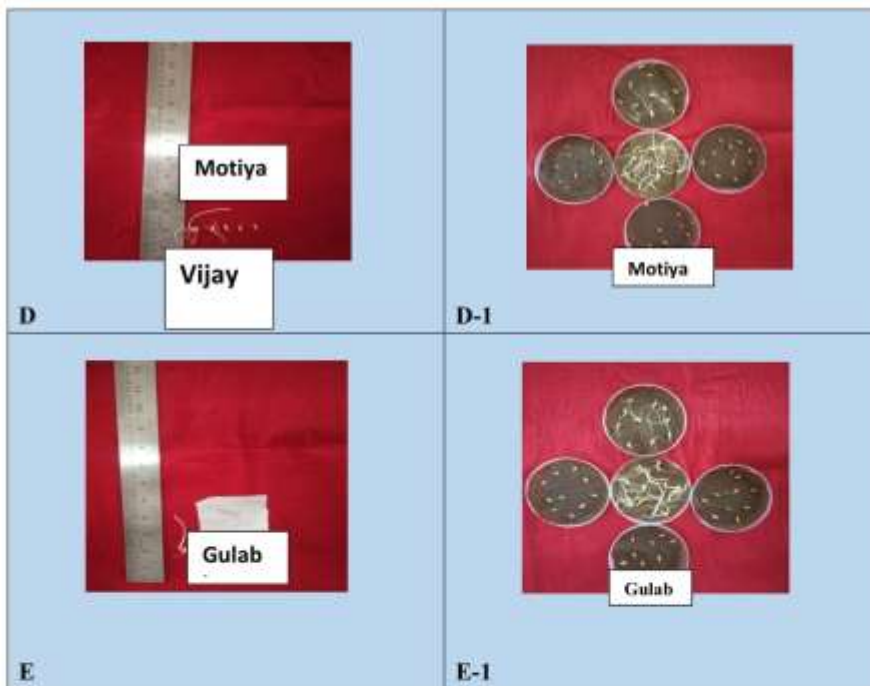


[96]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

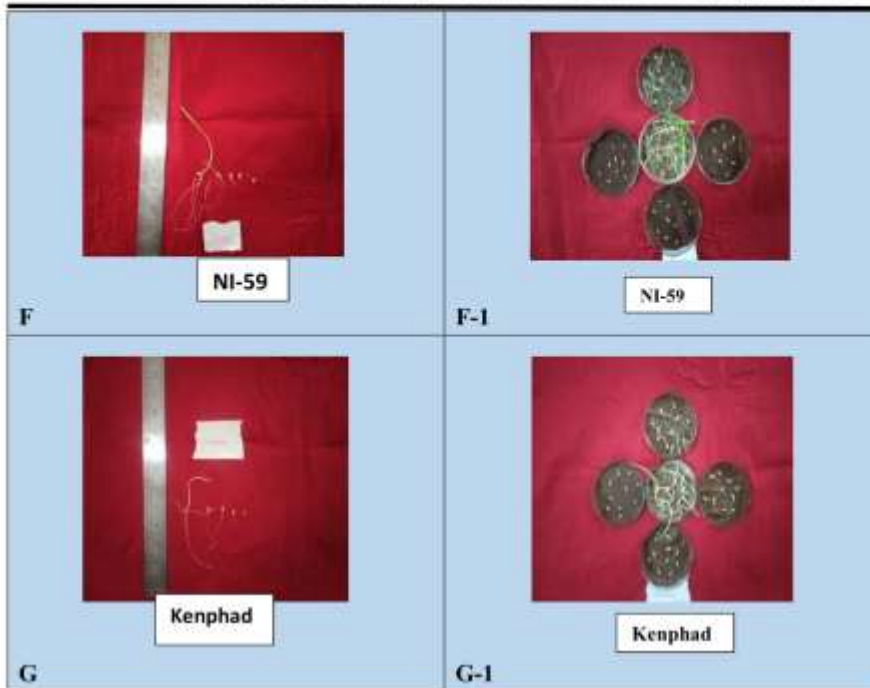


**Photoplate-2:-** Effect of PEG-6000 induced water stress on seed germination parameters on *Motiya; Gulab; NI-59 and Kenphad* wheat cultivar



[97]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*



## 26. Morphological Responses of Wheat (*Triticum aestivum* L.) to Mycorrhiza and Water Stress conditions at anthesis stage.



Wesleyan Journal of Research, Vol.14 No.27 (September 2021)

ISSN – 0975-1386  
Research article: (Science)

### MORPHOLOGICAL RESPONSES OF WHEAT (*TRITICUM AESTIVUM* L.) TO MYCORRHIZA AND WATER STRESS CONDITIONS AT ANTHESIS STAGE

**Sajan Khapke**

Dept. of Botany and Research Center, New Arts, Commerce and Science College, Parner - 414302 (M. S.), E-mail: [sajankhapke@gmail.com](mailto:sajankhapke@gmail.com)

**Rangnath Aher**

Dept. of Botany and Research Center, New Arts, Commerce and Science College, Parner - 414302 (M. S.),

#### Abstract

Water stress severely affects plant growth and development, limits plant production and the performance of crop plants. AM fungi can protect host plants against detrimental effects of water stress. The present study investigated the effect of Arbuscular mycorrhizal (AM) fungi and water stress conditions in wheat at anthesis stage. The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments, five water stress treatments and combination of AM fungi and water stress treatments. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Growth parameters like plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth were determined. AM fungal treated plants had significantly higher plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth than non AM plants at anthesis stage in the wheat. Plant height was greatly affected at 20% FC water stress treatment at anthesis stage. When water stress induces along with combination treatments of AM fungi it showed increase in all morphological parameters as compare to only water stress treatments.

**Key words:** - Mycorrhiza, Water stress, *Triticum aestivum*, Growth parameters

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Sajan Khapke

#### 1- Introduction

Wheat (*Triticum aestivum* L.) is the second most important cereal just after rice. It is eaten in various forms by more than one thousand million human beings in the world. In India it is second important staple food crop, which contain a high percentage of carbohydrates and proteins.

[37]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

Stress is an altered physiological condition caused by factors that tend to disrupt the equilibrium. Plants are frequently exposed to many stresses such as drought and low temperature, salt, flooding and heat, which severely affect plant growth and food productivity. Water, comprising 80% - 90% of the biomass of plants, is the central molecule in all the physiological processes of plants by being the major medium for transporting metabolites and nutrients. Drought is the most severe abiotic stress factor limiting plant growth and crop production [16]. Water deficit is considered as a major environmental factor affecting many aspects of plant physiology and biochemistry [8].

Arbuscular mycorrhizal fungi show symbiotic association with roots of terrestrial plants belonging to approximately 80% of plant families worldwide. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Many thousands of experiments have shown that AMF can overcome nutrient limitation to plant growth by enhancing nutrient acquisition [7]. The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. AMF also play an important role in the water economy. Drought is a complex phenomenon, and is considered one of the most important factors limiting crop yields around the world. Arbuscular mycorrhizal fungi symbiosis contributes to enhance growth and vigor of plants, and can alter plant water relations, particularly during water stress periods [4, 17]. The root colonization by the mycorrhiza increases active absorptive surface area and stimulates water uptake in water stress condition [12]. The extensive extrametrical hyphae of AMF extend out into the soil for several centimeters so that it bridges the zone of nutrient depletion. Thus, the plant is able to exploit microhabitats beyond the nutrient depleted area where rootlets and root hair cannot thrive [15]. The main purpose of this research was to investigate the growth responses of wheat to arbuscular mycorrhizal fungi and water stress conditions at anthesis stage.

## **2- Material and Methods**

The pot culture experiment was conducted at the Research centre, Department of Botany, New Arts, Commerce and Science College, Ahmednagar. The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

### **2.1- Mycorrhizal fungus inoculum**

The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was

[38]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

multiplied in earthen pots using Zea mays in sterilized sand soil (1:1 v/v) mixture [22]. After 90 days under greenhouse conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

#### 2.2- Experimental design for AM fungi

The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16 kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (16.5kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Plants were watered as required.

#### 2.3- Experimental design for water stress

The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method described by [14] was followed.

#### 2.4- Experimental design for combinational treatment of AM fungi and water stress

The above prepared FC (100% FC, 80% FC, 60% FC, 40% FC and 20% FC) set and one AM fungi treatment (75g) i.e. (75g + 100% FC, 75g + 80% FC, 75g + 60% FC, 75g + 40% FC, 75g + 20% FC) were used for the combinational experiments.

2.5- Plant growth parameters- The effect of AM fungi, water stress and combinational treatment of AM fungi and water stress were analyzed for various growth parameters at anthesis stage by using randomly five different plants for each treatment. The methodology used for such analyses is briefly described below.

2.6- Plant height- The plant height of five randomly selected plants from each bucket was recorded from the base of the plant near the ground level up to the tip of fully expanded leaf. After emergence of ear head, the height was measured up to the top of the ear head.

2.7- Numbers of leaves per plant- The total numbers of leaves were recorded.

2.8- Leaf area per plant- The leaf area per plant was calculated by taking maximum length and width of the selected leaf and it was multiplied by the factor 0.747 [21]. From this the total leaf area was calculated.

[39]



2.9- Stem Girth- Stem girth was recorded.

2.10- Statistical analysis

The data obtained from morphological parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients [19]. CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

### 3- Results and Discussion

3.1- Effect of AM fungi treatment on growth parameters

The influence of AM fungi treatments (*Glomus mosseae*) on wheat was assessed on the basis of parameters like plant height, leaf length, leaf breadth, no. of leaves, leaf area and stem girth against control. All AM fungi treatments showed positive effect on plant height, leaf length, leaf breadth, leaf area, leaf numbers per plant and stem girth compare to control at anthesis stage.

In the present study plant height increased significantly ( $p=0.1$ ) along with increase in AM fungi treatment. The highest plant height 57.36 cm was measured in 75 gm AM fungi treatment compare to control plants 45.68 cm at anthesis stage (Table 1).

Leaf length and leaf breadth also increases significantly with increase in AMF treatment. Leaf length was observed highest i.e. 11.86 cm, while leaf breadth increased larger i.e. 1.28 cm at 75 gm AMF treatment to control at anthesis stage. All AMF treatments showed more effect on leaf area at anthesis stage. It was observed more i.e. 91.10 cm<sup>2</sup> (Table 1) in 75 gm. mycorrhizal treatment at anthesis stage. Among all the morphological parameters, leaf area shows more variation than other parameters like plant height, leaf length, leaf breadth, no. of leaves and stem girth, therefore its SE is more i.e. 7.52 and CD also high i.e. 20.91 at anthesis stage (Table 1).

It is well established that mycorrhizal infection improves the growth and yield of plant. The inoculation of mycorrhiza in wheat there was increased in growth parameters like, stem length, number of leaves and leaf area as compared to control [9]. Addition of AM fungi significantly increased growth parameters of wheat such as plant height as compared to non-inoculated wheat plants [1]. Increase in growth parameters of four vegetable crops, *Lycopersicum*, *Solanum*, *Capsicum* and *Abelmoschus* with the inoculation of AM fungi [13]. There was a

[40]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

significant increase in phosphorous concentration in chilli for the optimum dose of 70 gm mycorrhizal soil, which resulted in maximization of parameters like growth and yield [18].

### 3.2- Effect of water stress treatments on growth parameters

Water stress has great influence on various morphological parameters like plant height, leaf area, leaf length, leaf breadth, number of leaves and stem girth. In this experiment wheat plant was exposed to various levels of water stress ranging from 100% FC to 20% FC. To know the effect of water stress on wheat cultivar was analyzed at anthesis stage.

In the present study, plant height was greatly affected at 20% FC water stress treatment at anthesis stage compared to control. On the other hand 40% FC and 20 % FC shows more negative effect in the form of decrease in plant height, leaf length, leaf breadth, leaf area and stem girth over control at anthesis stage (Table 2).

Like mycorrhizal treatment, leaf area shows more variation in water stress treatment than other parameters such as plant height, leaf length, leaf breadth, no. of leaves and stem girth., therefore its SE is more i.e. 11.41 and CD also high i.e. 31.72 at anthesis stage (Table 2). Among all water stress treatment, the treatment 80% FC shows more positive effect in the form of increase in plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth over control at anthesis stage. It indicates that maximum growth of wheat plant could be achieved in 20% decreased water level. It could be due to the necessary water requirement for maximum growth of selected wheat variety is lower than it's considered need of water. The further decrease in water level affects the growth of wheat plant. Similar observations were recorded [11], where decrease in growth parameters of wheat due to water stress. Although they noted differential response from different wheat cultivars based on individuals water stress tolerant ability. Little water shortage just before anthesis stage does not adversely affect the leaf area of wheat plant [3]. In concern with *Stevia rebaudiana* plant, [20] reported not much reduction in plant height at mild and moderate water stress condition as the plants were able to tolerate that much water deficit conditions.

### 3.3- Combinational effect of AM fungi and water stress on growth parameters

With the combination treatment of mycorrhiza and water stress, plant height was greatly affected and reduced at high concentration as compared to control at anthesis stage. The combination treatment of mycorrhiza with water stress i.e. 75 gm AM soil + 60% FC and 75 gm AM soil + 80% FC showed significantly enhancement in plant height i.e. 58.20 cm and 59.84 cm compare to control at anthesis stage. Among all combination treatment of

[41]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

mycorrhiza with water stress, the treatment 75 gm +80% FC shows more positive effect in the form of increase in leaf length, leaf breadth, no. of leaves, leaf area, stem girth and stem height over control at anthesis stage (Table 3).

Like mycorrhizal treatment and water stress treatment, this combination treatment also shows more variation in SE and CD values at anthesis stage. From this investigation we can conclude that, the parameter like leaf area has great significance while leaf breadth and stem girth has less significance during evaluation effect of treatments at anthesis stage.

In conclusion, when water stress induce along with combination treatments of mycorrhiza it showed increase in all morphological parameters as compare to only water stress treatments. The positive influence of mycorrhiza were might be attributed to improvement in phosphorus nutrition [5], the increased water uptake by hyphae network [10] and increase in root length density [6]. Presence of mycorrhizal fungi stimulated the morphological parameters at all growth stages of wheat plants under water stress condition [2].

#### **4- Conclusion**

Drought is a major constraint which affects wheat productivity and it can be improved using AM fungi. Impact of water stress can be improved by treating to the soil @ 5 g/1kg of the AM soil for enhancing the number of seeds/ear head, 100 seed weight and yield/plant under water stress. On the basis of growth results obtained during study, the optimum dose of 75 gm mycorrhizal soil treatment is the best. During stress experiment the treatment 80% FC was found best for improvement in growth parameters over 100 % FC (control) and other stress treatments. The current investigation confirms that mycorrhizal symbioses can play a vital role in the improvement of the growth in wheat plants.

#### **References**

- [1] Abd-Allah M. M., Safwat El-B., Bakry A. B. and Mervat S.S., (2015) Effect of arbuscular mycorrhiza and glutamic acid on growth, yield, some chemical composition and nutritional quality of wheat plant grown in newly reclaimed sandy soil, Res. J. Pharm., Bio. and Chem. Sci. 6 (3) 1038-1054.
- [2] Abo-Ghalia H. H. and Khalafallah A. A., (2008) Responses of wheat plants associated with Arbuscular mycorrhizal fungi to short-term water stress followed by recovery at three growth stages, J. Appl. Sci. Res. 4 (5) 570-580.

[42]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

- [3] Akram M., (2011) Growth and yield components of wheat under water stress of different growth stages, Bangladesh J. Agril. 36 (3) 455-468.
- [4] Auge R. M., (2001) Water relations, drought and vesicular–arbuscular mycorrhizal symbiosis, Mycorrhiza. 11: 3-42.
- [5] Bethlenfalvay G. J., Brown M. S., Ames R. N. and Thomas R.E., (1988) Effects of drought on host and endophyte development in mycorrhizal soybeans in relation to water use and phosphate uptake, Physiol. Plant. 72: 565-571.
- [6] Bryla D. R. and Duniway J. M., (1997) Effects of mycorrhizal infection on drought tolerance and recovery in sunflower and wheat, Plant Soil. 97: 95-103.
- [7] Clark R. B. and Zeto S. K., (2000) Mineral acquisition by arbuscular mycorrhizal plants, J. Plant Nutr. 23: 867-902.
- [8] Charles O., Joly R. and Simon J. E., (1994) Effect of osmotic stress on the essential oil content and composition of peppermint, Phytochemistry, 29: 2837-2840.
- [9] El-Amri S. M., Mohamed H. A., Gamal M. A. and Manzer H. S., (2013) Role of mycorrhizal fungi in tolerance of wheat genotypes to salt stress, Afr. J. Microbiol. 7(14) 1286-1295.
- [10] Faber B. A., Zasoske R. J., Munns D. N. and Shackel K., (1991) A method for measuring hyphal nutrition and water uptake in mycorrhizal plants, Can. J. Bot. 69: 87-94.
- [11] Kilic H. and Yagbasanlar T., (2010) The effect of drought stress on grain yield, yield components and some quality traits of durum wheat (*Triticum turgidum* ssp. durum) cultivars, .Not. Bot. Hort. Agrobot. Cluj. 38 (1) 164-170.
- [12] Kyriazopoulos A. P., Michail O., Eleni M. A., Zoi M. P. and Nikoleta S., (2014) Effects of arbuscular mycorrhiza fungi on growth characteristics of *Dactylis glomerata* L. under drought stress conditions, Not. Bot. Horti. Agrobo. 42 (1) 132-137.
- [13] Lenin M., Selvakumar G., Thamizhiniyan P. and Rajendiran R., (2010) Growth and biochemical changes of vegetable seedlings induced by arbuscular mycorrhizal fungus, J. of Exp. Sci. 1 (4) 27-31.
- [14] Narkhede P. L., (1989) Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolic of rabi sorghum and soil factors controlling conservation of moisture. Ph. D. Thesis, M. P. K. V. Rahuri.

[43]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

- [15] O' Keefe D. M. and Sylvia D. M., (1993) Chronology and mechanism of phosphorus uptake by mycorrhizal sweet potato plants, *New Phytol.* 122: 651-659.
- [16] Rohbakhsh H., (2013) Alleviating adverse effects of water stress on growth and yield of forage sorghum by potassium application, *Advances in Environmental Biology*, 7: 40-46.
- [17] Ruiz-Lozano J. M., Azcon R. and Gomez M., (1995) Effects of arbuscular mycorrhizal *Glomus* species on drought tolerance: physiological and nutritional plant responses, *Appl. Environ. Microbiol.* 61: 456-460.
- [18] Shrihari P. C. and Sreenivasa M. N., (1998) Optimum dose of arbuscular mycorrhizal inoculums for chilli in two soil types, *Karnataka J. Agric. Sci.* 11 (3) 696-700.
- [19] Snedecor C. W. and Cochran W. G., (1980) *Statistical Methods*. 7th Edition. Iowa State Univ. Press.
- [20] Srivastava S. and Srivastava M., (2014) Morphological changes and antioxidant activity of *Stevia rebaudiana* under water stress, *Am. J. of Plant Sci.* 5: 3417-3422.
- [21] Stickler F. C., Wearden S. and Pauli A.W., (1961) Leaf area determination in grain sorghum, *Agron. J.* 53: 178-188.
- [22] Sylvia D. M., (1994) Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2- microbiological and Biochemical Properties*, 351-378.

[44]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

**Table 1 :** Effect of AM fungi on morphological parameters of wheat at anthesis stage.

AM Soil (gm)	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
Control	45.68	10.34	0.90	5.00	46.51	1.06
25	48.44	10.80	1.04	6.00	67.38	1.14
50	52.68	10.92	1.10	6.00	72.07	1.20
75	57.36	11.86	1.28	6.00	91.10	1.34
100	57.12	11.36	1.20	6.00	81.78	1.24
<b>SE</b>	<b>2.32</b>	<b>0.26</b>	<b>0.07</b>	<b>0.20</b>	<b>7.52</b>	<b>0.05</b>
<b>CD at 5%</b>	<b>6.45</b>	<b>0.72</b>	<b>0.19</b>	<b>0.56</b>	<b>20.91</b>	<b>0.14</b>

**Table 2 :** Effect of water stress on morphological parameters of wheat at anthesis stage.

Field Capacity %	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
100	45.30	10.54	0.94	5.00	49.52	1.08
80	55.20	11.26	1.08	6.00	72.97	1.26
60	53.42	9.20	0.88	6.00	48.56	1.06
40	35.82	7.20	0.54	6.00	23.35	0.64
20	14.06	5.64	0.32	4.00	7.22	0.32
<b>SE</b>	<b>7.51</b>	<b>1.04</b>	<b>0.14</b>	<b>0.40</b>	<b>11.41</b>	<b>0.17</b>
<b>CD at 5%</b>	<b>20.88</b>	<b>2.89</b>	<b>0.39</b>	<b>1.11</b>	<b>31.72</b>	<b>0.47</b>

**Table 3 :** Effect of AM fungi and water stress on morphological parameters of wheat at anthesis stage.

AM Soil (gm) and Field Capacity %	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
Control+100	43.10	10.70	0.98	5.00	52.41	1.12
75 +80	59.84	12.88	1.36	6.00	105.11	1.36
75+60	58.20	11.14	1.12	6.00	74.87	1.16
75+40	42.30	7.48	0.80	5.00	29.91	0.84

[45]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

75+20	24.60	5.94	0.44	4.20	10.92	0.48
<b>SE</b>	<b>6.40</b>	<b>1.27</b>	<b>0.15</b>	<b>0.34</b>	<b>16.56</b>	<b>0.15</b>
<b>CD at 5%</b>	<b>17.79</b>	<b>3.53</b>	<b>0.42</b>	<b>0.95</b>	<b>46.04</b>	<b>0.42</b>

[46]

## 27. Screening of mycoflora on allium cepa l. From different localities of Parner tehsil Maharashtra



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Botany)

### SCREENING OF MYCOFLORA ON *ALLIUM CEPA* L. FROM DIFFERENT LOCALITIES OF PARNER TEHSIL MAHARASHTRA.

**Rani Shaikh**

Department of Botany and Research Center, New Arts, Commerce and Science College Parner, Tal- Parner, Dist- Ahmednagar, (M S),414 302. [ranishaikh2013@gmail.com](mailto:ranishaikh2013@gmail.com)

**Rangnath Aher**

Department of Botany and Research Center, New Arts, Commerce and Science College Parner, Tal- Parner, Dist- Ahmednagar, (M S),414 302

**Dnyaneshwar Sherkar**

Department of Botany, Arts, Commerce and Science College Warvat Bakal, Dist- Buldhana, M S.

#### ABSTRACT

Onion (*Allium cepa* L.) is belongs to the family Liliaceae. It is a crop grown throughout Maharashtra and it is cultivated in all season. It is common cash crop in Maharashtra. The bulb and leaves of onion are edible part, usually it is consumed after cooking although it can be eaten fresh. Onion crop is affected by different fungal pathogen. Present study was deals with survey of fungal diseases of onion during a field visit to different localities. A purple blotch on onion leaves and black mould on bulb of onion is predominately observed. The other fungal diseases like damping off and basal rot also observed in general. Isolation of fungal pathogen is done by using PDA media. Morphological characters were studied and identified. The fungal pathogen included *Alternaria porri*, *Fusarium spp.*, *Apergillus niger*, *Rhizoctonia spp.*

Key words: Onion, fungal diseases, PDA medium.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Rani Shaikh

#### INTRODUCTION

Mostly onion cultivated all over Maharashtra as a cash crop. Currently total area under onion cultivation is 1.74 million hectares of the world while total onion yield is 86.34 million tones (5). Now a days next to China India is the second largest producer country of onion (9). Maharashtra stood first in production of onion in 2019-20 by producing 10683 metric tons, total productivity was 17.29 tons/ha (3). Maharashtra is the largest producer of onion producing about 33 per cent of the total production in the country (7). Due to its pungency when chopped

[73]



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

contains sulfenic acid which irritates the eyes with tears. Onion contain and flavonoids and phenolics which has potential anti-inflammatory, anti-cholesterol and antioxidant properties. Most onion cultivars contains about 89% water, 4% sugar, 1% protein, 2% fibre and 0.1% fat, vitamin C, vitamin B6, folic acid and numerous other nutrients in small quantity. Onion is commonly used in spices and condiments also. They are low in fats and sodium. They can contribute their flavour to savoury dishes without increasing caloric content (8). Among the different onion growing states, Maharashtra tops in area and production, followed by Karnataka, Madhya Pradesh and Andhra Pradesh. Maharashtra has highest share both in area (24.73%) and production 27.72% (3). Onion yield is loses due to attack of different pathogen like mycoplasma, virus, bacteria, nematodes and fungi but out of all pathogen, fungi is most destructive pathogen due to that pre harvest as well as post harvest loss of onion is done on large scale. So keeping this view, present investigation are carried out for isolation and identification of fungal pathogen from different localities of Parner Tehsil.

## **MATERIALS AND METHODS**

### **Collection of samples**

Infected plant material of onion were collected from the different five fields namely Nighoj, Supa, Vasunde, Jamgoan and Panoli areas belongs to Parner Tehsil. Infected plant sample were collected in the polythene bags, that bag was brought in to the laboratory of Department of Botany, New Arts, Commerce and Science College for further studies. Isolation and identification was done as per standard protocol (2) and Demataceous hyphomycetes (4).

### **ISOLATION AND IDENTIFICATION OF FUNGAL PATHOGEN**

The collected infected plant samples were washed first with tap water followed by distilled water and then with 1% sodium hypochlorite (NaOCl) for one minute and then again washed it with distilled water. After washing allow it for drying. After drying then on the basis of symptoms plant material cut into a small part of infected area and inoculate it on PDA medium and incubated for 26°C. After 4-5 days mycelial growth was observed in petriplates. The developed fungal colonies were purified by hyphal tip and single spore isolation was done. Identification and the fungal isolation were carried out by using the morphological characteristic of mycelia and spore. Fungi were identified on the basis of colony character, mycelium structure and spore morphology as per (2) and Demataceous hyphomycetes (4).

## **RESULTS AND DISCUSSION**

The various types of plant pathogenic fungi have ability to infect a onion and cause a diseases. During the present investigation we are able to isolate a fungi specimens like *Alternaria porri*, *Rhizoctonia spp*, *Fusarium spp* and *Aspergillus niger* which causes a tremendous loss of onion crop. The diseases like purple blotch, damping off, basal rot and black mould all are initially identified on the basis of characteristic symptoms of diseases. The fungus were isolated from infected onion leaves and bulbs. For isolation of fungi we are visited a different location of Parner tehsil like Nighoj, Supa, Vasunde, Jamgoan, Panoli etc. During frequently visit we found that purple blotch and black mould of onion are predominately appear in all locations where as damping off and basal rot are less as compared to purple blotch and black mould.

[74]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

The fungus *Aspergillus niger* and *Alternaria porri* occurred higher in all the location like Supa, Jamgoan, Panoli, Vasunde, Nighoj etc whereas, *Rhizoctonia* spp. and *Fusarium* spp are dominantly found in Nighoj and Panoli areas while less in Supa, Jamgoan and Vasunde. *Alternaria porri*, *Rhizoctonia* are isolated from leaves whereas *Aspergillus niger* and *Fusarium* spp isolated from onion bulbs (Table-1). Similarly, from infected onion bulb *F. oxysporum*, *Sclerotium rolfsii* and *Botrytis allii* were also isolated and reported by (9). It is also reported phytopathogenic fungi namely *Alternaria porri*, *Fusarium oxysporium* and *Stemphylium vesicarium* were isolated from the soil as well as from the infected onion leaves(6). (12) reported that *Apergillus niger* and *Penicillium* sp. were isolated from the bulbs alone. Many other researchers also reported a fungus like *Fusarium* sp., *Rhizopus* sp. and *Aspergillus* sp were isolated from market onion samples (11), purple blotch caused by *Alternaria porri* (1 and 10).

**Table : 1. Isolation of fungal pathogen of onion from different localities of Parner tehsil.**

Sr. No	Name of disease	Causal Organism	Localities				
			Supa	Jamgoan	Vasunde	Panoli	Nighoj
1	Purple Blotch	<i>Alternaria porri</i>	+++	+++	+++	+++	+++
2	Basal Rot	<i>Fusarium spp</i>	++	+++	-	+++	+++
3	Damping off	<i>Rhizoctonia spp</i>	+	++	+++	+++	+++
4	Black mould	<i>Aspergillus niger</i>	+++	+++	+++	+++	+++

(+++)= High, (++) = Moderate, (+) = (Less), (-) = Absent

#### CONCLUSION

Present study shows that, plant diseases of onion like purple blotch and black mould of onion are common and were found throughout all locations while damping off and basal rot were restricted to specific locations. It is necessary to reduce a inoculum of pathogen by applying various bio control agents so that farmer could save their economy.

#### REFERENCES

1. Alves, M.L.B., Paiva, W.O. and Asis, L.A.G., (1982). Incidence of purple spot (*Alternaria poori*) on onion. Em Manaus, A. J. Acta Amazonica, 12(4) 673-676.
2. Barnett, H.L. and Hunter, B.B., (1972). Illustrated Genera of Imperfect Fungi. 3rd Edition, Burgess Publishing Co., Minneapolis 241

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

---

3. Data source National Horticultural Research and Development Foundation Nashik.
4. Ellis, M.B., (1971). Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, Surrey, England 608.
5. FAO., (2011). Food and Agriculture Organization. (<http://faostat.org/faostat/servlet>). Accessed on 3rd January 2012.
6. Gaikwad, K.N., Jadhav, S.U. and Kakulte, V.R., (2014). Management of fungal diseases of onion (*Allium cepa* L.) by using plant extract. Int. J. Life Sci. Pharma Res. 4(2) 28-30.
7. Kale, S.J., Prerna Nath, Jalgaonkar, K.R. and Mahawar, M.K., (2016). Low Cost Storage Structures for Fruits and Vegetables Handling in Indian Conditions Indian Horticulture Journal; 6(3) 376-379.
8. Prajapati, B.K., Patil, R.K. and Patel, N.J., (2016). Studies on Effect of *A. niger* on Physiological Weight Loss and Biochemical Changes in Black Mould Rot Diseased Onion. Vegetos- An International Journal of Plant Research 29(3) 410-414.
9. Pawar, S.B., Mane, S.B., Bhosale, S.B. and Chavan, A.M., (2016). Isolation and identification of field bulb fungal pathogen from (*Allium cepa* L.) in Maharashtra. Asian J. Sci. Technol., 7(8) 3387-3389.
10. Schwartz, H.F., Gent, D.H. and Bartola, M.E., (2007). Purple blotch high plants IPM Colorado state University and Montana State University.
11. Ushasri, K. and Anil Kumar, B., (2018). Isolation and identification of fungal pathogen from (*Allium cepa* L.) in Piler vegetable market, Andhra Pradesh, India. World J. Pharma. Pharmaceut. Sci., 7(3) 955-963.
12. Vijayanthi G. and R. Vijayakumar., (2019). Isolation and identification of fungal pathogens from onion crop cultivated in Perambalur District, South India. J. Sci. Trans. Environ. Technov. 2019, 12(3)132-135.

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)



Purple Blotch



Pure culture



*Alternaria porri*



Black Mould



Pure culture



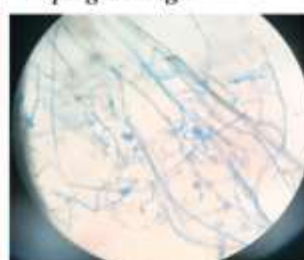
*Aspergillus niger*



Damping Off



Pure Culture



*Rhizoctonia*



Basal Rot



Pure Culture



*Fusarium Spp*

Isolation and identification of onion diseases

[77]

## 28. Study of *Dysteria Brasilensis* (Free living marine ciliate) from Guhagar beach, Ratnagiri, Maharashtra,



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Zoology)

### STUDY OF *DYSTERIA BRASILIENSIS* (FREE LIVING MARINE CILIATE) FROM GUHAGAR BEACH, RATNAGIRI, MAHARASHTRA

**V. D. Bandar**

New Arts, Commerce & Science College, Shevgaon, Dist. Ahmednagar (M.S.)

E mail- [vijubanedar@gmail.com](mailto:vijubanedar@gmail.com)

**S. R. Wagh**

New Arts, Commerce and Science College, Parner – 414 302, Dist. Ahmednagar (M.S.)

E mail: [sudhirwagh19@gmail.com](mailto:sudhirwagh19@gmail.com)

#### ABSTRACT:

The morphological features of a species *Dysteria brasiliensis* are described with special reference to morphology. Comparisons were made with other species. The present paper defines the morphological characteristics of *D. brasiliensis* by descriptions of certain structures, supplementing data of earlier studies by means of a morphometric survey and collection of data that may be used to make taxonomic determinations with accuracy.

**KEYWORDS:** Taxonomy, Morphology, Contractile vacuole, *Dysteria*.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: V. D. Bandar

#### INTRODUCTION:

The members of genus *Dysteria* enclosed several species of ciliates that are common in many marine habitats. The species *Dysteria* were described earlier by various workers Faria *et. al.*, 1922; Jun Gong and Weibo Song, 2003; Xiaozhong Hu *et. al.*, 2005; Mi Hyun *et. al.*, 2014 Claparede & Lachmann, 1858; Gong *et. al.*, 2002; Huxley, 1857; Maskell, 1887; 1902; Kahl, 1931; Gourret & Roeser, 1886; Claparede & Lachmann, 1858; Gourret & Roeser, 1887; Gong & Song, 2004; Maskell, 1887; Lepsi, 1927. Free living ciliates are usually abundant in various eutrophic marine biotopes playing significant roles in marine ecosystems. Compared with those inhabiting freshwater or (Foissner W.1996) soil biotopes, relatively fewer studies have been conducted on the marine forms in recent decades. The biodiversity of ciliates changes from place to place and time to time because of environmental make up (Kudo R.R., 1966). **Protozoan density and diversity is also useful to sewage fed irrigation in tropical agro ecosystem (S. Sahoo & *et. al.*, 2008).** These ciliates are extremely numerous in oceans and play an important role in maintaining the plant oxygen level, storing carbon and they are bio indicators

[107]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

of pollution (Bick, 1972). Therefore it is needful to study ciliates. During a study of marine ciliates in the coastal waters of Guhagar beach, Ratnagiri (M.S.) species of *Dysteria* were isolated. In this paper we have describe the morphology of a species, *D.brasiliensis*.

**MATERIAL AND METHOD:**

The marine water samples were collected from various sites of Guhagar beach (17.47° 'N, 73.2° E) of Ratnagiri District (M.S.) from August, 2017 to October, 2017. The water temperature was 27°C and the salinity 33‰. Specimens were studied using bright field microscope. The ciliates were investigated using live observation and the protargol impregnation protocol according to (Wilbert, 1975) was applied to reveal the infraciliature and nuclear apparatus. Measurements were obtained by using a calibrated ocular micrometer. The Hay infusion and Rice grain infusion are most effective methods for ciliates (Kirby, 1950).

**Classification of Ciliate:**

Domain: Eukaryota - eukaryotes

Kingdom: Protozoa (Goldfuss, 1818) R. Owen, 1858 – protozoa

Subkingdom: Biciliata

Infrakingdom: Alveolata Cavalier-Smith, 1991

Phylum: Ciliophora (Doflein, 1901) Copeland, 1956 – ciliates

Subphylum: Intramacronucleata Lynn, 1996

Class: [Phyllopharyngea](#) de Puytorac *et. al.*, 1974

Subclass: [Phyllopharyngia](#) de Puytorac *et. al.*, 1974

Order: [Dysteriida](#) Deroux, 1976

Family: [Dysteriidae](#) Claparède & Lachmann, 1858

Genus: *Dysteria* Huxley, 1857

Species: *D. brasiliensis* Faria *et. al.*, 1922

**RESULT:**

**Description of Genus (Huxley, 1857):**

Synonyms: *Aegyria* Ehrenberg, 1838; *Ervillea* Dujardin, 1841

This genus was first reported by Huxley in 1857. It is a member of class Phyllopharyngea shows characters such as ciliated stage with somatic kineties mostly as monokinetids that each have a lateral kinetodesmal fibril, a reduced or absent transverse microtubular ribbon. This genus belongs to subclass Phyllopharyngia show characters such as trophonts free-swimming, may be sessile but usually not sedentary. Cilia mainly on ventral surface. Oral ciliature typically composed of one preoral kinety and two circumoral kineties. Macronucleus is heteromorous. Some is symbionts of external body cavities. This genus belongs to order Dysteriida shows characters such as body is typically laterally compressed. Dorsal surface is rounded. Ventral cilia not thigmotactic and attached to substrate by unciliated adhesive region or by flexible podite. Juxtaposed heteromorous macronucleus. This genus belongs to family Dysteriidae shows characteristic features as attached by flexible podite. Left ventral somatic kineties as midventral postoral field and typically separated from an anterior preoral

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

field. Body may be conspicuously laterally compressed. The genus *Dysteria* shows characteristic features like body kinetics are complete. Body usually ovoid in shape and ventral surface is flattened. Dorsal surface is domed and longitudinally ribbed with a cleft on the right lateral edge. A large podite with secretory canal posterior. A large macronucleus generally elongate to ellipsoid in shape, present in centre of body. Micronucleus is not observed. Two contractiles are present.

**Description of species**

The body is elongate and roughly triangular in shape. Anterior end of body is wide whereas posterior end is narrow. It measures about 60-80 µm in length and 35-40 µm in width in vivo. Podite is slender in shape. Dorsal spine is cone shaped. Macronucleus is ellipsoid in shape. Micronucleus is not observed. Two contractile vacuoles are present in the center of body. Movement is slow, sometimes stationary.

**Table No. 1: Comparison of the present species with the species of genus *Dysteria*.**

Characters	<i>D. brasiliensis</i> (Faria et. al., 1922)	<i>D. magna</i> (Jun Gong and Weibo Song, 2003)	<i>D. yagiui</i> (Xiaozhong Hu et. al., 2005)	<i>D. nabia</i> (Mi Hyun et. al., 2014)	Present species
General body shape	Roughly triangular	Broadly rectangular,	Rectangular	Oval to elliptical	Elongated & roughly triangular
Length of body	55–80 µm	150–160 µm	140–200 µm	74–113 µm	60–80 µm
Width of body	35–40 µm	100 µm	60–100 µm	42–49 µm	35–40 µm
Shape of Macronucleus	Ellipsoid	Ellipsoidal	Elongated ellipsoid	Elongate	Ellipsoid
Micronucleus	Not observed	Not observed	Not observed	Not observed	Not observed
Number of Contractile vacuoles	2	2	2	2	2
Habitat	Marine	Marine	Marine	Marine	Marine

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)



**A** **B**  
**Microscopic Photograph showing A) General body shape & contractile vacuole;  
 B) Dorsal spine of *Dysteria brasiliensis*.**

#### DISCUSSION:

This genus first reported by Huxley (1857). After that many workers reported and studied the genus such as Faria *et. al.* (1922), Song & packroff (1997), Jun Gong *et. al.* (2002, 2004, 2007), Weibo & Song (2003), Xiaoz hong *et. al.* (2005), Lisfang Li (2006), Hung *et. al.* (2011), Mi Hyun *et. al.* (2014). The authors compared the present species with earlier species *D. brasiliensis*, *D. magna*, *D. yagiui*, *D. nabia* as shown in Table No.1. After observations it is seen that shape of present species is approximately similar *D. brasiliensis*. Body dimension approximately similar to *D. brasiliensis*. Shape of macronucleus is also same in *D. brasiliensis* but it is different from *D. magna*, *D. yagiui* and *D. nabia*. Micronucleus is not observed in all the species including present species. Number of contractile vacuoles i.e. 2 is also same in all the species including present species. All the species are marine in habitat. After discussion it is concluded that the present species very near to *D. brasiliensis*. So, considered as *D. brasiliensis* and redescribed here.

#### ACKNOWLEDGEMENT:

The Authors are grateful to the Head, Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for his cooperation during the research work.

#### REFERENCES:

- Berger H. (2001):** Catalogue of ciliate names 1. Hypotrichs. Verlag Helmut Berger, Salzburg.
- Foissner W. (1996):** Faunistics, taxonomy and ecology of moss and soil ciliates (Protozoa, Ciliophora) from Antarctica, with description of new species, including *Pleuroplitoidessmithigen.n.*, sp. n. *ActaProtozool.* 35: 95–123.
- Huxley, T.H., (1857):** On Dysteria; a new genus of infusoria. *Quart. J. Microsc. Sci.* 5, 78–82.
- Jun Gong, Weibo Song and Alan Warren (2002):** Redescriptions of two marine cyrtophorid ciliates, *Dysteria cristata* (Gourret and Roeser, 1888) Kahl, 1931 and *Dysteria monostyla* (Ehrenberg, 1838) Kahl, 1931 (Protozoa, Ciliophora, Cyrtophorida), from China Europ. *J. Protistol.* 38, 213–222.



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

**Jun Gong and Weibo Song (2003):** Morphology and infraciliature of two marine benthic ciliates, *Dysteria procera* Kahl, 1931 and *Dysteria magna* nov. spec. (Protozoa, Ciliophora, Cyrtophorida), from China Europ. J. Protistol. 39, 301–309.

**Jun Gong et. al. (2007):** Microscopical observations on four marine Dysteria species (Ciliophora, Cyrtophorida) European Journal of Protistology 43, 147–161.

**Jun Gong, Weibo Song (2004):** Description of a new marine cyrtophorid ciliate, *Dysteria derouxi* nov. spec., with an updated key to 12 well-investigated *Dysteria* species (Ciliophora, Cyrtophorida) European Journal of Protistology 40, 13–19.

**Kudo R.R. (1966):** Protozoology, 5th edition, Springfield III Thomas.

**Kirby, Harold, (1950):** Material and Methods in the Study of Protozoa. Univ. of Calif. Press.

**S. Sahoo\*, N. Behera, A. K. Patel and S. Dash (2008):** Protozoan density and diversity in response to sewage fed irrigation in tropical agro ecosystem, *The Bioscan*, 3(4), 383–386.

**Lifang LI and Weibo Song (2006):** Phylogenetic Positions of Two Cryptophorid Ciliates, *Dysteria procera* and *Hartmannula derouxi* (Ciliophora: Phyllopharyngea: Dysteriida) Inferred from the Complete Small Subunit Ribosomal RNA Gene Sequences *Acta Protozool.* 45, 265 – 270.

**Mi-Hyun Park and Gi-Sik Min (2014):** A New Marine Cyrtophorid Ciliate, *Dysteria nabia* nov. spec. (Ciliophora: Phyllopharyngea: Cyrtophorida: Dysteriidae), from South Korea. *Acta Protozool.* 53, 257–268.

**Wilbert, N. (1975):** Eine verbesserte Technik der Protargolimprägung für Ciliaten. *Mikrokosmos* 64, 171–179.

**Xiaozhong Hu, Toshikazu Suzuki (2005):** Light microscopical observations on two marine dysteriid ciliates from Japan, including a description of *Dysteria yagiui* nov. spec. (Ciliophora, Cyrtophorida) *European Journal of Protistology* 41, 29–36.

## 29. *Conarete parneri*: A new species of Gall midge (Diptera: Cecidomyiidae) from India.



Wesleyan Journal of Research, Vol.14 No.28 (September 2021)

ISSN – 0975-1386  
Research article: (Science)

### **CONARETE PARNERI: A NEW SPECIES OF GALL MIDGE (DIPTERA: CECIDOMYIIDAE) FROM INDIA**

**S.R. Wagh**

Department of Zoology, New Arts, Commerce and Science College, Parner- 414302.

Dist. Ahmednagar, Maharashtra, India, E mail: [sudhirwagh19@gmail.com](mailto:sudhirwagh19@gmail.com)

#### **ABSTRACT:**

*Conarete parneri* sp. nov. is described from Parner region of Ahmednagar District, Maharashtra, India. Key to the Indian species of the genus is provided.

**KEY WORDS:** Diptera, Cecidomyiidae, *Conarete parneri*, new species.

#### **Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: S.R. Wagh

#### **INTRODUCTION:**

The family Cecidomyiidae is one of the largest families of order Diptera not only from the point of view of regional fauna but also from the stand point of continents, zoogeographical regions and the entire world (Skuhrava, Skuhavy and Brewer, 1984). The name gall midge comes from the ability of the larvae to produce galls or abnormal growth on various organs of plants and the family name is derived from the Latin word 'Cecidium' means 'Gall'. Gall midges are found attacking variety of plants. They are widely distributed on most herbaceous and woody plants. Cecidomyiids, popularly known as gall midges, are minute to small, fragile, slender bodied, having long antennae and somewhat hairy flies, mostly inhabitants of galls (plant deformities) and belonging to the order Diptera, the suborder Nematocera, the superfamily Mycetophiloidea and the family Cecidomyiidae. (Mani, 1934)

In Maharashtra, a total of 106 Zooecidia were recorded on 64 plant genera belong to 40 families. Among these plant galls 48 galls are caused by diptera, 20 by homoptera, 15 by eriophid mites, 04 by thysanoptera, 04 by hymenoptera, 03 by lepidoptera, 01 by coleoptera and 01 by fungus. Evidently, dipterans especially gall midges (cecidomyiids) show dominance over other gall makers. (Sharma, 2003).

It is evident from the above that the gall midges are economically very important group of insects from agriculture and forestry point of view. While studying the gall midges from Ahmednagar District, Maharashtra, India flies were collected at light at Parner, Tal. Parner, Dist. Ahmednagar, Maharashtra, India in the year 2019. On closer observation of these flies a new species *Conarete parneri* is described.

**MATERIALS AND METHODS:**

The present research mainly deals with the taxonomic studies of gall midge. These notorious insects were collected from various parts of Parner region of Ahmednagar District, Maharashtra State of India; during 2018 – 2020. Midge flies were also collected at light, while they were on wing, hovering near grasses, crop plants, etc. For the taxonomic studies of the midge flies, various parts like head with antennae, thorax, legs, wings, abdomen with ovipositor in female were dissected under binocular microscope and then mounted on slide. Permanent slides were prepared by using D.P.X. as a mounting media. Morphological studies were carried out with the help of monocular microscope. Figures of various parts have been drawn with the help of camera lucida (mirror type). Comparative measurements were taken with ocular micrometer and proportions indicated in the parenthesis. The measurements of the figures drawn by the camera lucida were synchronized with the stage micrometer. All the measurements were recorded in millimeters.

For the identification of the genera of the midge flies, keys given by Mani (1934), Grover (1970 a & b), Grover (1975) were consulted. For confirmation of genera, diagnostic generic characteristics given by Grover (1979), Deshpande (1983) and Sharma (2012) were considered. Studying and comparing with the concerned literature carried out the identification of the species under each genus. Laboratory studies were conducted at the Department of Zoology, New Art's, Commerce and Science College, Parner, Dist. Ahmednagar.

**RESULTS AND DISCUSSION:*****Conarete parneri* sp. nov.**

(Figs. 1 - 7)

**Female:** Body: 0.76 mm long, dark brown in preserved condition. Eyes confluent above, ocelli absent; Trophi normal.

**Palpus:** Quadriarticulate, long, sparsely setose; first segment (12 : 8) subcylindrical, broad apically, narrow at base, 1.5 x as long as its maximum thickness; second segment (14 : 7) subcylindrical, broad at the base, narrowed apically, 1.16 x longer than the first, length 2 x as long as its maximum thickness; third segment (16 : 6) cylindrical, broad apically, narrow at base, 1.14 x as long as the second and 2.66 x as long as its maximum thickness; fourth segment (19 : 4) cylindrical, longest of all, narrow at the base, broad apically, 1.18 x as long as the third and 4.75 x as long as thick.

**Antenna:** Brown, 0.26 mm long, shorter than body with 2 + 9 segments, oval and moderately setose segments, with a whorl of bristles basally, segments without marked stems; scape (9 : 11), cup shaped, length 0.81 x its maximum thickness; pedicel (11 : 12) subglobose, wider and longer than the scape, 0.91 x as long as thick; third segment (11 : 10) not confluent with the fourth, with a short basal prolongation (1 : 1) as long as its maximum thickness, without marked apical stems; fourth segment (8 : 9) 0.72 x the length of the third and 0.88 x its maximum thickness; fifth segment (7 : 8) 0.87 x the length of fourth and 0.87 x its maximum thickness; sixth segment (8 : 8) little longer than fifth and as long as its maximum thickness; seventh segment (9 : 8) 1.12 x the length of sixth and 1.12 x its maximum thickness; eighth segment (9 : 7) as long as seventh segment and 1.28 x its maximum thickness; ninth segment (9 : 8) as long as eighth segment and 1.12 x its maximum thickness; penultimate segment (10 : 8) 1.11 x the length of ninth and 1.25 x as long as its maximum thickness; terminal

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

segment (13 : 7) longest of all, 1.3 x the length of the penultimate segment and 1.85 x as long as its maximum thickness, broad basally with a subapical constriction, ending in a short knob.

**Thorax:** Mesonotum dark brown scutellum and post scutellum brown in colour.

**Wing:** (44 : 14) Hyaline, nearly rectangular, length 3.14 x as long as broad, microtrichae scattered uniformly all over the wing, wing margin interrupted at the union of  $R_5$  with costa, vein  $R_5$  unites with costa at the  $\frac{3}{4}$  of the wing, fork of vein  $M_{1+2}$  longer than its stem, vein  $M_{3+4}$  complete, vein  $Cu$  simple, vein  $Cu_2$  clear.

**Legs:** Long, brown, sparsely setose, metatarsus (86) nearly as long as the terminal tarsal segments combined together (88), second tarsal segment (34) 0.39 the length of metatarsus, third tarsal segment (18) 0.52 the length of second tarsal segment; fourth tarsal segment (16) 0.88 x the length of third tarsal segment; terminal tarsal segment (20) longer than the fourth tarsal segment. claw (8) with three stout teeth; empodium (5) 0.62 x the length of claw.

**Ovipositor:** Not exerted, lamellate; basal lobe (12 : 8) cylindrical, nearly oval, length 1.5 x its maximum thickness, broad medially; terminal lobe (9 : 7) oval, 0.75 x as long as basal lobe and 1.28 x its maximum thickness.

**Holotype:** One female dissected and mounted on slide, labelled as, "at light, College Campus, Tal. Parner, Dist. Ahmednagar, S. R. Wagh collection, dated 23.VII.2019".

**Paratype:** Two females dissected and mounted on slide, labelled as in holotype.

**Remarks:**

The present species have resemblance to *Conarete mihijamensis* Grover (1970b) but can be distinguished from it by following set of characters.

- i. Terminal lobe of ovipositor 0.75 x as long as the basal lobe (not as long the basal lobe).
- ii. Third palpal segment 2.66 x as long as its maximum thickness (not 5 x as long as thick).
- iii. Fourth palpal segment 4.75 x as long as thick (not more than 10 x as long as thick).
- iv. Antennal segments without marked stems (not with marked stems).
- v. Empodium 0.62 x the length of claw (not less than half the length of claw).

**KEY TO THE FEMALE SPECIES OF CONARETE PRITCHARD (1951)**

- |    |  |                     |
|----|--|---------------------|
| 1. | Terminal lobe of the ovipositor circular.  | 2                   |
|    | Terminal lobe of the ovipositor not circular but oval or elongated oval.   | 3                   |
| 2. | Palpus quadriarticulate; antenna with 2 + 9 segments; antennal segment upto the fifth without marked stems; empodium less than half the length of claw; basal lamella very small; terminal lamella of ovipositor globose and circular. | <i>calcuttaense</i> |
|    | [ <i>Proc. R. ent. Soc. Lond.</i> , <b>18 (5&amp;6)</b> : 78 (1949).]  | Nayar               |

3. Terminal lobe of ovipositor oval as long as the basal; third palpal segment 5 x as long as thick; fourth palpal segment more than 10 x as long as thick; antennal segments with marked stems; empodium half the length of claw; claw simple, evenly curved. *mihijamensis*  
Grover  
[*Cecid. Indica.*, **V (2&3)**: 140 – 141 (1970b).]

Palpus quadriarticulate; antenna with 2 + 9 segments; antennal segment without any marked stems; Terminal lobe of ovipositor oval 0.75 x as long as basal; third palpal segment 2.66 x as long as thick; fourth palpal segment 4.75 x as long as thick; claw simple, evenly curved; empodium 0.62 x the length of claw. *parneri*  
sp. nov.

## PLATE: II

*Conarete parneri*, sp. nov. (Female)

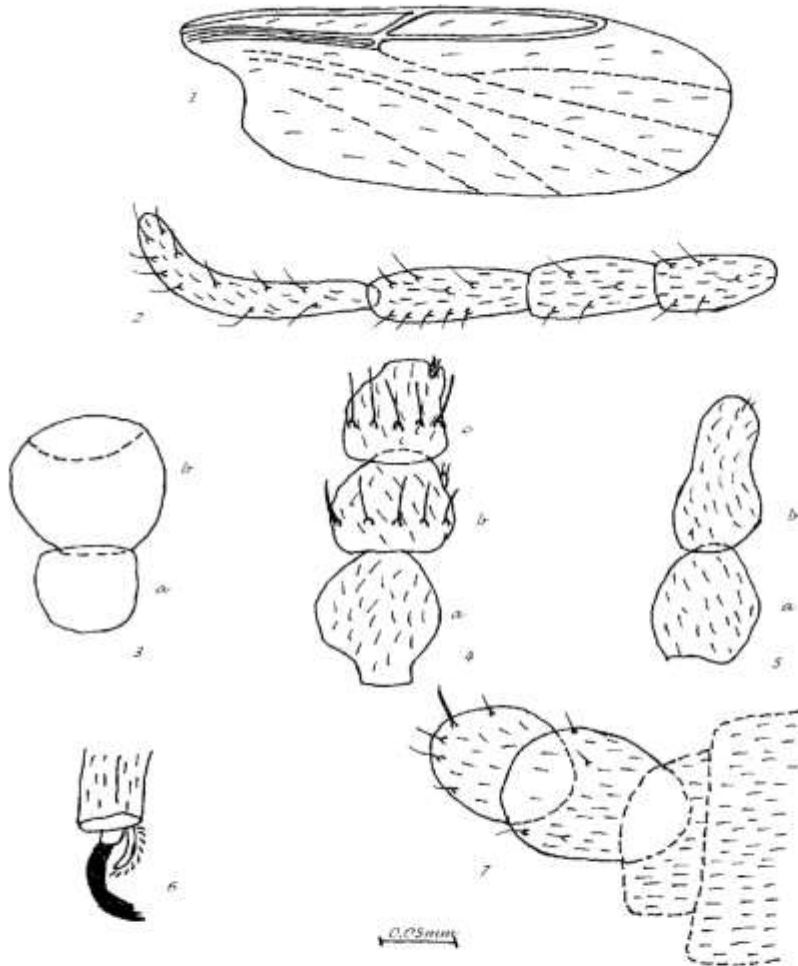
(Figs. 1 – 7)

- |          |                              |
|----------|------------------------------|
| Fig. 1   | Wing                         |
| Fig. 2   | Palpus                       |
| Fig. 3 a | Scape                        |
| Fig. 3 b | Pedicel                      |
| Fig. 4 a | Third antennal segment       |
| Fig. 4 b | Fourth antennal segment      |
| Fig. 4 c | Fifth antennal segment       |
| Fig. 5 a | Penultimate antennal segment |
| Fig. 5 b | Terminal antennal segment    |
| Fig. 6   | Claw                         |
| Fig. 7   | Ovipositor                   |

Wesleyan Journal of Research, Vol.14 No.28 (September 2021)

0.25mm

PLATE II



[91]

**ACKNOWLEDGEMENTS:**

I am thankful to the Principal, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Director, Zoological Survey of India, Western Regional Station, Pune and the Head, Department of Zoology, Shivaji University, Kolhapur for permission to undertake this work and providing necessary facilities.

**REFERENCES:**

- Deshpande, V. D. (1983): On a new gall midge species (Diptera: Cecidomyiidae: Lestremiinae).
  - Proc. 70<sup>th</sup> Indian Science Congress, **70 (3)**: 124-125.
- Grover, P., (1970a): Origin and classification of family Cecidomyiidae (Diptera: Nematocera)., *Cecid. Indica*, **5**: 71 – 108.
- Grover, P., (1970b): Studies on gall midges of India XXXIII. On a study of Indian Lestremiinae. *Cecid. Indica*, **5 (2 & 3)**: 122 – 180.
- Grover, P., (1975): Studies on gall midges from India XI. Keys to gall midges of oriental region. *Cecid. Indica*, **10 (1 & 2)**: 1 – 106.
- Grover, P., (1979): Studies on gall midges from India XLIII. A revision of the sub family Cecidomyiinae. *Cecidologia indica*, **14**: 10 – 186.
- Mani, M.S. (1934): Studies on Indian Itonididae (Cecidomyiidae: Diptera). *Rec. Ind. Mus.*, **36**:
  - 371-451.
- Nayar, K.K., (1949): New Indian gall midges (Diptera: Cecidomyiidae). *Proc. R. Ent. Soc. Lond.*, **18 (5 & 6)**: 78 – 89.
- Sharma, R. M., (2003): A checklist of gall midges (Diptera: Cecidomyiidae) from Maharashtra State. *Ann. For.* **11 (2)**: 269-279.
- Sharma, R. M., (2012): Insecta: Diptera: Cecidomyiidae (Gall Midges) *Zool. Surv. India, Fauna of Maharashtra, State Fauna Series*, **20 (2)**: 539 – 548.

**30. Diversity And Distribution Of Freshwater Sponges In India: A Review***Wesleyan Journal of Research*, Vol.14 No.26 (September 2021)ISSN – 0975-1386  
Research article: (Zoology)**DIVERSITY AND DISTRIBUTION OF FRESHWATER SPONGES IN INDIA: A REVIEW****Mr. Ganesh G. Wakchoure**

Department of Zoology, New Arts, Commerce and Science College (Autonomous), Laltaki Road, Ahmednagar, 414001. Maharashtra, India. E-mail ID: [ganesh.wakchoure619@gmail.com](mailto:ganesh.wakchoure619@gmail.com)  
ORCID ID: <https://orcid.org/0000-0003-3004-2335>

**Dr. Ananta D. Harkal**

Department of Zoology, New Arts, Commerce and Science College (Autonomous), Laltaki Road, Ahmednagar, 414001. Maharashtra, India. E-mail ID: [harkalananta@gmail.com](mailto:harkalananta@gmail.com), ORCID ID: <https://orcid.org/0000-0002-3629-0041>

**Mr. Mahesh S. Aher**

Department of Zoology, New Arts, Commerce and Science College, Parner, Tal. Parner, Dist. Ahmednagar, 414302, Maharashtra, India, E-mail ID: [ajinkya.aher@gmail.com](mailto:ajinkya.aher@gmail.com)  
ORCID ID: <https://orcid.org/0000-0002-4850-2427>

**Abstract:**

The article reviews the diversity and distribution records of freshwater sponges, in India. The single family i.e. Spongilidae are represented by 32 species. The papers give you an idea about the distribution records of 32 species in 19 states and in 3 union territories of the India and reveal vacant areas which are have to be explored to understand the real picture of diversity and distribution of these animals in India.

**Keywords:** Diversity, Distribution, Freshwater sponges, Endemic, India, Review etc.

**Abbreviations:** ZSI: Zoological Survey of India.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Mr. Mahesh S. Aher

**1. Introduction:**

The initial study on sponges have been performed by Carter (1849; 1881; 1882) & Bowerbank (1863) but Annandale (1911) who became pioneer for presenting a comprehensive account of taxonomy & biology of all freshwater sponges from Indian Region. (S. S. Jakhalekar & H. V. Ghate) According to Soota (1991), there are about 30 species of freshwater sponges in 10 genera of the family Spongillidae (Gray), from Indian region. (S. S. Jakhalekar & H. V. Ghate). Sponges form a group of aquatic invertebrates known as Porifera meaning pore

[1]



bearers. (T.D. Soota- 1991). These organisms have poorly organized body structure as well as little or no locomotory activities, they have a tendency to high morphological plasticity which leads to their Susceptibility to pronounce polymorphism. (T.D. Soota-1991). The texture of freshwater sponges is fragile and soft, as the colour coded for such species is whitish or green (Chitra J, 2012). Due to porous body, canals and chambers are involved in unidirectional water current through the body which is propelled by random beating of flagella occurring on a single layer of flagellated cells known as choanocytes and feed on suspended organic particles. (J. G. Pattanayak and Santanu Mitra, 2013). In freshwater sponges, the spicules always made of silica which is useful for taxonomic classification and all these spicules are showing 3 types of spicules and these are the skeletal (Megascleres), the flesh (Microscleres) and the gemmules (Gemmoscleres). (M. M. Saxena, 2017). In fact, these spicules are made of 92% Silicon dioxide, 7% water and some traces of Magnesium Potassium and Sodium (M. M. Saxena, 2017).

## **2. Diversity and Distribution of Sponges:**

Annandale is pioneer of poriferan taxonomy. Most of the Annandale's work is published in the records of Indian Museum. According to T.D. Soota (1991) Annandale described 3 genera and 16 new species of freshwater poriferans from Indian Subcontinent. He recorded the diversity of these animals from numerous localities in India. Annandale published 16-20 papers and one book entitled Freshwater sponges, Hydroids and Polyzoa – Fauna of British India (1911) to elucidate freshwater poriferans of India. The legacy of Annandale was actually followed by very few workers. By the recordings of ZSI, the Carter had enlisted 05 new species from Indian Subcontinent. *Radiospongilla cerebellata* (Bowerbank, 1863) and *Spongilla lacustris* (Linnaeus, 1759) are the most diversified species. *Radiospongilla cerebellata* had originally described elaborately by Bowerbank (1863) (T. D. Soota 1991). It has been described by various authors by several different names i.e. *Spongilla proliferens* (Annandale, 1907) and *Spongilla reticulata* (Annandale, 1907), later on these are redescribed as *Radiospongilla cerebellata* (Bowerbank, 1863). Likewise, *Radiospongilla cerebellata*, there are so many species namely *Eunapius carteri* (Bowerbank, 1863), *Radispongilla cinerea* (Carter, 1849), *Corvospongilla ultima* (Annandale, 1910), *Eunapius crassissimus* (Annandale, 1907), *Radiospongilla hemephydatia* (Annandale, 1909), *Ephydatia fluviatilis* (Haswell, 1882) which have been published by many other synonyms and later on all of the synonymic species are accepted by their original name by World Porifera Database (<http://www.marinespecies.org/porifera/>), as universal name.

According to (Saxena M. M., 2017), out of total 31 species, mentioned in the 'chapter 4' from 'Current Status of Freshwater Faunal Diversity in India' 11 species are recorded as Endemic species to India. As per this review, out of 31 species 13 species are only recorded from single state. Saxena M. M. (2017), mentioned in his table that *Eunapius calcuttanus* (Annandale, 1911), *Corvospongilla caunteri* (Annandale, 1911), *Corvospongilla lapidosa* (Annandale, 1908), *Corvospongilla ultima* (Annandale, 1910) and *Radiospongilla cinerea* (Carter, 1840) were also mentioned as endemic. But, about *Eunapius calcuttanus* (Annandale, 1911), was also recorded from Meghalaya (Pattanayak, 1999), in State Fauna Series 4; Fauna of Meghalaya Part 9. Remaining, all of these species i.e. *Corvospongilla caunteri* (Annandale, 1911), *Corvospongilla lapidosa* (Annandale, 1908), *Corvospongilla ultima* (Annandale, 1910) and *Radiospongilla cinerea* (Carter, 1840) were also recorded from different states. (T. D. Soota, 1991), Records of Z. S. I. Occ. Paper No. 138, (pp- 52, 53, 55 and 61). There are

actually so many species that are only recorded from single state but not counted as endemic, these are as follows. *Trochospongilla philottiana* (Annandale, 1907), *Eunapius fragilis* (Leidy, 1851), *Trochospongilla pennsylvanica* (Potts, 1882), *Corvospongilla burmanica* (Kirkpatrick, 1908), and *Eunapius fluviatilis* (Haswell, 1882). The occurrence of *Trochospongilla philottiana* (Annandale, 1907), *Eunapius fragilis* (Leidy, 1851), and *Trochospongilla latouchiana* (Annandale, 1907) is only from West Bengal. On the same basis, *Pectispongilla aurea* (Annandale, 1908), *Pectispongilla stellifera* (Annandale, 1915), *Pectispongilla subspinosa* (Annandale, 1911), *Trochospongilla pennsylvanica* (Potts, 1882) are only recorded from Kerala. From Maharashtra also the occurrence of *Stratospongilla graveleyi* (Annandale, 1912), *Stratospongilla sumatrana* (Weber, 1890) and *Corvospongilla burmanica* (Kirkpatrick, 1908) is getting restricted. *Corvospongilla bhavnagarensis* (Soota, Pattnayak and Safena, 1984), *Eunapius geminus* (Annandale, 1911) and *Ephydatia fluviatilis* (haswell, 1882) are only being recorded from Gujarat, Karnataka and Uttarakhand respectively. According to J. G. Pattanayak and Santanu Mitra (2013) and by Soota (1991), there are total 31 species are recorded from India, but by including of species *Metania vesporoides* (Annandale, 1908) which was restricted to Myanmar only as part of Indian subcontinent region (p.94) But by this review, we have noticed around 32 species by excluding *Metania vesporoides* (Annandale, 1908) and by including *Eunapius fragilis* (Leidy, 1851) (ZSI State Series) and *Trochospongilla latouchiana* (Annandale, 1907) (ZSI, State Series).The wide diversity and distribution of freshwater sponges has been recorded for India. All the publications are available on <https://zsi.gov.in/App/index.aspx> website.

**3. List of species of freshwater Sponges of India:**

*Radiospongilla cerebellata* (Bowerbank, 1863), *Eunapius carteri* (Bowerbank, 1863), *Corvospongilla lapidosa* (Annandale, 1908), *Trochospongilla paulula* (Bowerbank, 1863), *Ephydatia meyeri* (Carter, 1849), *Spongilla lacustris* (Linnaeus, 1759), *Stratospongilla indica* (Annandale, 1908), *Corvospongilla cauteri* (Annandale, 1911) *Radiospongilla cinerea* (Carter, 1849) *Dosilia plumosa* (Carter, 1849), *Stratospongilla bombayensis* (Carter, 1882), *Corvospongilla bhavnagarensis* (Soota, Pattnayak & Safena, 1984), *Spongilla alba* (Carter, 1849), *Eunapius geminus* (Annandale, 1911), *Corvospongilla ultima* (Annandale, 1910), *Radiospongilla crateriformis* (Potts, 1882), *Pectispongilla aurea* (Annandale, 1908), *Pectispongilla stellifera* (Annandale, 1915), *Pectispongilla subspinosa* (Annandale, 1911), *Trochospongilla pennsylvanica* (Potts, 1882), *Stratospongilla graveleyi* (Annandale, 1912), *Eunapius crassissimus* (Annandale, 1907), *Radiospongilla hemephydatia* (Annandale, 1909), *Stratospongilla sumatrana* (Weber, 1890), *Corvospongilla burmanica* (Kirkpatrick, 1908), *Ephydatia fluviatilis* (Haswell, 1882), *Eunapius calcuttanus* (Annandale, 1911), *Trochospongilla philottiana* (Annandale, 1907), *Umborotula bogorensis* (Weber, 1890), *Eunapius fragilis* (Leidy, 1851), *Trochospongilla latouchiana* (Annandale, 1907), *Radiospongilla indica* (Annandale, 1907).

Sr. No.	State	Number	Distribution record of sponges
1.	Andhra Pradesh	03	<i>Radiospongilla cerebellata</i> , <i>Eunapius carteri</i> , <i>Corvospongilla lapidosa</i>

## Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

2.	Arunachal Pradesh	03	<i>Radiospongilla cerebellata</i> , <i>Trochospongilla paulula</i> , <i>Euphydatia meyeri</i>
3.	Assam	03	<i>Radiospongilla cerebellata</i> , <i>Spongilla lacustris</i> , <i>Eunapius crassissimus</i>
4.	Bihar	06	<i>Radiospongilla cerebellata</i> , <i>Spongilla lacustris</i> , <i>Stratospongilla indica</i> , <i>Corvospongilla caunteri</i> , <i>Radiospongilla cinerea</i> , <i>Dosilia plumosa</i> .
5.	Gujarat	04	<i>Stratospongilla bombayensis</i> , <i>Corvospongilla bhavnagarensis</i> , <i>Corvospongilla caunteri</i> , <i>Corvospongilla lapidosa</i>
6.	Haryana	01	<i>Euphydatia meyeri</i> ,
7.	Himachal Pradesh	03	<i>Spongilla lacustris</i> , <i>Spongilla alba</i> , <i>Euphydatia meyeri</i>
8.	Karnataka	04	<i>Radiospongilla cerebellata</i> , <i>Spongilla lacustris</i> , <i>Eunapius geminus</i> , <i>Stratospongilla bombayensis</i> ,
9.	Kerala	09	<i>Radiospongilla cerebellata</i> , <i>Corvospongilla ultima</i> , <i>Radiospongilla crateriformis</i> , <i>Pectispongilla aurea</i> , <i>Pectispongilla stellifera</i> , <i>Pectispongilla subspinosa</i> , <i>Trochospongilla pennsylvanica</i> , <i>Spongilla alba</i> , <i>Ephydatia meyeri</i>
10.	Maharashtra	19	<i>Radiospongilla cerebellata</i> , <i>Ephydatia meyeri</i> , <i>Spongilla lacustris</i> , <i>Radiospongilla cinerea</i> , <i>Eunapius carteri</i> , <i>Stratospongilla bombayensis</i> , <i>Stratospongilla indica</i> , <i>Spongilla lapidosa</i> , <i>Corvospongilla caunteri</i> , <i>Stratospongilla graveleyi</i> , <i>Corvospongilla ultima</i> , <i>Dosilia plumosa</i> , <i>Eunapius crassissimus</i> , <i>Spongilla alba</i> , <i>Stratospongilla sumatrana</i> , <i>Corvospongilla burmanica</i> , <i>Radiospongilla crateriformis</i> , <i>Radiospongilla hemephydatia</i> , <i>Radiospongilla indica</i>
11.	Meghalaya	01	<i>Eunapius calcuttanus</i>
12.	Orissa	07	<i>Radiospongilla hemephydatia</i> , <i>Radiospongilla cerebellata</i> , <i>Spongilla lacustris</i> , <i>Eunapius carteri</i> , <i>Spongilla alba</i> , <i>Eunapius crassissimus</i> , <i>Dosilia plumosa</i>
13.	Punjab	01	<i>Spongilla lacustris</i> ,
14.	Rajasthan	06	<i>Ephydatia meyeri</i> , <i>Dosilia plumosa</i> , <i>Corvospongilla caunteri</i> , <i>Corvospongilla ultima</i> , <i>Eunapius carteri</i> , <i>Stratospongilla bombayensis</i>

[4]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

15.	Tamil Nadu	06	<i>Corvospongilla ultima, Radiospongilla cerebellata, Ephydatia meyeri, Spongilla lacustris</i>
16.	Tripura	02	<i>Spongilla lacustris, Eunapius carteri</i>
17.	Uttar Pradesh	06	<i>Radiospongilla cerebellata, Ephydatia meyeri, Stratospongilla bombayensis, Radiospongilla cinerea, Corvospongilla lapidosa, Corvospongilla caunteri,</i>
18.	Uttarakhand	01	<i>Ephydatia fluviatilis, Radiospongilla cinerea.</i>
19.	West Bengal	16	<i>Spongilla lacustris, Eunapius crassissimus, Radiospongilla cerebellata, Trochospongilla paulula, Ephydatia meyeri, Dosilia plumosa, Eunapius calcuttanus, Eunapius carteri, Spongilla alba, Corvospongilla lapidosa, Radiospongilla cinerea, Trochospongilla philottiana, Radiospongilla indica, Eunapius fragilis, Umbrotula bogorensis, Trochospongilla latouchiana</i>
20.	Andaman and Nicobar Islands	02	<i>Radiospongilla crateriformis, Umbrotula bogorensis</i>
21.	Delhi	01	<i>Spongilla Spp.</i>
22.	Jammu and Kashmir	01	<i>Spongilla lacustris</i>

**Table-1: Showing distribution record of freshwater of Sponges in India.**

#### 4. Remarks and Conclusion:

There are 32 documented species with the distribution records in 19 states and 3 union territory of India. All of these 32 documented species, were belonging from 10 different genera. According to this review, the major work has only performed from two states, means from Maharashtra (19 species were recorded) and from West Bengal (16 species were recorded). In remaining states, the moderate level study and findings has been performed. The 09 states namely Chhattisgarh, Goa, Jharkhand, Madhya Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Telangana and five union territories are still to be explored to understand the real picture of diversity and distribution of freshwater poriferans in India. According to this review paper, we have come to the conclusion, that the two species i.e. *Eunapius fragilis* (Leidy, 1851) and *Trochospongilla latouchiana* (Annandale, 1907) that has been recorded from West Bengal and still not obtain any proper position in any other literature review, and also not get any recommendation from T.D. Soota (1991), According to Pattanayak (ZSI State Series), the first record from India of *Trochospongilla latouchiana* (Annandale, 1907) was noted from West Bengal, but during the present investigation thorough search has been made in the type locality as well as in other areas of West Bengal, but author is unable to record this species again. The all species are being recorded on directly the ZSI. The some of the states which are less explored will possibly also add valuable information in the faunal resources of India.

#### 5. References:

1. Annandale N., (1907) Notes on freshwater sponges I-V, *Records of the Indian Museum*. 1: 267-273.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

2. **Annandale N., (1907)** Notes on freshwater sponges VI-VII. *Records of the Indian Museum*. 1: 387-392.
3. **Annandale N., (1911)** Freshwater Sponges, Hydroids and Polyzoa. Porifera. Pp. 27-126, 241-245
4. **Annandale N., (1908)** Notes on Freshwater Sponges. VIII. Preliminary Notice of a Collection from the Western India, with descriptions of two New Species. *Records of the Indian Museum*. 2(1): 25-28.
5. **Annandale N., (1919, 1921)** Sponges, Hydrozoa and Polyzoa of Seistan. In: Report on the aquatic fauna of Seistan with subsidiary studies. *Records of the Indian Museum*. 18 (2): 83-97.
6. **Annandale N., (1919)** The fauna of certain small streams in the Bombay Presidency. VIII. Sponges from the Satara and Poona districts and from Chota (Chutia) Nagpur. *Records of the Indian Museum*. 16: 156-161.
7. **Annandale N., (1909)** Notes on Freshwater Sponges. X. Report on a small collection from Travancore. *Records of the Indian Museum*. 3XII: 101-104.
8. **Annandale N., (1910)** Notes on Freshwater Sponges. XII. Description of a new species from Cape Comorin. *Records of the Indian Museum*. 5: 31.
9. **Annandale N., (1912)** The Freshwater Sponges of the Malabar zone. *Records of the Indian Museum*. 7: 383-397.
10. **Annandale N., (1915)** Notes on Freshwater Sponges. XVI. The genus *Pectispongilla* and its allies. *Records of the Indian Museum*. 11: 171-178.
11. **Annandale N., (1907)** Notes on the freshwater fauna of India. IX. Description of new freshwater Sponges from Calcutta, with a record of two new species from the Himalayas, and a list of the Indian forms. *Journal and Proceedings of the Asiatic Society of Bengal*. 3: 15-16.
12. **Annandale N., (1909)** Notes on freshwater sponges. XI. Description of a new species of *Spongilla* from Orissa. *Records of the Indian Museum*. 3: 101-104.
13. **Annandale N., (1918)** Sponges, Hydrozoa and Polyzoa of the Inle Lake. *Records of the Indian Museum*. 14: 75-78.
14. **Annandale N., (1908c)** Note on *Ephydatia meyeri* (Carter). *Rec. Indian Mus*, 2: 306-307.
15. **Annandale N., (1909a)** Beitrage zur Kenntnis der Fauna von Ergebnisse einer Reise von Prof. Max Weber in Jahre 1894. IX. Freshwater sponges. *Zool. Jb.*, 27(6): 559-568.
16. **Annandale N., (1911a)** Notes on a freshwater sponge and polyzoan from Ceylon. *zeylan.*, 1: 63-64.
17. **Annandale N., (1911b)** Notes on freshwater sponges. XIII. Specimens collected in the Poona district, Bombay Presidency, by S. P. Agharkar. *Rec. Indian illus.*, 6: 225-226.
18. **Annandale N., (1912a)** Notes on freshwater sponges. XIV. The generic position of "*Spongilla ultima*." *Rec. Indian Mus.*, 7: 99.
19. **Arun Kumar, (1997)** Species known from Delhi, State Fauna Series 6: Fauna of Delhi, *Zoll. Surv. India*.
20. **Bowerbank J.S., (1863)** A Monograph of the Spongillidae. *Proceedings of the Zoological Society of London*. 1863: 440-472. page(s): 465-466

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

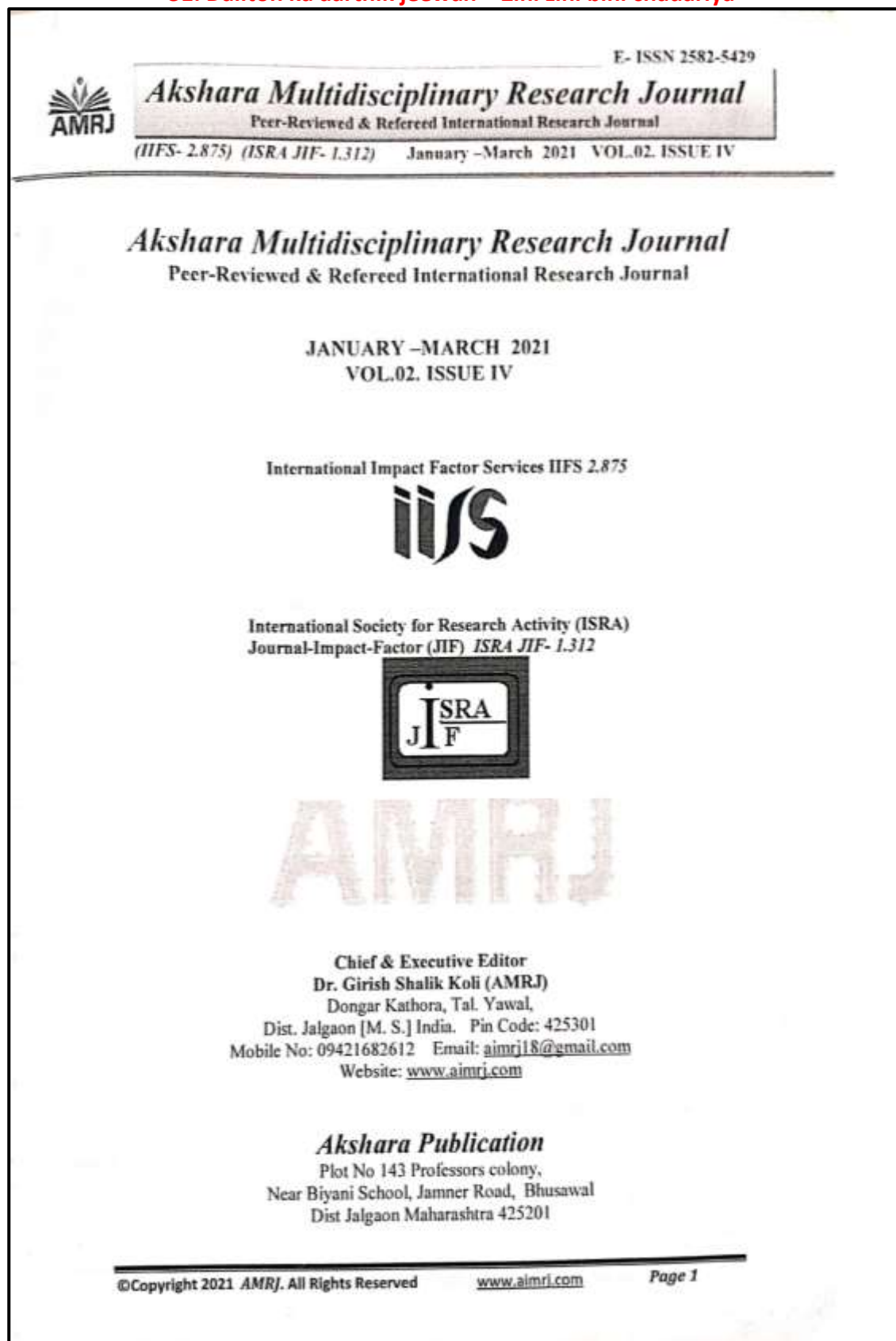
21. **Carter H.J., (1849)** A descriptive Account of the Freshwater Sponges (genus *Spongilla*) in the Island of Bombay, with Observations on their Structure and Development. *Annals and Magazine of Natural History*. (2)4 (20): 81-100.
22. **Carter H. J., (1882)** Spermatozoa, Polygonal Cell structure, and the Green Colour in *Spongilla* together with a new species. *Ann. Mag. nat. Hist.*, 10: 362-372.
23. **Chitra J., (2012)** Occurrence of *Spongilla lacustris* and a case study on its associates from Madambakkam Lake, Kancheepuram district, *J. Acad. Indus Res.* Vol. 1(7): 404-406.
24. **Gee N. G., (1932a)** The genus *Trochospongilla* of freshwater sponges. *Peking nat. Hist. Bull.*, 6(2): 1-32.
25. **Ghate H. V., (2012)** Freshwater Sponges, *Zool. Surv. India, Fauna of Maharashtra, State Fauna Series, 20(Part-2): 215-216.*
26. **Haswell, (1882)** *Meyenia ramsayi*. *Proc. Linn. Soc. NSW*, 7: 210
27. **Kakavipure, D.K. & Yeragi, S.G., (2008)** Occurrence of freshwater sponge *Eunapius carteri* (Bowerbank 1863) from Khativali-Vehloli lake near Shahapur District Thane, Maharashtra, India. *Proc. Taal 2007: the 12th World Lake Conference: 500-505.*
28. **Kirkpatrick R., (1908)** Description of a new variety of *Spongilla loricata*, Weltner. *Records of the Indian Museum*. 2 (1): 97-99.
29. **Leidy J., (1851)** On *Spongilla*. *Proceedings of the Academy of Natural Sciences of Philadelphia*. 5: 278.
30. **Pattanayak J. G. & Santanu Mitra, (2013)** Freshwater sponges of Arunachal Pradesh, India, *Rec. Zool. Surv. India: 113 (Part-4): 57-61.*
31. **Pattanayak J. G., (2003)** Occurrence of *Spongilla lacustris* and *Eunapius carteri* (Demospongiae: Spongillidae) from Tripura, India, *Rec. Zool. Surv. India: 100 (Part 1-2): 189-193,*
32. **Pattanayak J. G., (1999)** Porifera: Freshwater Sponges, *Zool. Surv. India, State Fauna Series 4: Fauna of Meghalaya, Part 9, 1-4.*
33. **Penney J.T. & Racek A.A., (1968)** Comprehensive Revision of a Worldwide. Collection of Freshwater Sponges (Porifera Spongillidae). *Bull. U.S. natn. Mus.*, No. 272: 184 pp.
34. **Potts E., (1882)** Three more Fresh-water Sponges. *Proceedings of the Academy of Natural Sciences of Philadelphia*. 1882(1): 12-14.
35. **Ramakrishna, (1993)** A freshwater sponge *Eunapius carteri* (Bowerbank, 1863) from Indira Sagar lake, Hyderabad, Andhra Pradesh, India, *Rec. Zool. Surv. India, 93 (1-2): 161-164.*
36. **Saxena M. M., (2017)** Ch. 4, Porifera (Sponge), Kailash Chandra, Gopi, K.C., Rao, D.V., Valarmathi, K. and Alfred, J.R.B., 2017. Current Status of Freshwater Faunal Diversity in India: 1-624 (Published by the Director, Zool. Surv. India, Kolkata)
37. **Shiple, A.E., (Ed.)** Fauna of British India, including Ceylon and Burma. (Taylor and Francis: London): i-viii, 1-251.
38. **Shriraj S. Jakhalekar and Hemant V. Ghate, (2016)** Taxonomy of freshwater sponges of Maharashtra, India, with illustrated descriptions and notes on ecology and habitats (Porifera: Spongillida: Spongillidae), *Zootaxa 4173 (6): 501-529.*

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

---

39. **Soota, T.D., Pattanayak, J.G. & Saxena, M.M., (1983)** On some freshwater sponges from Gujarat (India). Records of the Zoological Survey of India 81: 255-260.
40. **Soota, T.D. & Pattanayak J.G., (1982)** On some freshwater sponges from the unnamed collection of the Zoological Survey of India, Rec. Zool. Surv. India, 80: 215-229.
41. **Soota T.D., (1991)** Freshwater Sponges of India, Occasional Paper No. 138, Rec. Zool. Surv. India 1991.
42. **Weber, (1980)** *Spongilla sumatrana*. In Zoologische Ergebnisse einer Reise nach Neiderlandisch Ost-Indien. 1: 88.

## 31. Daliton ka aarthik jeewan – Zini zini bini chadariya





E-ISSN 2502-5429

**Akshara Multidisciplinary Research Journal**  
Peer-Reviewed & Refereed International Research Journal  
January - March 2021 VOL.02, ISSUE IV  
(ISSN 2502-5429) (ANR & JIP: 1, 112)

हिंदी विभाग

Sr.No	Title of the Paper	Author's Name	Page No.
13	महाकवि कालिदासकृत "अभिज्ञानसाकुंतलम्" की अथकावित (कवि बालभोजिनन्दवारिज विरचित) "मोविल्वज्ज्वलानन्दीयन्माभ्या" की रूपरेखा (तिरुवांकूर राज्य के पोन्नूर कोट्टैमना विवासी लिप्यन तन्मूविरिप्पात्र की हस्तपत्रियों से सन् 1919-1920 में लिखित)	डॉ. सत्यनारायण एण्.के	67-70
14	संख्यावाचक शब्दों के प्रयोग में मानी हिन्दी शक्तियों का विभक्तगत वर्गीकरण (महात्मा गाँधी जी की शक्तियों के संदर्भ में)	डॉ. तिराभूषीन तुमतीव	71-77
15	धीन में हिंदी भाषा में रोजगार की स्थिति	शिष्य रुई जीन	78-80
16	प्रभा खेतान की आत्मकथा 'अन्या से अनन्या में स्त्री का सामाजिक संघर्ष	डॉ. मनोहर आप्पासो जमदाड़े	81-83
17	दक्षित चेतना एवं गिरिराज किशोर की कहानियों में प्रतिपादित दक्षित जीवन	डॉ. सुरेश कानडे	84-88
18	समकालीन दक्षित कहानीयों में दक्षित जीवन	डॉ. भगवान बाबुराव भालेराव	89-92
19	अमृतनाथ : प्रगतिवादी चेतना के साहित्यकार	डॉ. विनायक यशवंत खरटमल	93-97
20	दक्षिण का आर्थिक जीवन-" झीनी झीनी बीनी चदरिया" उपन्यास के संदर्भ में ...	प्रा. डॉ. हनुमंत येदू गायकवाड	98-100
21	'पोस्ट बॉक्स नं. 203, नालासोपारा' किन्नरों के जीवन की दर्दनाक दास्तानें	प्रा. सौ. कविता संदीप तळेकर	101-105
22	ग्रामीण एवं सहरी विद्यालयों में बी.एड छात्राध्यापकों का इंटरशिप के दौरान शिक्षण प्रभावशीलता का अध्ययन	डॉ. परविन्दर हुंसपाल श्रीमती बनाली राय	106-107
23	भारतीय मार्क्सवाद के संदर्भ में डॉ. बाबासाहब आंबेडकर की भूमिका	प्रा. डॉ. हनुमंत येदू गायकवाड	108-110
24	पर्यावरणीय दुरुपयोग और अचाव के लिए पर्यावरणीय कानून	रमाकांत	111-113
25	मृणाल पाण्डे की कहानियों में नारी मनोविज्ञान	प्रा. संतोष भिका तमखाने डॉ. रमेश एस. जगताप	114-117
26	'लड्डी मैड की' नाटक में चित्रित संस्कृति, परंपरा एवं ग्रामजीवन	डॉ. निंबा लोटन वाल्हे	118-120
27	गाँधी दशन में भारतीय संस्कृति	डॉ. रमेश टी. बावनचडे	121-124
28	किन्नर और गन्धर्व : शोध यात्रा	डॉ. अंशुमान वल्लभ मिश्र	125-127
29	"जल टूटता हुआ में धार्मिक और सांस्कृतिक मूल्य विघटन"	प्रा.डॉ.अशोक डी तायडे	128-130

©Copyright 2021 AMRJ. All Rights Reserved [www.aimrj.com](http://www.aimrj.com) Page 4

**शोध सारांश-**

झीनी झीनी बीनी चदरिया उपन्यास अब्दुल विस्मिल्लाह द्वारा लिखित उपन्यास है। प्रस्तुत उपन्यास में दलित समाज की आर्थिक संपन्नता और विपन्नता को स्पष्ट रूप से उद्घाटित किया गया है। बदलते हुए आधुनिक युग में दलितों का बदलता हुआ आर्थिक जीवन उनकी स्तरीयता तथा अर्थार्जन की तलाश में नए-नए धितियों को स्पर्श करता हुआ दलित स्त्री, पुरुष वर्ग इस उपन्यास के साथ-साथ अन्य उपन्यासों में भी पाया जाता है।

**प्रस्तावना:-**

प्राचीन भारतीय हिंदू समाज व्यवस्था चतुरवर्णीय व्यवस्था में विभाजित थी। उस व्यवस्था का चतुर्थ अंग दलित समाज माना जाता था। उस व्यवस्था के नीति नियमों के अनुसार दलितों को निम्नांकित निम्न स्तर के काम करने पड़ते थे। उनके पास जीविका के लिए जमीन थी। न अन्य कोई व्यवसाय। मूलतः दलितों पर विभिन्न प्रकार के बंधन होने के कारण वे अपने आपको समाज के किसी भी स्तर पर प्रबल रूप से स्थापित कर नहीं पाए थे। इसलिए उसे जीविकोपार्जन के लिए उन्हें गुलामी सेवा साफ- सफाई के काम करने पड़ते हैं। जाहिर है कि पारंपरिक रूप से दलित लोगों के पास संपत्ति या जमीन व्यवसाय न होने के कारण उनकी आर्थिक परिस्थिति बहुत ही कमजोर रहा करती थी। तत्कालीन समाज व्यवस्था का आधार जाति व्यवस्था होने के कारण उन्हें अपने जाति के पारंपरिक अन्य व्यवसाय करने की अनुमति नहीं थी। इसलिए अपनी काबिलियत होने के बावजूद भी दलित समाज अन्य व्यवसाय नहीं कर पाता था। और इसी कारण वह आर्थिक क्षेत्रों में पिछड़ा रहा। इस संदर्भ में समाजशास्त्र के मोतीलाल गुप्ता कहते हैं “जाति व्यवस्था में निर्धारित एवं 19 एक व्यक्ति की आर्थिक कुशलता में कमी आती है अपनी रुचि एवं योग्यता के अनुसार स्वतंत्रता पूर्वक किसी भी व्यवसाय नहीं अपना सकता ऐसी दशा में समाज व्यक्ति की कार्य क्षमता का उदयलाल नहीं ले पाता तथा उत्पादन पूर्ण मात्रा में नहीं हो पाता”। स्पष्ट है कि; प्राचीन काल से चतुर वर्णीय व्यवस्था के कारण दलित समाज को एक विशिष्ट दायरे में रहकर ही निम्न स्तर के व्यवसाय करने पड़ते थे। परिणाम यह हुआ कि क्षमता होने के बावजूद वे अन्य व्यवसाय कर नहीं सके। अपने परिवार तथा समाज की आर्थिक स्थिति सुधार नहीं सके।

दलितों की आर्थिक स्थिति का चित्र अब्दुल विस्मिल्लाह ने अपना उपन्यास “झीनी झीनी बीनी चदरिया” इस उपन्यास में उद्घाटित किया। उपन्यासकार ने अपने इस उपन्यास में दलित शोषित समाज की आर्थिक विपन्नता के चित्र प्रस्तुत करने का प्रयास किया है वह इस उपन्यास में लिखते हैं कि बनारस शहर में बुनकर समाज व्यापक पैमाने में पर बनारसी साड़ियां बनाता है। यही



# Akshara Multidisciplinary Research Journal

Peer-Reviewed & Refereed International Research Journal

(IFS- 2.875) (ISRA JIF- 1.312)

January - March 2021 VOL.02, ISSUE IV

E- ISSN 2582-5429

उनका पारंपरिक व्यवसाय है। इसी व्यवसाय पर उनकी उपजीविका चलती है। परंतु रात-दिन मेहनत करने के बावजूद उन्हें बनारसी साड़ियों का बाजार में उचित मूल्य नहीं मिलता। व्यवसायिक वर्ग इन लोगों से साड़ियां तो ले लेता है पर वेतन का भुगतान चेक द्वारा करता है। चेक भी दो-दो माह के बाद के तारीख के लिए जाते हैं। इन सारी व्यवस्था से तंग आकर मतीन कहता है " किन्ती मेहनत से साड़ी बिना फिर उसे बाजार में ले जाओ और वहां क्या मिलता है? चेक। जो महीनेभर बाद भुगतान है। सोसाइटी के जरिए तो बड़ों- बड़ों की साड़ियां विकती है, गरीब को भला कौन पूछता है? मतीन ने सुना है अब तो कुछ फालतू कड़ोतिया शुरू हो गई है। गोलघर में भी और गिरस्ता लोगों की कोठियों में भी आठ सौ की साड़ी पर पच्चीस रुपये, छः सौ की साड़ी पर बीस रुपये, चार सौ की साड़ी पर पंद्रह रुपये, इसी दर से कोठीवाला हर साड़ी में से काट लेता है। क्यों काट लेता है पता नहीं? इस प्रकार पूँजीपतियों की नई नीतियों के कारण इन लोगों के सामने आर्थिक विपन्नता का संकट खड़ा हो रहा है। इसी विपन्नता से ग्रस्त यह बुनकर समाज जी - तोड़ मेहनत कर दो वक्त की रोटी तक जुड़ा नहीं पाता। सोसायटी की सदस्यता के लिए सौ रुपये इकट्ठा करना उनके लिए असंभव हो जाता है। बनारसी साड़ियाँ वे दूसरों के लिए बनाते हैं, पर उनकी ही औरतें इन साड़ियों को तरसकर रह जाती हैं। मतीन चाहकर भी अलीमुन को एक बनारसी साड़ी नहीं दे सकता। वह आजीवन बनारसी साड़ी के लिए तरसती है। इसके संदर्भ में उपन्यासकार इकबाल अपने विचार व्यक्त करते हैं, " जब वह छोटा था तभी से माँ की लालसा को वह देखता आ रहा था। घर की औरत को एक सस्ते दामवाली ही बनारसी साड़ी भी नसीब नहीं। पूरी उग्र कट गई सूती छोटियों और छीट की सलवार कमीज पर। " ३ यह आर्थिक विपन्नता पीढ़ी - दर - पीढ़ी चलते रहती है। मेहनत करने के बावजूद भी घर - परिवार की समस्याएँ यथास्थित बरकरार रहती हैं।

'झीनी झीनी बीनी चदरिया' में अब्दुल बिस्मिल्लाह ने बनारस के बुनकरों की आर्थिक जहोजहद को तटस्थता से प्रकट किया है। बनारस का बुनकर समाज रात - दिन मेहनतकर नित नयी बनारसी साड़ियाँ बुनकर बाजारों में बेचता है। बड़े - बड़े बाजारों में इन साड़ियों की काफी माँग है। इस व्यवसाय पर हजारों बुनकर अपनी उपजीविका को चलाते हैं। वे इन बनारसी साड़ियों पर नक्काशी इतनी सुंदर बनाते हैं कि उपन्यासकार कहते हैं, " एक कुशल बुनकर करघे पर अपनी कारीगिरी से बालूचर को पंखुड़ी जैसी कोमलता, तंतु को लावण्यता, किनखाब को भव्यता तंछई को ऐंद्रिक, अनुभूति, कांचीपुरम को आकर्षक सज्जा, पटोल को गहन नक्काशी और जरी को सुंदर स्वरूप प्रदान कर सकता है। " ४ इसके अलावा भी यह लोग कपड़ों की बुनाई, रंगरेजी का काम, नक्काशी का काम करते दिखाई देते हैं।

अब्दुल बिस्मिल्लाह ने इस आर्थिक चेतना की चिंगारी को झीनी झीनी बीनी चदरिया इस उपन्यास में उद्घाटित किया है। बुनकरों द्वारा बनाई गई महंगी से महंगी बनारसी, कांचीपुरम, पटोल आदि कई प्रकार की साड़ियों को बाजार में बेचने में कई प्रकार की आर्थिक मुश्किलों का सामना करना पड़ता है। साड़ियों को बनानेवाले यह बुनकर लोग हैं, और उनका मूल्य आंकनेवाले यह पूँजीपति व्यावसायिक वर्ग के लोग हैं। जो चाहे जैसा चाहे वे इस व्यवहार में शोषण करते हैं। कम



दामों में साड़ियों लेना और महंगे दामों में बेचना, साड़ियों के बिलों का भुगतान चेक द्वारा दो-दो माह देरी से करना, बाजार की नित-नई बदलती नीतियों के अनुसार लेन-देन के व्यवहार में परिवर्तन करना आदि कई प्रकार के शोषण से तंग आकर इकबाल जैसे उपन्यासकार बुनकरों को संगठित कर इन तमाम व्यवस्था के खिलाफ संघर्ष खड़ा करते हुए कहता है, "यह कटीती यह साजिश, यह बड़-इंतजामी खत्म होनी चाहिए। सरमायादारों की तिकड़में अब टूटनी चाहिए और आम बुनकरों को उनका हक मिलना ही चाहिए। हमारे बापों ने भले सब कुछ बर्दाश्त किया, पर हम नहीं करेंगे, इसे एहते जाज करेंगे।" ५ इकबाल का सभी बुनकरों को संगठित करना तथा अपने हक और अधिकारों के प्रति उनमें चेतना निर्माण करना सदियों से चली आती शोषण की परंपरा को पंढित करना है बुनकरों की यह आर्थिक चेतना बाहरी परिस्थितियों के ऊपर नहीं बल्कि आंतरिक परिस्थितियों की उपज है आज भी सरकार द्वारा भूमिहीन दलितों की जमीन आवंटन को लेकर गांव में पूंजीपति वर्ग द्वारा शोषण और अत्याचार होते पाया जाता है क्योंकि बंजर पड़ी जमीन को मुफ्त में सरकार द्वारा दलित पिछड़ों को आवंटित करना स्वर्ण जमींदारों को करता है इसलिए आवंटित जमीन को हथियाने का प्रयास करते हैं पर आज के समय में जमीन चाहे कम हो या अधिक वह उपजीविका का प्रमुख साधन होने से दलित लोग कि उसे छोड़ने के लिए तैयार नहीं हैं। झीनी झीनी बीनी चदरिया उपन्यास की तरह 'कागर की आग' हिमांशु जोशी, 'अनारो'- संजुल भगत; 'हजार घोड़ों का सवार'- यादवेंद्र शर्मा; 'शैलूष' - शिवप्रसाद, उपन्यासकारों के उपन्यासों में भी दलितों का आर्थिक जीवन उनकी आर्थिक स्थिति का चित्र हमें देखने को मिलता है।

इस प्रकार शहरों में दलित, शोषित समाज के लोग अपनी जीविका के लिए, अर्थार्जन के लिए समाज के निचले स्तरों में आर्थिक संघर्ष करते दिखाई देते हैं।

#### निष्कर्ष :-

इस प्रकार झीनी झीनी बीनी चदरिया इस उपन्यास में दलित समाज की आर्थिक संपन्नता और विपन्नता को स्पष्ट रूप से उद्घाटित किया गया है। बदलते हुए आधुनिक युग में दलितों का बदलता हुआ आर्थिक जीवन उनकी स्तरीयता तथा अर्थार्जन की तलाश में नए-नए क्षितिजों को स्पर्श करता हुआ दलित स्त्री, पुरुष वर्ग इस उपन्यास के साथ-साथ अन्य उपन्यासों में भी पाया जाता है। 'झीनी झीनी बीनी चदरिया' के बुनकरों की आर्थिक विपन्नता का और उनके शोषण का इसमें स्पष्ट दिखाई देता है आज हर व्यक्ति आर्थिक विपन्नता के जाल से बाहर आने के लिए छटपटा रहा है मानव जीवन से जुड़े तमाम मूल्यों में आर्थिक मूल्य सबसे अहम बन चुका है इसीलिए हर कोई आर्थिक संपन्नता प्राप्त करना चाहता है इस आर्थिक संपन्नता को प्राप्त करने की कोशिश को 'शैलूष', 'विकल्प' आदि उपन्यासों में पाया जाता है।

#### संदर्भ ग्रंथ सूची:-

- १ भारतीय सामाजिक संस्थाएं -मोतीलाल गुप्ता पृ. १०४
- २ झीनी झीनी बीनी चदरिया -अब्दुल बिस्मिल्लाह पृ. १५२
- ३ झीनी झीनी बीनी चदरिया -अब्दुल बिस्मिल्लाह पृ. १९०
- ४ झीनी झीनी बीनी चदरिया -अब्दुल बिस्मिल्लाह पृ. २२
- ५ झीनी झीनी बीनी चदरिया -अब्दुल बिस्मिल्लाह पृ. १९२



## 32. Structural, magnetic, and electrical properties of Mn- substituted magnesium chromate spinel structure

*J Mater Sci: Mater Electron* (2021) 32:6810–6819



### Structural, magnetic, and electrical properties of manganese-substituted magnesium chromate spinel structure

S. P. Deshmukh<sup>1</sup>, K. R. Sanadi<sup>2</sup>, R. S. Diggikar<sup>3</sup>, V. B. Koli<sup>4</sup>, and A. V. Mali<sup>5,\*</sup>

<sup>1</sup>Department of Chemistry, D.B.F. Dayanand College of Arts and Science, Solapur, India

<sup>2</sup>Department of Chemistry, Doodhsakhar Mahavidyalaya, Bidri, India

<sup>3</sup>Department of Chemistry, New Arts, Commerce and Science College, Parner, India

<sup>4</sup>Department of Physics, National Dong Hwa University Shou-Feng, Hualien 97401, Taiwan

<sup>5</sup>Department of Chemistry, Yashwantrao Chavan College of Science, Karad, India

Received: 8 November 2020

Accepted: 22 January 2021

Published online:

25 February 2021

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC part of Springer Nature 2021

#### ABSTRACT

Manganese-substituted magnesium chromate spinel structure with composition  $Mg_{1-x}Mn_xCr_2O_4$  ( $x = 0.0, 0.25, 0.50, 0.75, 1.0$ ) was synthesized by sol-gel auto-combustion route. The polycrystalline powder was characterized using XRD, TGA/DTA, SEM/EDAX, TEM, and FTIR spectroscopy. XRD analysis unveiled the single cubic spinel structure without any additional peak and the lattice constant upsurges with the amount of manganese content were augmented. Thermal analysis reveals the decomposition of organic moieties at different steps and the stability of the spinel structure. Furthermore, SEM measurement shows that grain size lies between 1.74 to 3.17  $\mu m$ , and EDAX measurement demonstrates stoichiometry according to its composition. TEM also reveals the average particle size around 20 nm. Continuous increase in saturation magnetization and magnetic movement gives information about  $Mg^{2+}$  completely replaced by  $Mn^{2+}$  in A site. At the same time, B site  $Cr^{3+}$  is not interfering with the A site in this particular situation. A persistent decrease in electrical properties and the increase in magnetic movement concerning temperature indicate the replacement of  $Mg^{2+}$  by  $Mn^{2+}$  in A site, while B site  $Cr^{3+}$  is unaffected by  $Mn^{2+}$ .

Address correspondence to E-mail: ankushvmali@gmail.com

Springer

<https://doi.org/10.1007/s10854-021-05386-8>

## 1 Introduction

Spinel oxide materials and minerals are anions in the cubic close pack and cation present in tetrahedral and octahedral position in the crystal lattice. The inversion parameter can explore the degree of disorder at a defining site, leading to a normal and inverse spinel structure [1]. The variation in the chemical composition of cations and their charges paves the way toward forming versatile compounds with a wide range of optimized physicochemical properties. Recently, polycrystalline chromite has been explored in the field of magnetic, thermal, and electric resources. The  $M\text{Cr}_2\text{O}_4$  compounds were formed using the second oxidation state of these elements as Co, Cu, Zn, Ni, and mainly Mg through the spinel-like structure. Metal chromite has enhanced thermal stability, shock proof ability, least amount of thermal expansion, and the static nature in the molten stages; therefore, it was used as gyratory cement ovens, converter boilers, and the subordinate metallurgical treatment and fuel cells [2]. Antiferromagnetic nature metal oxide was formed because of lower Neel temperature in the range of  $-263.15\text{ }^\circ\text{C}$ ; on the contrary, exchange interaction has overridden this compound having ferromagnetic [3].

In the spinel formation, use of magnesium is preferentially at a particular site.  $\text{MgCr}_2\text{O}_4$  as a normal spinel has been thoroughly explored in the field of refractory materials due to its stability at elevated temperature and confrontation of slag attack [4, 5]. Spinel compound in the nano-dimension can alter their physicochemical properties correlated to bulk counterparts [6]. It also has competent resistive materials in nature. Therefore, it was used in magnetic and microwave-based devices [7]. Nevertheless, these materials properties were amending because of nano-dimension, appropriate exchange, and diverse structures. Nowadays, spinel oxides and their combination are used in biological applications [8, 9], solar cells [10, 11], efficiently used as a catalyst for oxidation purposes [12], fabrication of acoustic and elevated frequency transformers, coils, and optical devices [13]. The wide range of development in the synthesis of  $\text{MgCr}_2\text{O}_4$  nanomaterials with controlled size and morphology was significant because of their future applications as smart and useful materials. The thermal route of mixed oxides was used for formation of the magnesium chromate spinel compounds [14],

precipitation technique [15], ultrasonic process [2, 16], hydrothermal [17], mechanical alloying [18], and for obtaining the desired properties of materials. Among these methods, some of them were complex protocol, high costing, and non-reliable. Therefore to overcome these constraints, flexible, cheaper, and efficient methods have been used with desired size, shape, composition, and properties. Among the various spinel compounds, the deviations in magnetic property were observed due to change in magnetic ion yet to be sightsaw. In addition, the thermal characteristic and the stability of the compounds are depending on the substituting ions that can alter their properties for the specific application. Huizhong et al. reported the effect of iron oxide sintering temperature and mechanical properties of magnesia-chrome refractory materials [19]. The consequence of chemical properties of zinc-substituted magnesium ferrite chromate has been reported and it reveals paramagnetic constituent superimposed on broadening magnetic sextets of the materials [20, 21]. Several researchers have reported metal effects on mixed metal oxide's structural and magnetic properties [22–24]. Furthermore, chromium-doped magnesium ferrites show an increase in chromium substitution, leading to alteration in magnetic properties [25]. Lotfian et al. reported the comparison of nanostructured  $\text{MgCr}_2\text{O}_4$  and  $\text{FeCr}_2\text{O}_4$  microstructural properties, in which 1 wt%  $\text{MgCr}_2\text{O}_4$  exhibited the higher thermo-mechanical properties in correlation with  $\text{FeCr}_2\text{O}_4$  materials [14]. To the present day, yet no report has been observed in the literature of manganese-substituted magnesium chromate spinel structure for electrical and magnetic properties. In addition,  $\text{Mg}_{1-x}\text{Mn}_x\text{Cr}_2\text{O}_4$  spinel compound was prepared using sol-gel auto-combustion method to investigate its magnetic and electrical properties. The structure and composition of manganese-substituted magnesium chromate spinel compound were studied using spectroscopic and analytic techniques. Thereafter, the effect of concentration of manganese content on the magnetization was revealed in detail. The remanence magnetization ratio decreases with an increase in the manganese content. Furthermore, changes in the electrical resistivity due to the presence of manganese in the spinel compound were observed. It also reveals the continuous decrease in electrical resistivity with increase in manganese content.

## 2 Materials and experimental

### 2.1 Materials

A.R. grade chemicals were used throughout the experiment. Citric acid ( $C_6H_8O_7 \cdot H_2O$ ), magnesium nitrate [ $Mg(NO_3)_2 \cdot 6H_2O$ ], manganese nitrate [ $Mn(NO_3)_2 \cdot 4H_2O$ ], and chromium nitrate [ $Cr(NO_3)_3 \cdot 9H_2O$ ] were used as preparatory resources.

### 2.2 Experimental

Polycrystalline powder of  $Mg_{1-x}Mn_xCr_2O_4$  (where  $x = 0.0, 0.25, 0.50, 0.75, 1.0$ ) was prepared by the sol-gel combustion method. The polycrystalline powder was prepared using metal nitrate solution. The optimized ratio (1:1) of citric acid to the metallic ions was retained, in which citric acid plays a dual role as chelating agent and avoids precipitation with change in pH of the solution. The stoichiometric ratio was maintained during the constant agitation at room temperature. The pH of solution was adjusted to 9.5 by addition of liquid ammonia in the reaction medium. The obtained gel solution was heated in electric oven and then this powder was calcined for 6 h [26].

## 3 Characterization techniques

The TGA/DTA analytical techniques were employed for the study of thermal stability of the synthesized materials. TGA-DTA outlines were documented with a heating rate of  $9.85^\circ C$  per minute. At various temperatures, the weight loss was observed. The Philips (PW1710) X-ray diffract meter with  $CuK\alpha$  radiation was utilized to calculate the average grain size, phase, and lattice parameter of the synthesized material.

The prepared particles size and morphology were studied by scanning electron microscopy (SEM) (Model: JEOL-JSM 6360). Cottrell's method was used to compute all compounds' grain size, while energy dispersive X-ray analysis (EDAX) equipped with Scanning electron microscopy was used for elemental analysis. The transmission electron microscopy (JEM-2100) model was used for morphology and particle size analysis. The vibrating sample magnetometer (VSM) was employed for magnetic measurements at room temperature of these samples. An FTIR spectrum was detailed within the range of 350 to

$700\text{ cm}^{-1}$  on a Perkin Elmer IR spectrophotometer (model E-2829) using KBr pellets.

## 4 Results and discussion

### 4.1 Thermogravimetric analysis

The spinel compound thermal properties were studied using the TGA-DTA instrument, as shown in Fig. 1. Initially, the exothermic DTA curve nature denotes the loss of the adsorbed water molecule and water vapor. The sharp exothermic peak at  $303^\circ C$  was designated as maximum weight loss due to releasing organic matter and inorganic salts, which was confirmed using TGA analysis. The TGA curve represents the loss of weight with temperature. The three steps were observed in the weight loss process; initial weight loss under the  $100^\circ C$  was found and showed loss of adsorbed hydroxyl and water vapor. The 12.79% weight loss was observed in the first two steps and 67.21% weight loss in the last two steps. Maximum weight loss was found in a second step from  $200$  to  $400^\circ C$ ; this was due to the loss of organic matter and inorganic salts; finally, the weight loss above  $400^\circ C$  was associated with almost complete degradation of  $Mg_{0.5}Mn_{0.5}Cr_2O_4$ . In the end, the temperature reached  $700^\circ C$ , and no weight loss was observed, which reveals that the synthesized material was stable above  $700^\circ C$ . It was confirmed that the organic constituents were completely removed above  $700^\circ C$  from the precursor sample [27]. Therefore, we have designed a protocol for the use of a stable spinel compound to study magnetic properties. All samples

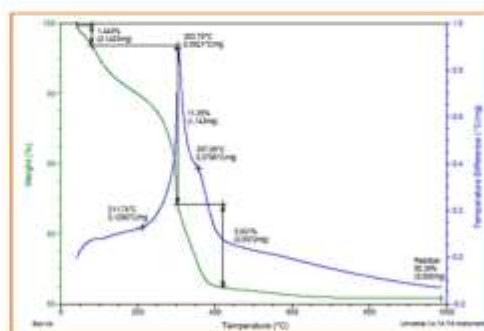


Fig. 1 TGA and DTA curves for  $Mg_{0.5}Mn_{0.5}Cr_2O_4$

were also calcined at 700 °C and a crystalline nature of these spinel compounds was observed.

### 4.2 XRD studies

The XRD techniques were used to identify the different phases of the  $Mg_{1-x}Mn_xCr_2O_4$  powder. The sintering temperature of the material  $Mg_{0.5}Mn_{0.5}Cr_2O_4$  was different, and their resultant XRD patterns are shown in Fig. 2. The decrease in crystalline size of the material was observed as sintering temperature increases, and stable phases were observed at 599.85 °C. Furthermore, the XRD patterns of  $Mg_{1-x}Mn_xCr_2O_4$  with  $x = 0.0, 0.25, 0.50, 0.75$  and  $1.0$  sintered at 699.85 °C are presented in Fig. 3. This arrangement demonstrates diffraction lattice planes of (220), (311), (400), (422), (511), (440), and (533) corresponding to 30.92°, 36.42°, 44.29°, 55.03°, 58.69°, 64.40°, and 76.29° of diffraction angle matched with JCPDS card number 23-1237. The face-centered cubic spinel structure of the all prepared compounds was observed without any other peak. The average crystallite size was determined via the Scherrer formula in 22 nm to 25 nm by considering the most passionate peak.

The observed results are shown in Table 1.

The inter-planar space 'd' is measured for each diffraction plane using the formula:

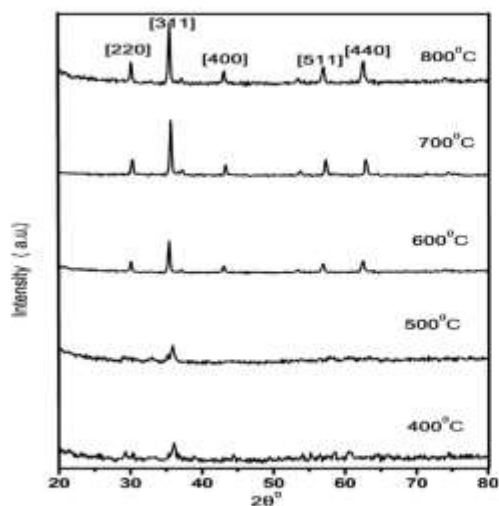


Fig. 2 XRD pattern of  $Mg_{0.5}Mn_{0.5}Cr_2O_4$  at different temperatures

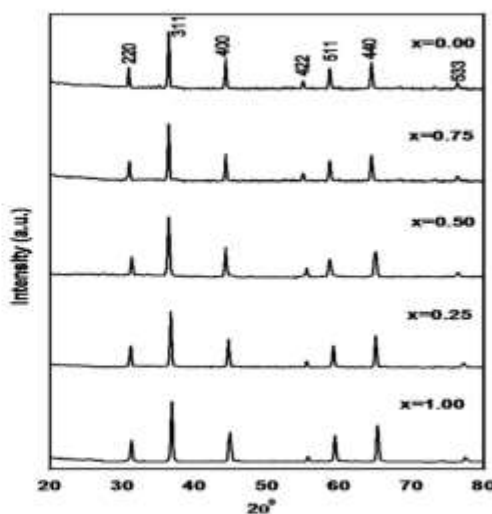


Fig. 3 XRD patterns of  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ )

$$D = \frac{0.9\lambda}{\beta \cos \theta} \tag{1}$$

Figure 2 shows that diffraction peaks are broader as a magnesium amount in the  $Mg_{1-x}Mn_xCr_2O_4$  spinel structure increases. Also, the crystalline size rose with a rise in the content of manganese.

The standards of lattice coefficients were acquired via XRD data and are listed in Table 1. It was witnessed that the lattice constant upsurges with enhanced manganese content. It is also accredited to the dissimilarity in an ionic radius of  $Mg^{2+}$  (0.65 Å) and  $Mn^{2+}$  (0.80 Å). Analogous tendencies in deviation of crystalline nature and lattice parameter were described in manganese-switched lithium ferrite material [28].

Table S1 shows the physical parameters of  $Mg_{0.5}Mn_{0.5}Cr_2O_4$  synthesized at different temperatures. The X-ray density ( $\rho_x$ ) of all samples was calculated for each plane using the following equation and is tabulated in Table 1.

$$\rho_x = \frac{8M}{Na^3} \tag{2}$$

where  $N$  is the Avogadro's number ( $6.023 \times 10^{23}$  atom/mole),  $M$  is the molecular weight, and  $a$  is the lattice constant.



**Table 1** XRD data for  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ )

Sr. no	Composite	Crystallite size (nm)	Lattice constants (Å)	Physical density ( $d_p$ ) g/cm <sup>3</sup>	X-ray density ( $d_x$ ) g/cm <sup>3</sup>	Porosity (P) (%)
1	$x = 0.0$	22.52	8.315	3.46	3.93	10.18
2	$x = 0.25$	22.86	8.347	3.72	4.13	9.92
3	$x = 0.5$	23.35	8.376	3.94	4.32	9.47
4	$x = 0.75$	24.48	8.392	4.01	4.47	9.24
5	$x = 1.0$	24.93	8.413	4.28	4.61	9.16

**4.3 SEM studies**

SEM was employed for the understanding the external dimension of  $Mg_{1-x}Mn_xCr_2O_4$  ( $x = 0.0, 0.25, 0.50, 0.75, 1.0$ ) heated at 700 °C and is shown in Fig. 4a–d and S2 of  $Mg_{0.5}Mn_{0.5}Cr_2O_4$ . Cottrell’s methods were employed to determine the grain size of the spinel [29]. The correlation among the total number of intercepts ( $n$ ) and grain boundary per unit length ( $P_L$ ) was revealed as

$$P_L = (n/2\pi r)M. \tag{3}$$

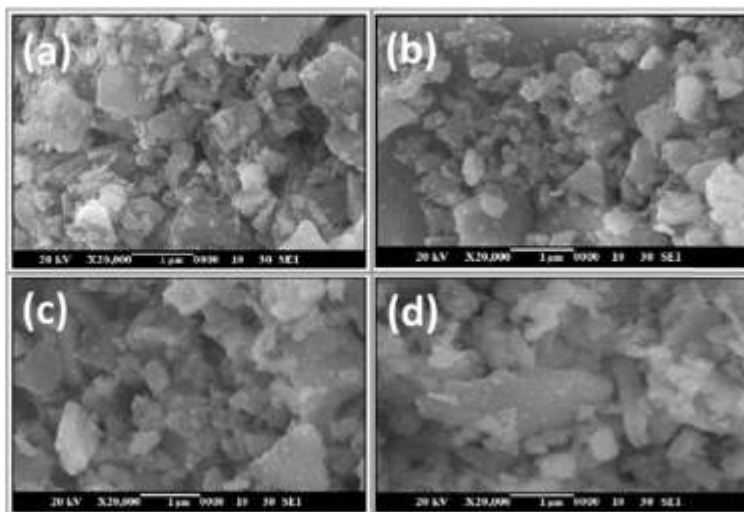
Magnification was represented as  $M$  at which graph SEM micrograph was scanned, circle radius is ‘ $r$ ,’ and grain number is ‘ $n$ .’ Grain size in between 1.74 to 3.17  $\mu m$  is shown in Table 2. The substantial agglomeration was the critical cause of larger grain

**Table 2** Energy of activation from resistivity and grain size from SEM of the  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ )

Composition	Grain size ( $\mu m$ )
$MgCr_2O_4$	1.74
$Mg_{0.75}Mn_{0.25}Cr_2O_4$	1.89
$Mg_{0.5}Mn_{0.5}Cr_2O_4$	2.13
$Mg_{0.25}Mn_{0.75}Cr_2O_4$	2.68
$MnCr_2O_4$	3.17

size [30]. Furthermore, it was observed that the grains are evenly dispersed on the surface by the SEM micrograph.

**Fig. 4** Scanning electron micrographs of  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ ) a  $MgCr_2O_4$ , b  $Mg_{0.75}Mn_{0.25}Cr_2O_4$ , c  $Mg_{0.5}Mn_{0.5}Cr_2O_4$ , d  $MnCr_2O_4$



#### 4.4 Energy dispersive X-ray spectroscopy

Figure 5a–c explores the EDAX (energy dispersed analysis by X-rays) patterns of  $Mg_{1-x}Mn_xCr_2O_4$  ( $x = 0.0, 0.50, 1.0$ ) spinel signifying their fundamental configuration. Spinel structure displays the existence of Mg, Mn, Cr, and O without any impurities.

It was perceived that theoretical metal mass % well counterparts with metal mass % of the mole ratio of  $Mg^{2+}$ ,  $Mn^{2+}$ , and  $Cr^{3+}$  are shown in Table 3.

#### 4.5 Fourier transform infrared spectroscopy

FTIR is a unique spectroscopic method to recognize the vibration modes of the mixed metal oxide. Figure 6 shows FTIR spectra of the  $Mg_{1-x}Mn_xCr_2O_4$  system in the range  $700\text{--}350\text{ cm}^{-1}$ . Overall, intrinsic stretching and vibration at  $600\text{ cm}^{-1}$  ( $\nu_1$ ) reveal the metal cation (Cr–O) at the tetrahedral locations, whereas the band at  $400\text{ cm}^{-1}$  ( $\nu_2$ ) resembles metal cation (Mn–O) in the octahedral locations [31]. Table 4 shows the band positions; stretching and bending vibrations of  $Cr^{3+}\text{--}O^{2-}$  complexes employed in the respective locations were recognized. The stretching vibration band peak intensity was  $\nu_1$  reduced by augmenting the amount of Mg related to

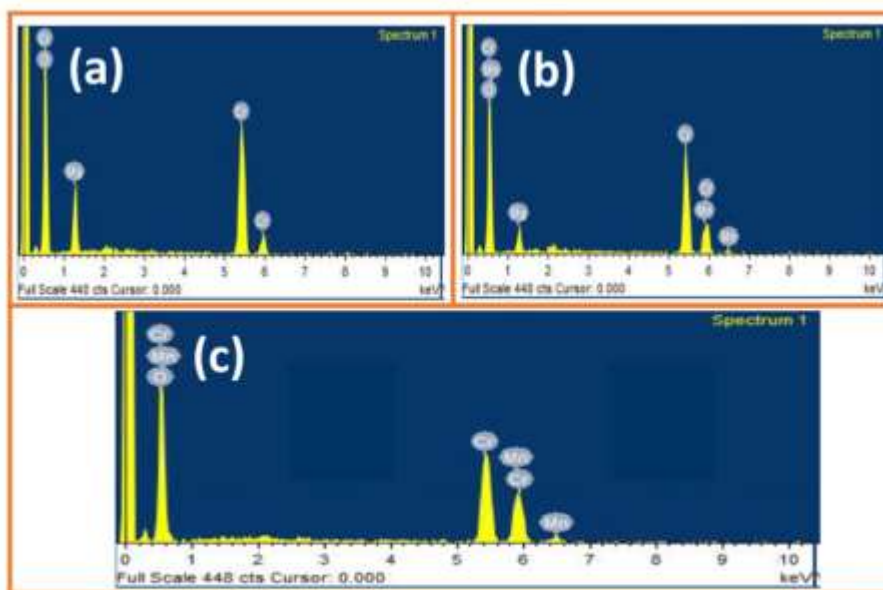
**Table 3** Elemental analysis with EDAX of the  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ )

Composition	Expected (%)			Observed (%)		
	Mg	Mn	Cr	Mg	Mn	Cr
$MgCr_2O_4$	12.64	–	54.08	12.75	–	54.11
$Mg_{0.5}Mn_{0.5}Cr_2O_4$	5.85	13.23	50.09	5.83	13.26	50.07
$MnCr_2O_4$	–	26.64	46.64	–	26.67	47.62

plain  $MnCr_2O_4$ . Hooks law reveals the band intensity upsurges with accumulative manganese concentration.

#### 4.6 Transmission electron microscopy (TEM)

Particle size and its dimension of characteristic compositions of  $Mg_1Cr_2O_4$  and  $MnCr_2O_4$  acquired from TEM pictures are presented in Fig. 7a, b. The average particle size was 20 nm from the TEM images, which matches the crystallite size determined from Scherrer formula of expanded X-ray diffraction peaks. TEM image histogram also reveals the average particles size around 13 nm with a standard



**Fig. 5** Energy dispersive spectra of a  $MgCr_2O_4$ , b  $Mg_{0.5}Mn_{0.5}Cr_2O_4$ , c  $MnCr_2O_4$

deviation of 0.26 nm. The spinel compounds were heated at 700 °C showing the aggregated nanoparticles in the range of 22.52 and 24.93 nm.

4.7 Magnetic hysteresis

Room temperature VSM was performed to study the magnetic properties of the spinel compounds. The observed hysteresis loops are shown in Fig. 8a–c. It

reveals the magnetic behavior of the MgCr<sub>2</sub>O<sub>4</sub> was less than the magnetic behavior of Cr<sub>2</sub>O<sub>4</sub>, and Han-kare et al. reported the analogous nature of distinction of such spinel compounds [32]. Besides, the magnetic behavior of MgCr<sub>2</sub>O<sub>4</sub> was significantly influenced by the substitution of Mn<sup>2+</sup> ion. The interaction between tetrahedral and octahedral sublattice showed the dependence of the magnetic moment and saturation magnetization concerning their grain size and temperature [33]. The saturation magnetization, coercivity, remnant magnetization, remanence ratio, anisotropy constant (K), and the magnetic moments are recorded in Table 5.

The magnetic moment is determined from the subsequent equation:

$$\eta = \frac{M_p \times M_r}{5585} \tag{4}$$

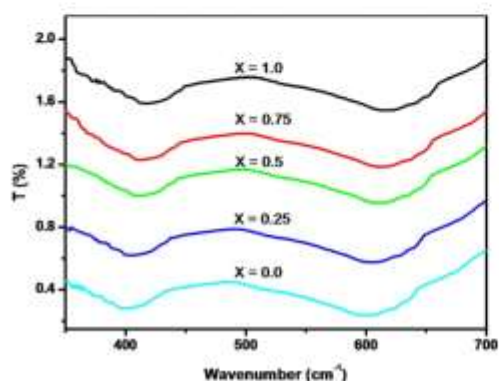


Fig. 6 FTIR Spectra of the Mg<sub>1-x</sub>Mn<sub>x</sub>Cr<sub>2</sub>O<sub>4</sub>

Table 4 FTIR bands in Mg<sub>1-x</sub>Mn<sub>x</sub>Cr<sub>2</sub>O<sub>4</sub>

Composition (x)	$\nu_1$ (cm <sup>-1</sup> )	$\nu_2$ (cm <sup>-1</sup> )
MgCr <sub>2</sub> O <sub>4</sub>	398	601
Mg <sub>0.75</sub> Mn <sub>0.25</sub> Cr <sub>2</sub> O <sub>4</sub>	405	605
Mg <sub>0.5</sub> Mn <sub>0.5</sub> Cr <sub>2</sub> O <sub>4</sub>	411	612
Mg <sub>0.25</sub> Mn <sub>0.75</sub> Cr <sub>2</sub> O <sub>4</sub>	414	613
MnCr <sub>2</sub> O <sub>4</sub>	418	616

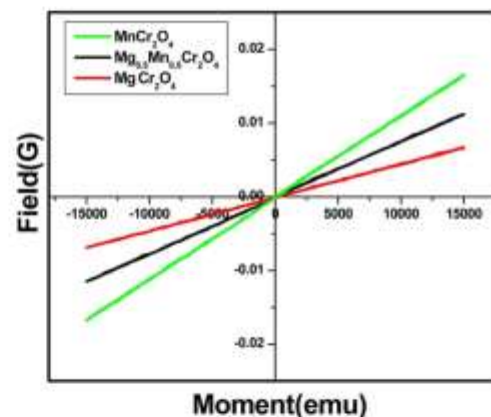
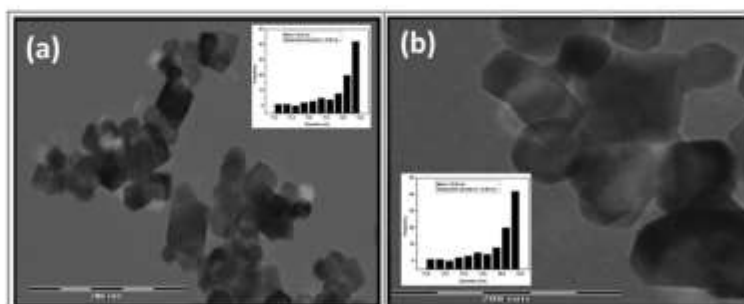


Fig. 8 Hysteresis Loop of the system Mg<sub>1-x</sub>Mn<sub>x</sub>Cr<sub>2</sub>O<sub>4</sub>

Fig. 7 TEM Images of a MgCr<sub>2</sub>O<sub>4</sub>, b MnCr<sub>2</sub>O<sub>4</sub>



**Table 5** Magnetic hysteresis for  $Mg_{1-x}Mn_xCr_2O_4$  spinel compound

Sr. no.	Compound	Coercive field ( $H_c$ ) (G)	Saturation Magnetization ( $M_s$ ) (emu)	Remnant magnetization ( $M_r$ ) (emu)	Remanence magnetization ratio $M_r/M_s$	K (energy / area)	Magnetic moment ( $\mu_B$ )
1	$MgCr_2O_4$	79.925	6.7939E-3	38.473E-3	5.662	554.084E-3	0.252
2	$Mg_{0.5}Mn_{0.5}Cr_2O_4$	34.929	11.357E-3	36.254E-3	3.192	404.784E-3	0.391
3	$MnCr_2O_4$	6.5130	16.648E-3	11.829E-3	0.710	110.641E-3	0.664

where  $M_w$  is the molecular weight and  $M_s$  is the saturation magnetization.

Anisotropy constant  $K$  is determined from the subsequent equation:

$$K = \frac{M_s \times H_c}{0.98} \tag{5}$$

where  $H_c$  is the coercivity and  $M_s$  is the saturation magnetization.

In the present work, the saturation magnetization and magnetic movement upsurge regularly with a rise in Mn content from 6.793 to 16.648, replacing Mn wholly with Mg in A site. At the same time, B site Cr was not interfering with A site in this particular situation. Furthermore, electric resistivity was also observed.

The remanence magnetization ratio was decreased with an increase in the Mn amount from 5.074 to 0.710. It reveals the reduction of the materials anisotropic behavior and the value of anisotropy constant  $K$  decreases from 554.01 at  $x = 0$  to 110.64 in  $x = 1$   $Mg_{1-x}Mn_xCr_2O_4$ . It was associated with a lower coercivity of the desired material.

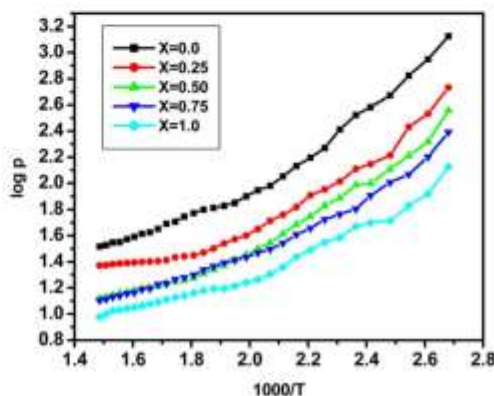
**4.8 Electrical resistivity**

The variation of DC resistivity for  $Mg_{1-x}Mn_xCr_2O_4$  samples with temperature in the range of 100–400 °C is shown in Fig. 9. The relation between resistivity and temperature is shown below [34].

$$\rho = \rho_0 \exp\left(\frac{E_a}{KT}\right),$$

where  $\rho$  is resistivity at temperature  $T$ ,  $E_a$  is the activation energy for the electrical process,  $K$  is Boltzmann constant, and  $T$  is the temperature in °C.

From these plots, it was observed that the electrical resistivity of all the samples decreases with



**Fig. 9** Variation of  $\log \rho$  with  $10^3/T$  for  $Mg_{1-x}Mn_xCr_2O_4$  ( $0 \leq x \leq 1$ )

increasing temperature, which shows semiconductor behavior [35]. Although the trends depend on Mg concentration in the sample, these are more strongly dependent on the sample’s sintering temperature. In mixed metal oxide, the electron conduction mechanism has been studied by many investigators and reviewed by Haomiao Zhang [36]. The variation of resistivity was explained based on the actual location of the cation in the spinel structure. Conduction in mixed metal oxide is due to the transfer of electron ions. The conduction at low temperature (i.e., < 127 °C) takes place due to impurities, whereas at the higher temperature (i.e., > 127 °C), it is due to polaron hopping. The result of conduction by the hopping process was large effective mass and low mobility. The temperature dependence of electrical conductivity in such a case involves less dent

concentration of carriers and is mostly associated with temperature-dependent mobility. Figure 9 also reveals the continuous decrease in electrical resistivity with an increase in Mn content indicates complete replacement of  $Mg^{2+}$  by  $Mn^{2+}$  in A site while B site remains unchanged.

## 5 Conclusions

Manganese-substituted magnesium chromate was prepared with optimized pH by the sol-gel auto-combustion route. The diffraction phenomenon shows the cubic spinel crystalline nature of the synthesized compounds. The spinel's nano-dimensional nature was confirmed with average crystallite size of 25 nm; with the increase in manganese content, the spinel compound grain size increased. TEM studies show an average of 20 nm particle sizes, which reach an agreement with the XRD data. The nature of the curve revealed that all spinel compounds were ferromagnetic. The saturation magnetization was increased because of the augmenting amount of manganese content in the sample. The coercive force and remnant magnetization decreased as the amount of manganese content increased, whereas saturation magnetization rises as the concentration of manganese increases. The decrease in electrical resistivity reveals the replacement of magnesium by manganese.

## Funding

None.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Supplementary Information:** The online version contains supplementary material available at <http://s://doi.org/10.1007/s10854-021-05386-8>.

## References

1. D.H. Taffa, R. Dillert, A.C. Ulpe, K.C. Bauerfeind, T. Bredow, D.W. Bahnemann, M. Wark, *J. Photon. Energy* **7**, 012009 (2016)
2. A. Azhari, F. Golestani-Fard, H. Sarpoolaky, *J. Eur. Ceram. Soc.* **29**, 2679–2684 (2009)
3. Y. Hinatsu, Y. Doi, *J. Solid State Chem.* **220**, 22–27 (2014)
4. L. Mao, H. Cui, C. Miao, H. An, J. Zhai, Q. Li, *J. Mater. Cycles Waste Manage.* **18**, 573–581 (2016)
5. V. D'Ippolito, G.B. Andreozzi, D. Bersani, P.P. Lottici, *J. Raman Spectrosc.* **46**, 1255–1264 (2015)
6. A. Fernández, H. Galleguillos, F. Pérez, *Sol. Energy* **109**, 125–134 (2014)
7. K. Sadhana, S.R. Murthy, K. Praveena, *Mater. Sci. Semicond. Process.* **34**, 305–311 (2015)
8. S.P. Deshmukh, S.M. Patil, S.B. Mullani, S.D. Delekar, *Mater. Sci. Eng. C* **97**, 954–965 (2019)
9. R.S. Diggikar, S.P. Deshmukh, T.S. Thopate, S.R. Kshirsagar, *ACS Omega* **4**, 5741–5749 (2019)
10. E. Jafarnejad, S. Khanahmadzadeh, F. Ghanbary, M. Enhesari, *Curr. Chem. Lett.* **5**, 173–180 (2016)
11. A.G. Dhodamani, K.V. More, S.B. Mullani, S.P. Deshmukh, V.B. Koli, D.K. Panda, S.D. Delekar, *ChemistrySelect* **5**, 218–230 (2020)
12. S.M. Patil, S.P. Deshmukh, A.G. Dhodamani, K.V. More, S.D. Delekar, *Curr. Org. Chem.* **21**, 821–833 (2017)
13. M. Ejaz, A. Mahmood, M.A. Khan, A. Hussain, A. Sultan, A. Mahmood, A.H. Chughtai, M.N. Ashiq, M.F. Warsi, I. Shakir, *J. Magn. Magn. Mater.* **404**, 257–264 (2016)
14. N. Lotfian, A. Nourbakhsh, S.N. Mirsattari, A. Saberi, K.D. Mackenzie, *Ceram. Int.* **46**, 747–754 (2020)
15. H.R. Zargar, C. Oprea, G. Oprea, T. Troczynski, *Ceram. Int.* **38**, 6235–6241 (2012)
16. S.P. Deshmukh, V.B. Koli, A.G. Dhodamani, S.M. Patil, V.S. Ghodake, S.D. Delekar, *ChemistrySelect* **6**, 113–122 (2021)
17. S. Seif, S. Fatemi, O. Tavakoli, H. Bahmanyar, *J. Supercrit. Fluids* **114**, 32–45 (2016)
18. T.P. Putra, M. Yonemura, S. Torii, T. Ishigaki, T. Kamiyama, *Solid State Ionics* **262**, 83–87 (2014)
19. L.H. Huizhong, W. Jianxiu, *Refractories* **5**, 002 (2003)
20. A. Gismelseed, K. Mohammed, A. Al-Rawas, A. Yousif, H. Widatallah, M. Elzain, *Hyperfine Interact.* **226**, 57–63 (2014)
21. K. Khalaf, A. Al-Rawas, H. Widatallah, K. Al-Rashdi, A. Sellai, A. Gismelseed, M. Hashim, S. Jameel, M. Al-Ruqeishi, K. Al-Riyami, *J. Alloys Compd.* **657**, 733–747 (2016)

22. S.S. Kumbhar, M.A. Mahadik, V.S. Mohite, Y.M. Hunge, K.Y. Rajpure, C.H. Bhosale, *Mater. Res. Bull.* **67**, 47–54 (2015)
23. S. Kumbhar, M. Mahadik, V. Mohite, Y. Hunge, P. Chougule, K. Rajpure, C. Bhosale, *J. Mater. Sci.* **27**, 3799–3811 (2016)
24. S. Kumbhar, M. Mahadik, P. Chougule, V. Mohite, Y. Hunge, K. Rajpure, A. Moholkar, C. Bhosale, *Mater. Sci.* **33**, 852–861 (2015)
25. F. Nesa, A. Zakaria, M.S. Khan, S. Yunus, A. Das, S.-G. Eriksson, M. Khan, M. Hakim, (2012)
26. A. Mali, T. Wandre, K. Sanadi, A. Tapase, I. Mulla, P. Hankare, *J. Mater. Sci.* **27**, 613–619 (2016)
27. N. Jaiswal, S. Upadhyay, D. Kumar, O. Parkash, *Int. J. Hydrogen Energy* **39**, 543–551 (2014)
28. S. Mazen, N. Abu-Elsaad, *J. Magn. Magn. Mater.* **324**, 3366–3373 (2012)
29. P. Hankare, K. Sanadi, K. Garadkar, D. Patil, I. Mulla, *J. Alloys Compd.* **553**, 383–388 (2013)
30. S.P. Deshmukh, S.B. Mullani, V.B. Koli, S.M. Patil, P.J. Kasabe, P.B. Dandge, S.A. Pawar, S.D. Delekar, *Photochem. Photobiol.* **94**, 1249–1262 (2018)
31. D.L. Carvalho, L.E. Borges, L.G. Appel, P.R. de la Piscina, N. Homs, *Catal. Today* **213**, 115–121 (2013)
32. P. Hankare, U. Sankpal, R. Patil, A. Jadhav, K. Garadkar, B. Chougule, *J. Magn. Magn. Mater.* **323**, 389–393 (2011)
33. N. Deraz, A. Alarifi, *J. Anal. Appl. Pyrolysis* **94**, 41–47 (2012)
34. E. Eser, H. Koç, *Phys. B* **492**, 7–10 (2016)
35. J. Kummerow, S. Raab, *Energy Procedia* **76**, 240–246 (2015)
36. H. Zhang, A. Suresh, C. Carter, B. Wilhite, *Solid State Ionics* **266**, 58–67 (2014)

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

### 33. Weddings-Challenges To Indian Perspective An Overview Through Scientific Research

886

#### “WEDDINGS” – CHALLENGES TO INDIAN PERSPECTIVE: AN OVERVIEW THROUGH SCIENTIFIC RESEARCH

**RAHUL S. DIGGIKAR**

Assistant Professor, New Arts, Commerce and Science College,  
PARNER, Ahmed Nagar District, Maharashtra, 414302, India.

**DILIP R. THUBE**

Professor, New Arts, Commerce and Science College,  
PARNER, Ahmed Nagar District, Maharashtra, 414302, India.

#### **Abstract**

For sustainable development of India, science and cultural tradition must work hand to hand, for this there is need of scientific, cultural, inspirational and motivational short, long-term plans to be implemented in all layers of society. The plans must be formulated in regards with the science and technology based cultural programs which balance culture and scientific innovations. Herewith, it is presented the survey of two serious issues observed in the Indian community and need to be resolved. The issues related to the Indian wedding culture and its scientific and non-scientific outcomes. It is found that, due to globalization, the world is moving very speedily so that there is less time is to be prefer for the weddings. The marriages which are conducted for a longer period are the scientifically correct. For the sustainable development of India, short term plans for inter caste marriages should be promoted. The discrimination in the caste anyhow should be removed from the society, rule is not sufficient. Should promote inter caste marriages and must create pleasant environment for the marriages. For the sustainable development of India, inter caste weddings and its pleasant environment plays significant role. The inter caste marriages and love marriages should be promoted by any means. Due to this, everyone should be healthy and wealthy that can create strong India. Scientific research is

essential to understand the concept of diseases and other heritable attributes increases, so that the questions arise regarding communal marriages is relevant and should be encouraged, motivated? The marriage beuro has become the endogamy but genetic diseases arising out of a limited gene pool are major impact of it. Now a days for globalized community, there is huge demand to pertain these practices and determine what's the best way to choose a life partner. The Indian wedding industry costs around 50- 60 billion dollars which is 11<sup>th</sup> largest after USA. In India, every year there is more than 10 million wedding out of which 80 % are Hindus & 20 % are rest. The fact is around 95% marriages are from same community. No doubt due to higher education, the trend now days has been abruptly changing but still caste systems affect hugely on sustainable development of India.

**Keywords:** Sustainable development, plans, weddings, scientific innovations, culture.

#### **Introduction:**

India, an official Republic of India is one of the biggest democratic countries in the world along with the its sustainable culture, located in the Asian continent.<sup>1</sup> Population of India reaches up to 1,39,4,346,143 from all religions and its religious scenario is unity in diversity which equals to 17.7 % of world's total population.<sup>2</sup> Due to Indian tradition, in a single Indian family, there are all

മുൻകരുതൽ പ്രവർത്തനങ്ങൾ നടപ്പിലാക്കിയിട്ടുള്ളതായി വിലയിരുത്തുന്നതിന് പ്രത്യേക പരിശോധന നടത്തേണ്ടതുണ്ട്. 2021 ISSN:2321-984X  
Journal of Modern Tharrizh Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN:2321-984X

**“WEDDINGS” – CHALLENGES TO INDIAN PERSPECTIVE: AN OVERVIEW THROUGH SCIENTIFIC ... 887**

kinds of dictionary relatives are stayed very happily with a leader. Culture of joint family is the strength of India. There is serious problem of population control for each and every nation of the world. The population of India at one side are said to be strength for the future as the younger population is more at other side it is leading to serious problem to employment. However, some country/s have implemented the rules towards population control and are working on the rules very strictly whereas some of them do not, because of their religion myths. In India, there is the rule for the same but there are challenges in its implementation due to the religious issue.<sup>3</sup> After independence of India, in some of the religious communities there is explosion of population and in some others, there is abrupt decreases in the population. As population is huge, life style must be commendable as far as efficiency of people is considered. The efficiency is depending on environmental conditions, but the other parameters have greater impact on the lavish life style as expected from the economic conditions. There is a huge discrimination in religious population, on the other side there is serious problem in wedding system and on the next generations of it. It is observed even today and may be continued if not addressed scientifically. This research article is focused on the scientific social research by taking into account of the two issues, which are emerged as the outcome of today's wedding system.<sup>45</sup>

**Methods:**

There is survey focused on, a) Religious / communal wedding's problems for sustainable development of India b) The period of pregnancy, its faithful outcomes.

**a) Religious / communal wedding's problems for sustainable development of India**

The causes of religious / communal marriages are elaborated by the following method,

1. Non-scientific arguments marrying inside the community: To marry outside the cast as on Today is social threat for concern families and relatives. The main discrimination is due to caste base community and its culture found in India. Communal discrimination is different layers of the caste. The Indian community is composed of upper caste and lower castes, each caste also subdivided in number of sub caste layers, this system is very tightly bound together which suggests knowingly and unknowingly the greatness of lower and upper caste differences from the birth. Community – based marriage systems remain prevalent in India despite rapid urbanization and the proliferation of poor and smaller families. There are the myths of caste system.

2. Scientific arguments marrying outside the community and warnings: At present India is one of the most globalized nation in the world. Various orthodox families shows intense deliberations on the merits of getting on their own community. On the internet, their are various communal beuro are established mainly concentrated on matching of *gotra* and *patrika* finally by family meetings.

Scientific research is essential to understood the concept of diseases and other heritable attributes increases, so that the questions arise regarding communal marriages is relevant and should be encouraged, motivated? The marriage beuro has became the endogamy but genetic diseases arising out of a limited gene pool are major impact of it. Now a days for globalized community, there is huge demand to pertain these practices and determine what's the best way to choose a life partner. The Indian wedding industry costs around 50- 60 billion dollars which is 11<sup>th</sup> largest after USA. In India, every year there is more than 10 million wedding out of which 80 % are Hindus & 20 % are rest. The fact is around 95% marriages are from same community. No

புதிதான புதியதாக ஒரு புதிய புதியதாக. புதிதான புதியதாக ஒரு புதிய புதியதாக. புதிதான புதியதாக ஒரு புதிய புதியதாக. ISSN:2321-984X  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN:2321-984X



doubt due to higher education, the trend now days has been abruptly changing but still caste systems affect hugely on sustainable development of India. Tentative data has been published by Das *et. al* <sup>4</sup>

Table: Women marrying man of different castes in India and States (~ since last 10 years)

State	Women marrying men of			Total
	Same caste	Lower caste	Upper Caste	
India	89.04	5.58	5.38	43102
North India	89.83	5.34	4.83	3313
Central India	90.16	5.54	4.30	11572
East India	90.94	4.69	4.37	5606
West India	83.25	7.38	9.38	7647
South India	90.29	5.02	4.68	13917
North East India	89.20	5.98	4.82	1037

The above statistical data is pertaining there is more preference for communal marriages. This system is obviously sustainable for nuclear family, globalization transcends traditions. The genetic mutation provokes to infections present in the community which pertains high risk to future generations. Best example is from Hebrew (its language) community to Aryas community members cannot break down a particular anaesthetic molecule. The children are pre-exposed to the genetic disorder and diseases. Therefore, now a days community marriages signals warnings with caveat genetic diseases. Conventional marriage systems show the limited genetic pool, if genetic pool destroys it is quite amplified genetic pool there is less chances to come to contact with any infections. India needs future to be healthy, educated and productive. There is a nature and nurture component to their development — endowing them with healthy genes, bringing them up in a peaceful environment, and providing them the opportunities to learn and explore. So far current generations, needs quality scientific education and freedom to make informed choices about their partners.

**Serious problems occurring due to communal marriages: Now a days *roti beti***

culture is almost at the verge except Rajasthan. In India, there are some states yet they are very stick up their culture and tradition, observed more in states like Rajasthan and near by states compare to Kerala. The disease like thalassemia, blood disorder cause of gene mutation. If one gene mutated the children suffer from milder version – minor thalassemia. Thalassemia syndromes are caused by inheritance of abnormal genes from both the parent or one of them. This is only hypothesis, which shows more risk in communal marriages than outside caste marriages. More scientific research is indeed for sustainable development. There is a smaller number of communal marriages in west India, known as the developed states of India. It is most common, in India there is more chances to have communal marriages is more in reserve category people, there is less alternative to them due to discrimination of caste. The socially, economically development found in them is less.

**a) The period of pregnancy, its faithful outcomes.**

There are huge expenses for the ceremony of Indian marriages. Now a days there is always debates regarding expenses on marriages at various platforms. At the older days the marriage

പണ്ടെ പണ്ടിനോട് കൂടെ പറ്റിയിട്ടുണ്ട്. അതി പലതരം ആണിട്ടു കൂടിയിട്ടുണ്ട്. അതി പ. കെ. 3. 3. 1 - സെപ്റ്റംബർ 2021 ISSN 2321-984X  
Journal of Modern Thaisich Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN 2321-984X

**"WEDDINGS" – CHALLENGES TO INDIAN PERSPECTIVE: AN OVERVIEW THROUGH SCIENTIFIC ...889**

ceremony was held up to 1 month or more. Now a days the trend has come *pat magni pat saadi*, due to this trend some serious problems are arises in India as well as in the world. The causes of huge expenses against marriages are not scientifically dead. The other practices are common in Indian marriages is not lawful and ethical.

The environment created for marriage ceremony must be pleasant. It is created by made the expenses for purchase of cloths, valuable goods, gold and to offer enjoyable things to the visitors, making invitation card and distribution etc etc. After marriage there should be minimum period so that the newly married couple not to be come close, to keep far away to each other for that various traditional programme like visit to temple and so on organized in the marriage house, on the same day of marriage the couple came in contact, the bride was totally unknown of her new house so that she will be little tense. In due course of time, bride became familiar to the new home. In digital India, yet there is no information yet been circulated about reproductive health either from mother and society to the newly married women / girls. The younger age women have the less health care services utilization than older.

**Serious problems occurring due to not to non-pleasant environment:** If couple intercourse in non – pleasant environment then common observation is found in the all sectors of society. There are none proper chromosol arrangements in infant is to be observed there is huge chances abnormal birth. The body defects can be judge by sonography there is not any device yet developed in medical field which can indicates irregularities in chromosomes. Ultimately, there is more chances of down syndrome like infant birth (even though trisomy 12) <sup>6-13</sup>

**Common Observations and Impact of Inter Caste And Pleasant Environment of Marriages on Indian Community:**

There are two classes of marriages commonly observed in Indian community.

- 1) Conventional arranged marriage
- 2) Recent love marriages

**1) Conventional arranged marriage:** Planned martial union particularly by family is refered as Arranged Marriage. Most of Indian marriages (90%) are of this kind, the age difference between groom and bride found to be 4-5 years in general. Around 48% girls are social traditional unconstitutional laws forcibly or by emotionally get married before 18 years of age. For this, very large kind non ethical practices are yet going on. Many families of both side (Groom and Bride) are relies on first site of *patrika*, *gotra* etc. Here more priority is to be given to grooms in spite of bride. It is justified, as the culture of India is man leading. Next is for brides, the priority is given to Government job holder grooms without considering the opinion of bride consult (It is not for all cast / community). Due to less availability of Government job holder groom, the bride parents invest much more earnings to such grooms. Impact is there is huge amount of discrimination found in poor parents they could not satisfied all the requirements as considered. Facts are most of farmer parent in India get suicide because of difficulty to made arrangement for all expectations of Todays groom and his parents. In the present era inter cast marriages are far away even though there is promotion and funds has been made available by the Governments, the authorities, policy makers themselves were not involved directly in to the inter cast marriages.

Due to the very high age gap between bride and groom large varieties of issues are created.

நவீனத் தமிழ்நாடு (நவீன அறிவுத் தமிழ்நாடு): கல்வி அமைச்சு: A மாதாந்திர ஆங்கிலத் தாய்நாடு 9, 2021-2022 - சனவரி - செப்டம்பர் 2021 ISSN:2321-984X  
Journal of Modern Tamilnad Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN:2321-984X

Basic issue is mainly related to divorce in early stages of life. New born baby may not be healthy, earnings are invested in hospitals for taking care, there is large number of disputes have been started and earnings wasted in the work of courts.<sup>16</sup>

**2.Recent love marriages:** A love marriage is driven solely for wedding with or without permission of their parents by opposing. India is a traditional well bound cultural nation. In India, there are 29 states and 7 union territories but not a single state or union Governments forms any regulation for promotion of love marriages. It indicates anyone office bearers or stake holders are not ready to promote love marriages. Average literate or illiterate Indian people feels (parents), love marriages are considered to be trouble to the community and ultimately for family ethics. The parents are ethically considered they have courage, prestige in the community, if adolescent did inter caste weddings not to be good for them or society. However, in the rich and or Bollywood Indian families it is found that the people are not worried about the unconstitutional laws made by the society. These people are always promoted to the multiple type of weddings. They are not tightly bound with traditional culture they are always ready to follow the western culture. Love marriages are there in India but not expected. Still love marriages are in embryo stage. The next generation of these people are leaving happily and has made progress in their corresponding life.<sup>17-20</sup> Love marriages are the key of successes as their partner has been chooses by their own choices.

**FINDING and SUGGESTIONS:**

It is found that, due to globalization, the world is moving very speedily so that there is less time is to be prefer for the weddings. The marriages which are conducted for a longer period are the scientifically correct. For the sustainable development of India, short term plans for inter

caste marriages should be promoted. The discrimination in the caste anyhow should be removed from the society, rule is not sufficient. Should promote inter caste marriages and must create pleasant environment for the marriages.

**Conclusions:**

For the sustainable development of India, inter caste weddings and its pleasant environment plays significant role. The inter caste marriages and love marriages should be promoted by any means. Due to this, everyone should be healthy and wealthy that can create strong India.

**Acknowledgments:**

Authors are thankful to Principal of New Arts, Commerce and Science College, Parner and Management of Ahmednagar Jilha Maratha Vidya Prasarak Samaj, Ahmednagar to motivate the put forth the views in front of society.

**References:**

1. Krishnamurthy Srinivasan, *Population Concerns in India*, 2017
2. Ministry of External Affairs, Government of India, *India's Demography: Unity in diversity*, 2020
3. S.Y. Qureshi, *The Population Myth: Islam, Family Planning and Politics in India*, 2021
4. Lori M. Hunter, *Population and Environment, A complex Relationship*, 2000
5. F.N. 15-6/2018, Government of India, *Ministry of Social Justice and Empowerment*, 2018
6. Shambhavi Naik, *Science*, 2020, <https://epc2010.princeton.edu/sessions/24>
7. Banerjee, A.R. and Banerjee S., 1978, Inter-caste marriage pattern among some caste groups of Calcutta, *Man in India*, Vol. 58 (4).

മുൻപ് പ്രസിദ്ധീകരിച്ച (അല്ലെങ്കിൽ തിരുത്തലുകൾ, വാഗ്ദാനം) കേരളം അന്തർദ്ദേശീയ കലാകൃതികളുടെ മാസിക 9, 2021, 2021-2022, ISSN:2321-890X  
 Journal of Modern Theatrical Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN:2321-890X

---

 "WEDDINGS" – CHALLENGES TO INDIAN PERSPECTIVE: AN OVERVIEW THROUGH SCIENTIFIC ... 891
 

---

8. Banerjee, A.R. and Chowdhuri L., 1988, Caste exogamy and class/Gothra endogamy in the contemporary Bengale society, *Man in India*, Vol. 68 (2).
9. Chair, L., 1984, Marriage under Hindu law, *Social Welfare*, Vol. 31(1).
10. Kannan, C.T., 1963, Inter-caste and inter-community marriages in India, Allied Publishers Private Limited, Bombay.
11. Kannan, C.T., 1963, Inter-caste marriages in Bombay, Allied Publishers Private Limited, Bombay.
12. Kapadia, K.M., 1958, Marriage and family in India, Bombay.
13. Prasad, N., 1957, The myth of the caste system, Patna.
14. Reddy, S. and Rojanna Ch., 1984, Marriage under Hindu law, *Social Welfare*, Vol. 31(1).
15. Saroja, K., 1999, Inter-caste marriage and social Dynamics in India: A critique, *The Journal of Social Work*, Vol. 60 (2).
16. Susan L. Brown, *J Marriage Fam.* 2010 Oct 1; 72(5): 1059-1077.
17. Renu Singh, Uma Vennam, *Young Lives* , 2016
18. [https://dash.harvard.edu/bitstream/handle/1/36853322/Ben\\_Palmer\\_Ec\\_970.pdf?sequence=1&isAllowed=y](https://dash.harvard.edu/bitstream/handle/1/36853322/Ben_Palmer_Ec_970.pdf?sequence=1&isAllowed=y)
19. [https://en.wikipedia.org/wiki/Arijit\\_Singh](https://en.wikipedia.org/wiki/Arijit_Singh)
20. [https://en.wikipedia.org/wiki/Sara\\_Ali\\_Khan](https://en.wikipedia.org/wiki/Sara_Ali_Khan)

CS

### 34. A Phosphor -TiO<sub>2</sub> Nanocomposite as a Visible Light Photo-catalyst: Synthesis and Characterization



Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

#### A PHOSPHOR -TiO<sub>2</sub> NANOCOMPOSITE AS A VISIBLE LIGHT PHOTOCATALYST: SYNTHESIS AND CHARACTERIZATION

**Dilip. R. Thube**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India, drthube@rediffmail.com

**Rahul S. Diggikar**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**S. L. Kadam**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Bharat B. Kale**

Centre for Materials for Electronic Technology, Panchavati, Off-Pashan, Pune-411 00, India

**Tae-Sun Chang**

Korea Research Institute of Chemical Technology, P.O. Box 107, Yuseong, Daejeon, 305-600, South Korea

**Hojin Ryu**

Korea Research Institute of Chemical Technology, P.O. Box 107, Yuseong, Daejeon, 305-600, South Korea

#### Abstract

The CaAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>,Nd<sup>3+</sup> supported novel TiO<sub>2</sub> photocatalytic nanocomposites were successfully synthesized by growing the nanocrystalline titanium dioxide layer on the long-lasting phosphor, using sol-gel method. The photocatalysts are characterized using X-ray diffraction (XRD), diffused reflectance UV-Visible spectroscopy (DRS UV-Vis), fourier-transform infrared (FT IR), and electron microscopy techniques. XRD studies reveal that the TiO<sub>2</sub> crystal structure does not transform from anatase to rutile phase till 600 °C. The red shift in wavelength observed in the DRS UV-Vis spectra implies the presence of covalent interaction between the phosphor and TiO<sub>2</sub> particles. This implies that the band-gap has been tuned towards the absorption light in the visible range. The well dispersed polycrystalline TiO<sub>2</sub> nanoparticles on the surface of the phosphor substrate are evident from TEM micrographs of the nanocomposites. The presence of Lewis acid-base interactions between TiO<sub>2</sub> and phosphor support are evident from the difference in size of TiO<sub>2</sub> nanoparticles. Therefore, in addition

[15]

to protecting TiO<sub>2</sub> from structural transformation, the phosphor also plays an important role as a dispersant through covalent bonding.

**Keywords: Composites; Nanostructures; Sol-gel chemistry; X-ray diffraction; Surface properties.**

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dilip. R. Thube

**1. Introduction**

Photocatalysis has attracted extensive attention for decades due to its potential applications in energy and environmental clean up [1-3]. Photocatalytic degradation in solar light is a promising technology for the removal of toxic organic and inorganic contaminants from water and waste water [4-7]. Among various photocatalysts, most attention has been given to efficient and environmentally benign TiO<sub>2</sub> photocatalyst due to its high photocatalytic activity, strong oxidizing power, resistance to corrosion, photostability, chemical inertness, low cost and non-toxicity [8-10]. In addition, TiO<sub>2</sub> based self cleaning surfaces also exhibit antimicrobial activity useful in the home and hospital [11]. However, because of its large band gap (3.20 eV for anatase phase), it could be only activated by ultraviolet (UV) light. The solar light has only a small fraction (3-4 %) of UV light as compared to visible light (45%) [11-12]. Hence to make efficient use of the solar light, many attempts such as transition metal ion deposition [13] and anion doping [14-26] have been made to sensitize TiO<sub>2</sub> to absorb in the visible region. However, doped materials suffer from thermal instability and increase of carrier-recombination centers [27]. Several reports on the modification of TiO<sub>2</sub> nanoparticles with transition metal oxides and other oxides such as SiO<sub>2</sub>, SnO<sub>2</sub>, In<sub>2</sub>O<sub>3</sub>, (Sr, La)TiO<sub>3+δ</sub> and SrTiO<sub>3</sub>, etc [28-31] exist which have been used to enhance the visible light absorption. Existing bulk semiconducting materials possess low surface area, absorb less light energy and exhibit fast electron-hole recombination affecting the photocatalytic activity. In order to overcome these drawbacks, research has been focused towards the synthesis of nanomaterials which possess enhanced properties and activity [32]. Nanocrystalline materials exhibit unique properties such as quantum size effect, high surface area, short interface migration distance and visible light activity, which are of great importance for enhancing photocatalytic activity. The particle size of a catalyst has a direct consequence on surface area. When particle size is smaller, the number of active surface sites increases and consequently the surface charge carrier transfer rate also increases in photocatalysis [33-34]. The sol-gel process is the versatile technique for the preparation of nanocrystalline TiO<sub>2</sub> through which the physico-chemical and electrochemical properties of TiO<sub>2</sub> can be modified to improve its efficiency [1, 34-35].

Recently, Zheng et al. have reported light-storing photocatalyst [36] by combining light-storing phosphor and TiO<sub>2</sub>. This photocatalyst can absorb and store the light from the source and supply it for the TiO<sub>2</sub> photocatalyst when the light source is cut off. Hence, this kind of catalyst can function all day long when it is used in outdoor environment and save energy for indoor use. This encouraged us to explore the modification of TiO<sub>2</sub> nanoparticles

[16]

with optically sensitive phosphor material. Thus in this work, we present the synthesis of phosphor (calcium aluminate;  $\text{CaAl}_2\text{O}_4:\text{Eu}^{2+}, \text{Nd}^{3+}$ ) supported  $\text{TiO}_2$  nanoparticles using sol-gel method. The resultant products are characterized thoroughly using XRD, DRS UV-Vis, FT-IR, SEM and TEM techniques. Their structure, thermal stability and morphological properties are discussed in the following sections.

## 2. Material and Methods

### 2.1. Synthesis of $\text{TiO}_2$ nanoparticles

The typical procedure reported in the literature [35] for the synthesis of  $\text{TiO}_2$  nanoparticles was used: Ethanol (225 g, Merck, 99.7%) and deionized (DI) water (6.8 g) with a catalytic quantity of glacial acetic acid (0.07 g) were stirred for 10 min to ensure thorough mixing, to which 35 g of titanium (iv) isopropoxide (TIP,  $\text{Ti}(\text{OC}_3\text{H}_7)_4$ , Aldrich, 97%) was added drop-wise over a period of approximately 10 min, under constant stirring. A white precipitate of  $\text{TiO}_2$  was formed immediately upon addition of TIP precursor. The precipitate was aged at room temperature for approximately 48 h and the residue obtained by filtration was dried at 80 °C in an oven for about 20 h. The dried precipitate was then heat treated at different temperatures from 300 to 600 °C with a heating rate of 2 °C  $\text{min}^{-1}$ .

### 2.2. Synthesis of phosphor supported $\text{TiO}_2$ nanoparticles

The phosphor ( $\text{CaAl}_2\text{O}_4:\text{Eu}^{2+}, \text{Nd}^{3+}$ ) supported  $\text{TiO}_2$  nanoparticles were synthesized using sol-gel procedure as follows: the phosphor ( $\text{CaAl}_2\text{O}_4:\text{Eu}^{2+}, \text{Nd}^{3+}$ , 1.2 – 4.8 g) was dispersed into ethanol (115 g, Merck, 99.7%), DI water (3.5 g) and a catalytic quantity of glacial acetic acid (0.035 g) with constant stirring for 30 min. TIP, (Aldrich, 97%), 0.08 to 0.24 M was added drop-wise over a period of approximately 10 min, under constant stirring. The white precipitate of  $\text{TiO}_2$  formed immediately was stirred at 50 °C for 5 min and then dried in oven at 70-80 °C for 48 h. It was then calcined at 400 and 600 °C and characterized using XRD, DRS UV-Vis, FT-IR, SEM and TEM techniques. The as-prepared catalysts were abbreviated as PST1-a, PST1-b and PST1-c for phosphor supported  $\text{TiO}_2$ , with  $\text{TiO}_2$  to phosphor molar ratio 1:1 and titanium precursor (TIP) concentration varied from 0.08, 0.16 and 0.24 M, respectively. The samples PST2-a, PST2-b and PST2-c, the molar ratio is 1:2 and TIP concentration varied from 0.08, 0.16 and 0.24 M, respectively. In samples PST3-a, PST3-b and PST3-c, the molar ratio is 1:4 and TIP concentration varied from 0.08, 0.16 and 0.24 M, respectively.

### 2.3. Characterization

The  $\text{TiO}_2$  materials produced were analyzed and characterized with powder-XRD, DRS UV-Vis, FT-IR, SEM and TEM. The XRD spectra were recorded on a RIGAKU D/MAX 2200V, Japan with  $\text{Cu K}\alpha$  radiation ( $\lambda=1.54059 \text{ \AA}$ ) and a graphite monochromator operated at 40 kV and 40 mA. The diffractograms were recorded in the  $2\theta$  range 10-80° in steps of 0.02°  $\text{s}^{-1}$ . The primary crystallite size of the powders was estimated using the Scherrer equation (1) [37-38],

$$D_c = \frac{K\lambda}{B\cos\theta} \quad \dots\text{equation (1)}$$

where  $D_c$  is the average crystallite size;  $K$  ( $=0.89$ ) is the Scherrer constant;  $\lambda$  ( $=1.54059 \text{ \AA}$ ) is the X-ray wavelength;  $B$  is the full-width at half-maximum (FWHM) and  $\theta$  is the diffraction angle. The identification of the different crystalline phases was accomplished using the JCPDS database.

FT-IR spectra were recorded with a BRUKER EQUINOX55 FT-IR spectrometer in the range of  $4000\text{--}200 \text{ cm}^{-1}$  on powders dispersed in KBr pellets. DRS UV-Visible spectra were recorded using UV-visible spectrophotometer (Shimadzu 2401 PC), with  $\text{BaSO}_4$  as a reference. The spectra were recorded at RT in air, in the range  $250$  to  $800 \text{ nm}$ . SEM images were recorded using Philips XL30S FEG at  $10 \text{ kV}$ . Samples were deposited as dry powders on carbon tape on aluminium microscopy stubs and sputtered with platinum. TEM images of the materials were recorded with FEI TECNAI G<sup>2</sup> T-20S microscope. A drop of sample suspension, which had been previously dispersed in ethanol by ultrasonication, was placed on a Cu microgrid coated with carbon film. The particle sizes were investigated by high-resolution transmission electron microscopy (HRTEM), using an accelerating voltage of  $200 \text{ kV}$ .

### 3. Results and Discussion

#### 3.1. Powder X-ray Diffractometry

The XRD patterns of phosphor supported  $\text{TiO}_2$  samples PST1, PST2, and PST3, are presented in Fig. 1(a), (b) and (c), respectively. Fig. 1(a) illustrates the XRD patterns of PST1 wherein the content of  $\text{TiO}_2$  is increased from PST1-a to PST1-c. There is gradual increase in the intensity of patterns for all the major peaks ((1 0 1), (0 0 4) and (2 0 0)) of anatase with the increase in the  $\text{TiO}_2$  contents. It is quite understood that due to high concentration of precursor the growth of the  $\text{TiO}_2$  is faster and hence there is slight increase in the intensity of XRD peaks with concentration of titanium precursor. Additionally, it also increases the crystallinity of the  $\text{TiO}_2$  leads to show sharp and intense peaks in XRD. The particle size derived by Scherrer equation is given in Table 1. There is increase in the particle size with the increase in the  $\text{TiO}_2$  content as discussed above. It is also verified from the TEM pictures as discussed below. Though, the  $\text{TiO}_2$  particles are covalently bound to phosphor surface, no change in the morphology of the patterns is observed. It is an interesting observation, which confirms adsorption of particles on the surface of phosphor after they are grown, rather than adsorbing titanium precursor,  $\text{Ti}(\text{OC}_2\text{H}_5)_4$ , in the beginning itself. It is a quite general phenomenon as hydrophobic alkyl surrounding of titanium will be repelled and adsorbed on the polar surface of phosphor. So the hydrolysis and growth of  $\text{TiO}_2$  nanocrystallites occur independently and finally transported to the phosphor surface as they have high surface energy.

The XRD patterns of PST2 shown in Fig. 1(b) also illustrate nearly similar features. The particle size of PST2-a, PST2-b and PST2-c are also presented in the same table and compared. There is slight increase in size for PST2-a, PST2-b and PST2-c as compared to PST1-a, PST1-b and PST1-c respectively. This observation suggests the influence of phosphor support on the equilibria of hydrolysis of titanium (iv) isopropoxide and nucleation of  $\text{TiO}_2$  nanocrystallites. The XRD patterns of PST3-a to PST3-c, shown in Fig. 1(c) illustrates the



*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

patterns of both phosphor and TiO<sub>2</sub>, but the intensity of TiO<sub>2</sub> patterns shows a significant decrease compared to Fig. 1(a) and Fig. 1(b). It is a clear indication for decoration of phosphor support with much more finely divided TiO<sub>2</sub> nanocrystallites. This observation once again supports the influence of phosphor support on the hydrolysis of titanium (iv) isopropoxide and the growth of TiO<sub>2</sub> nanocrystallites. Since our main interest is to develop a methodology for the development of phosphor supported TiO<sub>2</sub> photocatalyst, fine dispersion of TiO<sub>2</sub> on phosphor support is important for enhanced photocatalytic activity. In this context, the methodology with the composition corresponding to the synthesis of PST3 samples appears to be better than others. The small particle size for PST3 catalysts than PST2 shown in Table 1 also confirms fine dispersion of TiO<sub>2</sub> on phosphor support.

The thermal stability of TiO<sub>2</sub> and phosphor supported TiO<sub>2</sub> (PST2) catalyst was studied between 300 and 600 °C using XRD technique. The conversion of anatase to rutile is partly evident at 500 °C and more so at 600 °C (Fig. 2(a)). The influence of phosphor on the thermal stability of TiO<sub>2</sub> is illustrated in Fig. 2(b). At 600 °C, no evidence is observed in support of conversion of anatase into rutile, hence phosphor is confirmed to confer thermal stability to TiO<sub>2</sub> nanocrystallites. An important point to mention is unless the TiO<sub>2</sub> particles are covalently bound to phosphor surface they cannot derive stability hence there might be covalent binding between phosphor and TiO<sub>2</sub> to provide such property. The shift in 2θ values of XRD patterns presented in the Table 2 also proves the bonding interaction between TiO<sub>2</sub> and phosphor. In addition, a point to note is there might not be free TiO<sub>2</sub> nanocrystallites, as there is no evidence for rutile peaks. So it could be suggested that the phosphor support might provide significant binding force to attract and hold the TiO<sub>2</sub> nanocrystallites either directly or through pre-adsorbed TiO<sub>2</sub> crystallites. Thus, the phosphor support is discerned to inhibit the densification and crystal growth by providing dissimilar boundaries. Similar results for the thermal stability of anatase were also reported in the literature [39-42].

In order to establish the nature of interaction between TiO<sub>2</sub> and phosphor support, additional support materials such as γ-alumina and MgO were chosen. The former can provide Lewis acid interaction and the later, Lewis basic interaction with TiO<sub>2</sub>. These supports were separately mixed with TiO<sub>2</sub>, calcined at 600 °C and subjected to XRD analysis. The XRD results indicated absence of anatase to rutile conversion, hence the TiO<sub>2</sub> particles can be adsorbed on any supports which can act either as Lewis acid or as Lewis base. When the support acts as a Lewis acid, TiO<sub>2</sub> oxidic sites can act as Lewis base. On the other hand if the support acts as a Lewis base titanium can act as Lewis acid site during the binding. Actually in alumina Lewis acidic aluminium sites are more important to bind than its Lewis basic oxidic sites.

### 3.2. FT-IR Spectroscopy

FT-IR spectra of phosphor, TiO<sub>2</sub> and phosphor supported TiO<sub>2</sub> (PST2-c) are compared in Fig. 3. The characteristic stretching vibrations of the materials lie in between 200-1000 cm<sup>-1</sup>[43-48]. A careful examination of the group vibrations clearly shows shifts in peak positions for phosphor supported TiO<sub>2</sub> compared to both, free phosphor and TiO<sub>2</sub>. Hence it also becomes an important supporting evidence for the bonding interaction between the phosphor and TiO<sub>2</sub>. The vibrations of phosphor are shifted to lower values after supporting TiO<sub>2</sub>. Hence, the interaction between phosphor and support should transport π-electronic cloud from TiO<sub>2</sub> to phosphor. In other

[19]

words, the phosphor can drain electronic cloud from TiO<sub>2</sub> by acting as Lewis acid. Since only oxidic  $\pi$ -electronic cloud of TiO<sub>2</sub> is to be involved for such interactions, the sigma ( $\sigma$ ) bonding in TiO<sub>2</sub> is to be strengthened. It is exemplified by the increase in the energy of TiO<sub>2</sub> vibrations in phosphor supported TiO<sub>2</sub> compared to free TiO<sub>2</sub>. Actually for bonding between phosphor and TiO<sub>2</sub>, phosphor acts as the Lewis acid, but for bonding between TiO<sub>2</sub> crystallites this order could occur in both ways.

Based on the shift of the IR peak position to higher wavenumbers and decrease in the d-spacing as evidenced from XRD studies, it could be confirmed that the TiO<sub>2</sub> nanoparticles are not free but covalently bound to the phosphor support. Therefore, there must be transfer of  $\pi$ -electron clouds particularly from the terminal oxidic sites of TiO<sub>2</sub> nanoparticles to the phosphor support. This might be true as the support carries Lewis acidic sites such as Al<sup>3+</sup> and rare earth ions as discussed above. The transfer of  $\pi$ -electronic cloud from the terminal oxidic sites would result in the suppression of backdonation of the some of the titanium sites through antibonding molecular orbitals, as a consequence there might be strengthening of the Ti-O sigma bonds in the entire nano-TiO<sub>2</sub> particles. This type of interaction might also be the cause for controlling size and higher level dispersion of TiO<sub>2</sub> nanoparticles as evidenced from TEM studies.

### 3.3. Diffuse Reflectance Spectroscopy

The DRS UV-visible spectral analysis of TiO<sub>2</sub> and phosphor supported TiO<sub>2</sub> catalysts was carried out between 250 and 800 nm covering the ultraviolet and visible regions. The spectra for PST1, PST2 and PST3 catalysts are presented in Fig. 4(a), (b) and (c) respectively. In each figure phosphor content remains the same while the TiO<sub>2</sub> content increases, but the phosphor content increases from Fig. 4 (a) to (c). A shift in the onset of absorbance towards longer wavelength with increase in TiO<sub>2</sub> content is clearly evident in each figure. The absorbance maximum for as-prepared free TiO<sub>2</sub> corresponds to 396 nm. The absorbance maximum and the band-gap energy derived for all the samples are presented in Table 3. The shift in absorbance towards longer wavelength indirectly proves increase in the particle size of TiO<sub>2</sub> nanocrystallites as discussed in XRD analysis, this observation is therefore conforming to quantum size effects as reported in the literature [49-52]. With increase in phosphor content the expected decrease in TiO<sub>2</sub> size is not observed in this study. In other words, from PST1 to PST3, the numbers of phosphor particles are increased but the TiO<sub>2</sub> size does not show the expected decrease by dilution effect of phosphor. From PST1 to PST2 the particle size increases therefore in PST1 the number of phosphor particle's content might not be sufficient to attract and adsorb all Ti precursors on their surface to form TiO<sub>2</sub> crystallites, where as in PST2 the phosphor particle's content is suggested to be optimum level to adsorb Ti precursors in greater amount on their surface thus aiding formation of large TiO<sub>2</sub> crystallites. Hence with PST2 supported catalyst, there might be minimum free TiO<sub>2</sub> particles compared to PST1 supported TiO<sub>2</sub> catalyst. If it is true then further increase in the phosphor content might show obvious decrease in the size of TiO<sub>2</sub> crystallites. In line with our view, the size of TiO<sub>2</sub> crystallites with PST3 systems is less than that of PST2 system. The presence of more free TiO<sub>2</sub> particles in PST1 and less in PST2 and PST3 is also partly evident from TEM analysis as discussed below. The excessive phosphor content is suppressing the formation of free TiO<sub>2</sub>. Dense aggregates

of TiO<sub>2</sub> crystallites on the surface of phosphor in PST2 also support our view of minimizing formation of free TiO<sub>2</sub> particles. In comparison, the TEM pictures of PST1 and PST3 do not have such dense aggregation.

The DRS UV-visible absorbance spectra of phosphor (CaAl<sub>2</sub>O<sub>4</sub>: Eu<sup>2+</sup>,Nd<sup>3+</sup>) show characteristic absorbance maximum at 425 nm. It is also matching with the one already reported in the literature [53]. The above said absorbance is closely matching with TiO<sub>2</sub>. This study therefore fulfils the requirement of nearly same absorbance maxima for both, phosphor support and TiO<sub>2</sub>, for visible light photodegradation even in the absence of sunlight. An added advantage of the supported catalyst is absorbance of light can occur either on TiO<sub>2</sub> or phosphor. The light absorption on TiO<sub>2</sub> can end up with either photodegradation or photoexcitation of phosphor, whereas the excitation of phosphor is to subsequently excite TiO<sub>2</sub>. In any way there is enhanced light absorption cross section for phosphor supported material and so there might be consequent enhancement of photocatalysis activity. Hence phosphor supported TiO<sub>2</sub> is expected to have better photocatalytic performance than TiO<sub>2</sub> itself.

Generally band-gap of semiconducting materials is increased with decrease in particle size [49-52]. Contrary to the quantum size effects, the band-gap is observed to be less although the particle dimensions are in nanosize. Thus, it is understood that each particle in this system is not an independent isolated one. Hence they are to be aggregated not by Van der Waal's forces but through covalent bond interactions. So when a particle interacts three dimensionally with other particles through covalent bond, new filled energy levels are to be added in the band-gap. This process leads to minimization of band-gap, thus making the absorption band to occur in the visible region, so aggregation of nanoparticles by bonding results in band-gap reduction and shifting the absorption band towards the lower energy region. In other words, quantum size effects can be applied to a system of nanoparticles which are isolated or are aggregated through Van der Waal's forces and not for the particles aggregated through actual bond formation. In such aggregates newer molecular orbitals are formed which can go around the entire molecular aggregates without confining to individual particles.

#### 3.4. SEM and TEM Studies

TEM study is a powerful tool to study the structural transformation and morphology of the material. The morphology of synthesized nanoparticles was studied using HRTEM images and selected area electron diffraction (SAED). Each composition was investigated by HRTEM for their microstructure and crystallinity. Fig.5 (a) and (b) shows the representative TEM and HRTEM images along with the corresponding SAED patterns of phosphor supported TiO<sub>2</sub> (PST1-a and PST3-a) composites. Fig. 6 (a) and (b) shows the representative SEM image of phosphor supported TiO<sub>2</sub> nanoparticles (PST2-b and PST2-c).

A TEM picture of phosphor supported TiO<sub>2</sub> nanoparticles clearly reveals the crystalline nature of the material. The well defined rings and bright spots in SAED pattern show good crystallinity. SEM and TEM pictures confirmed that the TiO<sub>2</sub> particles are spherical in shape with an average grain size of 8-15 nm. There is very fine dispersion of TiO<sub>2</sub> crystallites on the surface of phosphor as compared to free TiO<sub>2</sub>. Fig. 5 and Fig. 6 illustrate aggregates of TiO<sub>2</sub> crystallites on the surface of phosphor. The morphology of these TiO<sub>2</sub> nanoparticles remains same however the particle size is decreased to 8–15 nm. The covalent interactions that co-exist between TiO<sub>2</sub> nanoparticles and support as discussed earlier might be the cause for higher level dispersion. As and when the

TiO<sub>2</sub> nanoparticles attains a particular size they will be picked up by covalent bonding by phosphor materials so further growth has been suppressed. Such a size controlling donor-acceptor mechanism is clearly evidenced in this study.

Although TiO<sub>2</sub> particles are of nanosize but they appear to have the different sizes i.e. lack of uniform particle size. It is attributed to the difference in the Lewis acid strength of different sites on the surface of phosphor material.

#### **4. Conclusion**

The phosphor supported TiO<sub>2</sub> nanoparticles were successfully synthesized by sol-gel method for the first time. The particle size of as-prepared phosphor supported TiO<sub>2</sub> nanoparticles is controlled due to the phosphor support and found to be smaller (8-15 nm) than free TiO<sub>2</sub> (~25 nm). The smaller particle size is known to improve the surface area which is important in catalysis. The TiO<sub>2</sub> nanocomposites exhibit excellent thermal stability which retards the anatase to rutile phase transition in TiO<sub>2</sub> has been confirmed from XRD data. The as-prepared TiO<sub>2</sub> nanoparticles show covalent interactions with the phosphor support and hence, show absorption towards the longer wavelength in the diffuse reflectance spectra. Thus, the band-gap of these photocatalysts can be tuned to improve the absorption in the visible spectrum of solar light and further work in this direction is underway.

#### **Acknowledgement**

One of the authors (D. R. Thube) is grateful to Korea Federation of Science and Technology KOFST, South-Korea, for the fellowship under Brain Pool Program. Dr. M. Palanichamy, Anna University, Chennai, India is gratefully acknowledged for useful discussions on the results obtained in this studies.

#### **References**

- [1] Chen X. & Mao S. S., (2007) Titanium Dioxide Nanomaterials: Synthesis, Properties, Modifications, and Applications, *Chem. Rev.* 107, 2891-2959.
- [2] Thompson T.L. & Yates J.T. Jr, (2006) Surface Science Studies of the Photoactivation of TiO<sub>2</sub>-New Photochemical Processes, *Chem. Rev.* 106, 4428-4453.
- [3] Legrini O., Oliveros E. & Braun A., (1993) Photochemical processes for water treatment, *Chem. Rev.* 93 671-698.
- [4] Ollis D.F. & Turchi C.S., (1990) Heterogeneous photocatalysis for water purification: Contaminant mineralization kinetics and elementary reactor analysis, *Environ. Prog.* 9, 229-234.
- [5] Bahnemann D.W., (1991) Photochemical conversion and storage of solar energy, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 251-276.

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

- [6] Hoffmann M.R., Martin S.T., Choi W. & Bahnemann D.W., (1995) Environmental applications of semiconductor photocatalysis, *Chem. Rev.* 95(1), 69-96.
- [7] Mills A. & Hunte S.L., (1997) An overview of semiconductor photocatalysis, *J. Photochem. Photobiol. A* 108, 1-35.
- [8] Fujishima A. & Honda K., (1972) Electrochemical photolysis of water at a semiconductor electrode, *Nature* 238, 37-38.
- [9] Fox M.A. & Dulay M.T., (1993) Heterogeneous photocatalysis, *Chem. Rev.* 93(1), 341-357.
- [10] Shankar M.V., Anandan S., Venkatachalam N., Arbindoo B. & Murugesan V., (2004) Novel thin-film reactor for photocatalytic degradation of pesticides in an aqueous solution, *J. Chem. Technol. Biotechnol.* 79, 1279-1285.
- [11] Quan X., Zhao Q., Tan H., Sang X., Wang F. & Dai Y., Comparative study of lanthanide oxide doped titanium dioxide photocatalysts prepared by coprecipitation and sol-gel process, (2009) *Mater. Chem. Phys.* 114(1), 90-98.
- [12] Burda C., Lou Y., Chen X., Samia A.C.S., Stout J. & Gole J.L., Enhanced nitrogen doping in  $\text{TiO}_2$  nanoparticles, (2003) *Nano. Lett.* 3, 1049.
- [13] Sakthivel S. & Kisch H., (2003) Daylight photocatalysis by carbon-modified titanium dioxide, *Angew. Chem. Int. Ed.*, 42, 4908-4911.
- [14] Irie H., Watanabe Y. & Hashimoto K., (2003) Carbon-doped anatase  $\text{TiO}_2$  powders as a visible-light sensitive photocatalyst, *Chem. Lett.* 32, 772-773.
- [15] Umebayashi T., Yamaki T., Tanaka S. & Assai K., (2003) Visible light-induced degradation of methylene blue on s-doped  $\text{TiO}_2$ , *Chem. Lett.* 32, 330-331.
- [16] Ohno T., Mitsui T. & Matsumura M., (2003) Photocatalytic activity of s-doped  $\text{TiO}_2$  photocatalyst under visible light, *Chem. Lett.* 32, 364-365.
- [17] Yu J.C., Yu J.G., Ho W.K., Jiang Z.T. & Zhang L.Z., (2002) Effects of F<sup>-</sup> doping on the photocatalytic activity and microstructures of nanocrystalline  $\text{TiO}_2$  powders, *Chem. Mater.* 14, 3808-3816.
- [18] Lindgren T., Mwabora J.M., Avendano E., Jonsson J., Hoel A., Granqvist C.-G. & Lindquist S.-E., (2003) Photoelectrochemical and optical properties of nitrogen doped titanium dioxide films prepared by reactive DC magnetron sputtering, *J. Phys. Chem. B*, 107, 5709-5716.
- [19] Ihara T., Miyoshi M., Iriyama Y., Matsumoto O. & Sugihara S., (2003) Visible-light-active titanium oxide photocatalyst realized by an oxygen-deficient structure and by nitrogen doping, *Appl. Catal. B* 42, 403-409.
- [20] Lettmann, C., Hildenbrand, K., Kisch, H., Macyk, W. & Maier, W.F. (2001) Visible light photodegradation of 4-chlorophenol with a coke-containing titanium dioxide Photocatalyst, *Appl. Catal. B* 32, 215-227.

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

- [21] Zhao W., Ma W., Chen C., Zhao J. & Shuai Z., (2004) Efficient degradation of toxic organic pollutants with Ni<sub>2</sub>O<sub>3</sub>/TiO<sub>2-x</sub>B<sub>x</sub> under visible irradiation, *J. Am. Chem. Soc.* 126, 4782-4783.
- [22] Irie H., Washizuka S., Yoshino N. & Hashimoto K., (2003) Visible-light induced hydrophilicity on nitrogen-substituted titanium dioxide films, *Chem. Commun.*, 1298-1299.
- [23] Irie H., Watanabe Y. & Hashimoto K., (2003) Nitrogen-concentration dependence on photocatalytic activity of TiO<sub>2-x</sub>N<sub>x</sub> powders, *J. Phys. Chem. B*, 107, 5483-5486.
- [24] Gole, J.L., Stout, J.D., Burda, C., Lou, Y. & Chen, X. (2004) Highly efficient formation of visible light tunable TiO<sub>2-x</sub>N<sub>x</sub> photocatalysts and their transformation at the nanoscale, *J. Phys. Chem. B*, 108, 1230-1240.
- [25] Lin L., Lin W., Zhu Y.X., Zhao B.Y. & Xie Y.C., (2005) Phosphor-doped titania—a novel photocatalyst active in visible light, *Chem. Lett.*, 34, 284-285.
- [26] Lin L., Zheng R.Y., Xie J. L., Jhu Y.X. & Xie Y.C., (2007) Synthesis and characterization of phosphor and nitrogen co-doped titania, *App. Catal. B: Environ. App. Catal. B*, 76, 196-202.
- [27] Asahi A., Morikawa T., Ohwaki T., Aoki K. & Taga Y., (2001) Visible-light photocatalysis in nitrogen-doped titanium oxides, *Science*, 293, 269-271.
- [28] Shchukin D., Poznyak S., Kulak A. & Pichat P., (2004) TiO<sub>2</sub>-In<sub>2</sub>O<sub>3</sub> photocatalysts: preparation, characterisations and activity for 2-chlorophenol degradation in water, *J. Photochem. Photobiol. A: Chem.*, 162, 423-430.
- [29] Otsuka S. -Yao- Matsuo & Ueda M., (2004) Visible light-induced photobleaching of methylene blue aqueous solution using (Sr<sub>1-x</sub>La<sub>x</sub>)TiO<sub>3-δ</sub>-TiO<sub>2</sub> composite powder, *J. Photochem. Photobiol. A: Chem.*, 168, 1-6.
- [30] Cheng P., Li W., Zhou T., Jin Y. & Gu M., (2004) Physical and photocatalytic properties of zinc ferrite doped titania under visible light irradiation, *J. Photochem. Photobiol. A: Chem.*, 168 97-104.
- [31] Ye F.X., Tsumura T., Nakata K., Ohmoric A., (2008) Band gap engineering and optoelectronic properties of metal-doped tio<sub>2</sub> nanostructures for enhanced-performance of dye sensitized solar cell, *Mater. Sci. Eng. B* 148, 154-161; Sung H.J., Jung S.C. and Kim J.S., (2021) Photocatalytic reaction properties of TiO<sub>2</sub>-Supported on the Long Lasting Phosphor: Sr<sub>4</sub>Al<sub>14</sub>O<sub>25</sub>:Eu<sup>2+</sup>,Dy<sup>3+</sup>, *J. Nanosci. & Nanotech.*, 21, 3729-3734; M. Chisaka and H. Morikoka, (2019) Phosphor and nitrogen co-doped rutile TiO<sub>2</sub> covered on TiN for oxygen reduction reaction in acidic media, *Cat. Sci & tech.*, 3, 611-619.
- [32] Wang H, Wu Y, Xu BQ (2005) Preparation and characterization of nanosized anatase TiO<sub>2</sub> cuboids for photocatalysis. *Appl. Catal. B Environ* 59:139–146.; Kim J.S., Kim S. W. & Jung S.C, (2014) Photocatalytic reaction characteristics of the titanium dioxide supported on the long phosphorescent phosphor by a low pressure chemical vapor deposition, *J. Nanosci. & Nanotech.*, 14, 7751-7755; Eun S. R., Mavengere S. & Kim J. S., (2021) Preparation of Ag-TiO<sub>2</sub>/Sr<sub>4</sub>Al<sub>14</sub>O<sub>25</sub>:Eu<sup>2+</sup>,Dy<sup>3+</sup> Photocatalyst on phosphor beads and its photoreaction characteristics, *Catalysts*, 11, 261-273;
- [33] Sonawane R.S., Kale B. B., Dongare M.K., (2004) Preparation and photo-catalytic activity of Fe-TiO<sub>2</sub> thin films prepared by sol-gel dip coating, *Mater. Chem. Phys.* 85, 52-57.

[24]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

- [34] Venkatchalam N., Palanichamy M., Murugesan V., (2007) Sol-gel preparation and characterization of nanosize TiO<sub>2</sub>: Its photocatalytic performance, *Mater. Chem. Phys.* 104, 454-459.
- [35] Hart J. N., Bourgeois L., Cervini R., Cheng Y. B., Simon G. P., Spiccia L., (2007) Low temperature crystallization behavior of TiO<sub>2</sub> derived from a sol-gel process, *J Sol-Gel Sci. Tech.* 42, 107-117.
- [36] Zhang J., Pan F., Hao W., Qi Ge, Wang T., (2004) Light storing photocatalyst, *Appl. Phys. Letts.* 85, 5778-5780.
- [37] Scherrer P., Gottinger, (1918) *Nachrichte* 2, 98-100.
- [38] Cullity B. D., (1978) *Elements of X-Ray Diffraction*, 3<sup>rd</sup> Edn. Addison-Wesley, Reading, MA, pp. 102.
- [39] Datye A. K., Riegel G., Bolton J.R., Haung M., Prairie M.R., (1995) Microstructural Characterization of a Fumed Titanium Dioxide Photocatalyst, *J. Solid State Chem.* 115, 236-239.
- [40] Zhang Y.H., Zhang H.X., Xu Y.X., Wang Y.G., (2004) Significant effect of lanthanide doping on the texture and properties of nanocrystalline mesoporous TiO<sub>2</sub>, *J. Solid State Chem.* 177, 3490-3498.
- [41] Hishita S., Mutoh I., Koumoto K., Yanagida H., (1983) Inhibition mechanism of the anatase-rutile phase transformation by rare earth oxides, *Ceram. Int.* 9 (1983) 61-67.
- [42] Nair J., Nair P., Mizukami F., Oosawa Y., Okuba T., (1999) Microstructure and Phase Transformation Behavior of Doped Nanostructured Titania, *Mater. Res. Bull.* 34 (1999) 1275-1290.
- [43] N. Venkatchalam, M. Palanichamy, V. Murugesan, (2007) Sol-gel preparation and characterization of alkaline earth metal doped nano TiO<sub>2</sub>: Efficient photocatalytic degradation of 4-chlorophenol, *J. Mol. Catal. A: Chem.* 273, 177-185.
- [44] Bauer W., Tomandl G., Preparation of spherical TiO<sub>2</sub> particles by an emulsion method using TiCl<sub>4</sub>, *Ceram. Int.* 20 (1994) 189-193.
- [45] Ocana M., Fomes V., Serna C.J., (1992) A simple procedure for the preparation of spherical oxide particles by hydrolysis of aerosols, *Ceram. Int.* 18, 99-106.
- [46] Zhao D., Chen C., Wang Y., Ji H., Ma W., Zang L., Zhao J., (2008) Surface Modification of TiO<sub>2</sub> by Phosphate: Effect on Photocatalytic Activity and Mechanism Implication, *J. Phys. Chem, C* 112 (2008) 5993-6001.
- [47] Sivakumar S., Krishna P., Mukundan P., Warriar K.G.K., (2002) Sol-gel synthesis of nanosized anatase from titanyl sulfate, *Mater. Lett.*, 57 330-335.
- [48] Zhu J., Yang J., Bian Z.-F., Ren J., Liu Y.-M., Cao Y., Li H.-X., He H.-Y., Fan K.-N., (2007) Nanocrystalline anatase TiO<sub>2</sub> photocatalysts prepared via a facile low temperature nonhydrolytic sol-gel reaction of TiCl<sub>4</sub> and benzyl alcohol, *Appl. Catal. B*, 76, 82-91.

[25]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

[49] Li Z., Hou B., Xu Y., Wu D., Sun Y., (2005) Hydrothermal synthesis, characterization, and photocatalytic performance of silica-modified titanium dioxide nanoparticles, *J. Colloid. Interface. Sci.* 288, 149-154.

[50] Wang Z., Mao L., Lin J., (2006) Preparation of TiO<sub>2</sub> nanocrystallites by hydrolyzing with gaseous water and their photocatalytic activity, *J. Photochem. Photobiol. A: Chem.* 177, 261-268.

[51] Kim D.S., Han S.J., Kwak S.Y., (2007) Synthesis and photocatalytic activity of mesoporous TiO<sub>2</sub> with the surface area, crystallite size, and pore size, *J. Colloid. Interface. Sci.* 316, 85-91.

[52] Anpo M., Shima T., Kodama S., Kubokawa Y., (1987) Photocatalytic hydrogenation of propyne with water on small-particle titania: size quantization effects and reaction intermediates, *J. Phys. Chem.* 91, 4305-4310.

[53] Chang C., Xu J., Jiang L., Mao D., Ying W., (2006) Luminescence of long-lasting CaAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>,Nd<sup>3+</sup> phosphor by co-precipitation method, *Mater. Chem. Phys.* 98, 509-513.

**Table 1**

Average crystallite sizes (nm) derived from anatase peak (1 0 1) of phosphor supported TiO<sub>2</sub> calcined at 400 °C using XRD.

Material	Average crystalline size in nm		
	a	b	c
Phosphor Supported TiO <sub>2</sub>			
PST1	14.28	16.46	16.91
PST2	19.07	21.76	19.54
PST3	16.13	17.46	17.34

The average crystallite size of materials was determined by XRD using Scherrer equation.

PST - Phosphor supported TiO<sub>2</sub>.

1, 2 and 3 - Molar ratio of TiO<sub>2</sub>: phosphor 1:1, 1:2 and 1:3, respectively.

a, b and c – TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

**Table 2**

The two-theta (2θ) values of selected peaks for free and phosphor supported TiO<sub>2</sub> using XRD.

Peak	Two-theta (2θ) values for									
	Free TiO <sub>2</sub>	PST1			PST2			PST3		
		a	b	c	a	b	c	a	b	c
(1 0 1)	25.319	25.300	25.340	25.300	25.340	25.320	25.340	25.380	25.379	25.241
(0 0 4)	37.880	37.740	37.999	37.798	37.726	37.879	37.899	37.821	37.682	37.670
(2 0 0)	48.061	48.040	48.160	48.099	48.120	48.060	48.000	47.937	48.080	47.881

PST - Phosphor supported TiO<sub>2</sub>.

[26]



*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

1, 2 and 3 - Molar ratio of TiO<sub>2</sub>: phosphor 1:1, 1:2 and 1:3, respectively.  
a, b and c – TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

**Table 3**

DRS UV-visible absorption maxima (in nm) for free TiO<sub>2</sub> and phosphor supported TiO<sub>2</sub> nanoparticles from.

Material	Absorption band in nm	Band-gap energy in eV
TiO <sub>2</sub>	396	3.13
PST1-a	397	3.12
PST1-b	397	3.12
PST1-c	402	3.09
PST2-a	397	3.12
PST2-b	400	3.10
PST2-c	405	3.06
PST3-a	408	3.04
PST3-b	412	3.01
PST3-c	420	2.95

PST - Phosphor supported TiO<sub>2</sub>.

1, 2 and 3 - Molar ratio of TiO<sub>2</sub>: phosphor 1:1, 1:2 and 1:3, respectively.

a, b and c – TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

Band-gap energy is calculated using equation,  $E_{bg}$  (in eV) =  $1240/\lambda$  (in nm)

**Figure captions**

**Fig. 1** XRD patterns of phosphor supported TiO<sub>2</sub> (a) PST1, (b) PST2 and (c) PST3 at 400 °C.

**Fig. 2** XRD patterns of (a) TiO<sub>2</sub> and (b) phosphor supported TiO<sub>2</sub> at different temperatures.

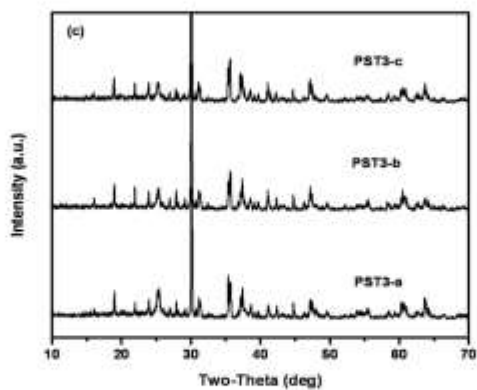
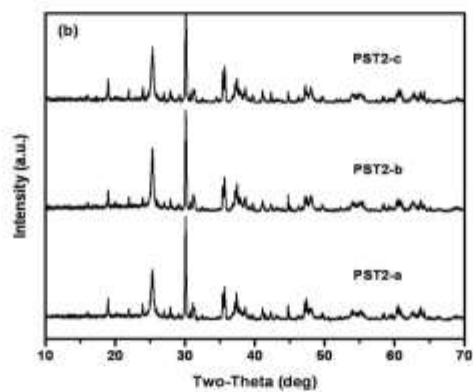
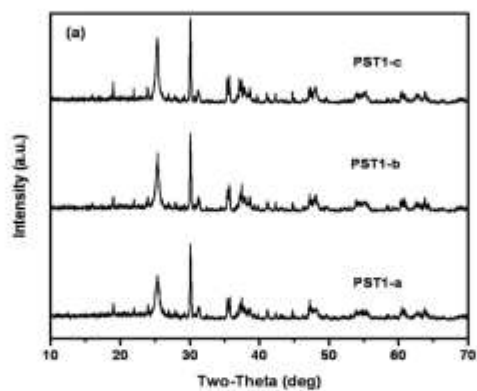
**Fig. 3** FT-IR spectra of phosphor, free TiO<sub>2</sub> and phosphor supported TiO<sub>2</sub> (PST2-c) catalysts. Inset showing enlarged view in the range from 200 to 800 cm<sup>-1</sup>.

**Fig. 4** UV-Visible diffuse reflectance spectra for free and phosphor supported TiO<sub>2</sub> catalysts: (a) PST1, (b) PST2 and (c) PST3.

**Fig. 5** (a) TEM image of PST1-a and (b) HRTEM image of PST3-a with an inset of corresponding SAED pattern.

**Fig. 6** SEM images of phosphor supported TiO<sub>2</sub> (a) PST2-b and (b) PST2-c

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*



[28]

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

Fig. 1.

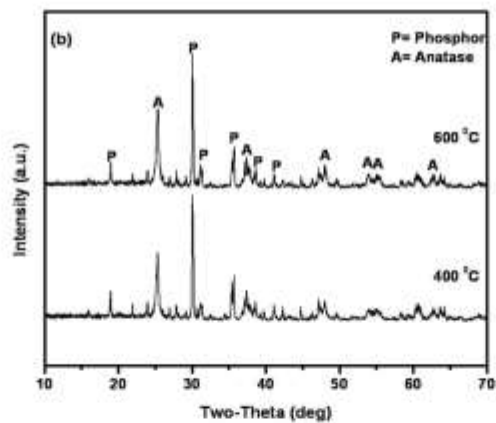
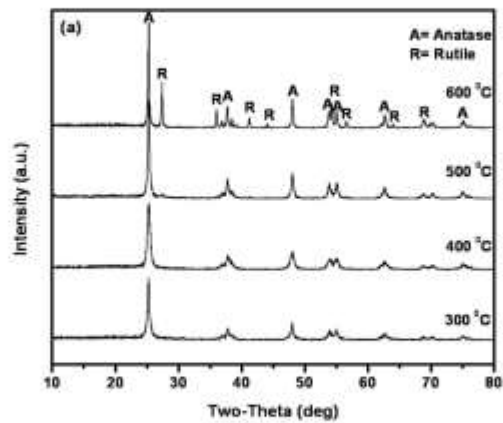


Fig. 2.

[29]

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

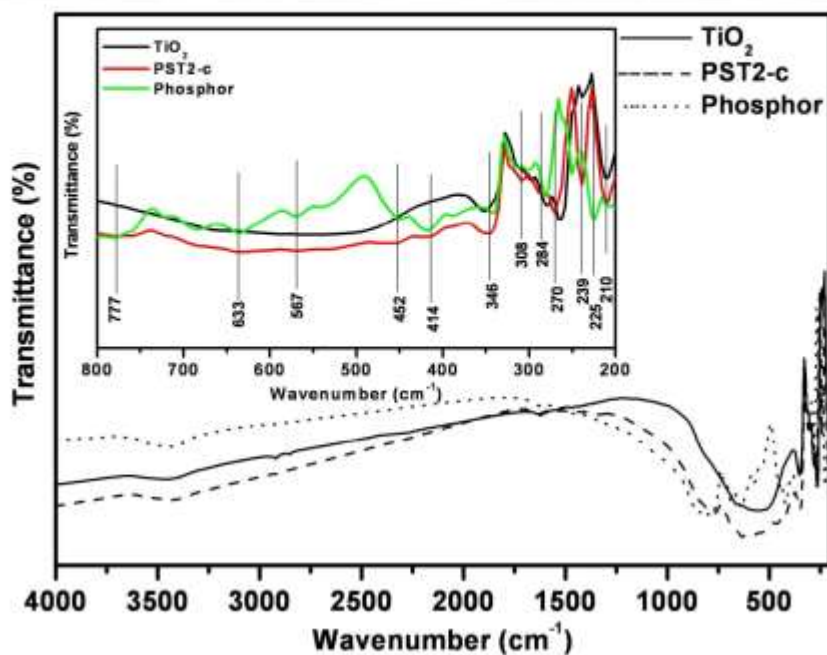
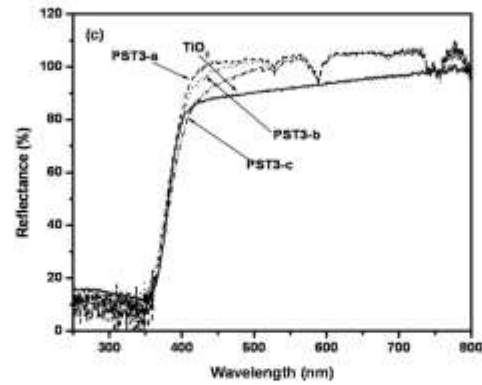
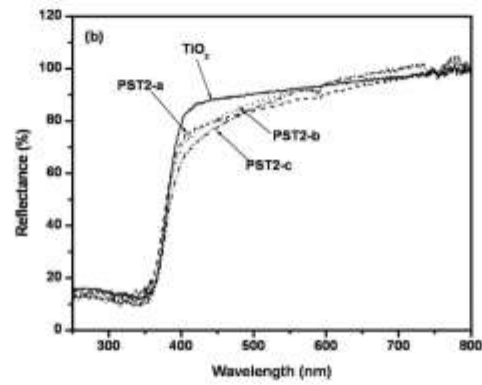
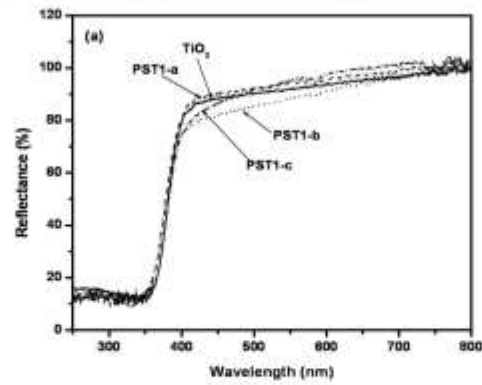


Fig. 3.

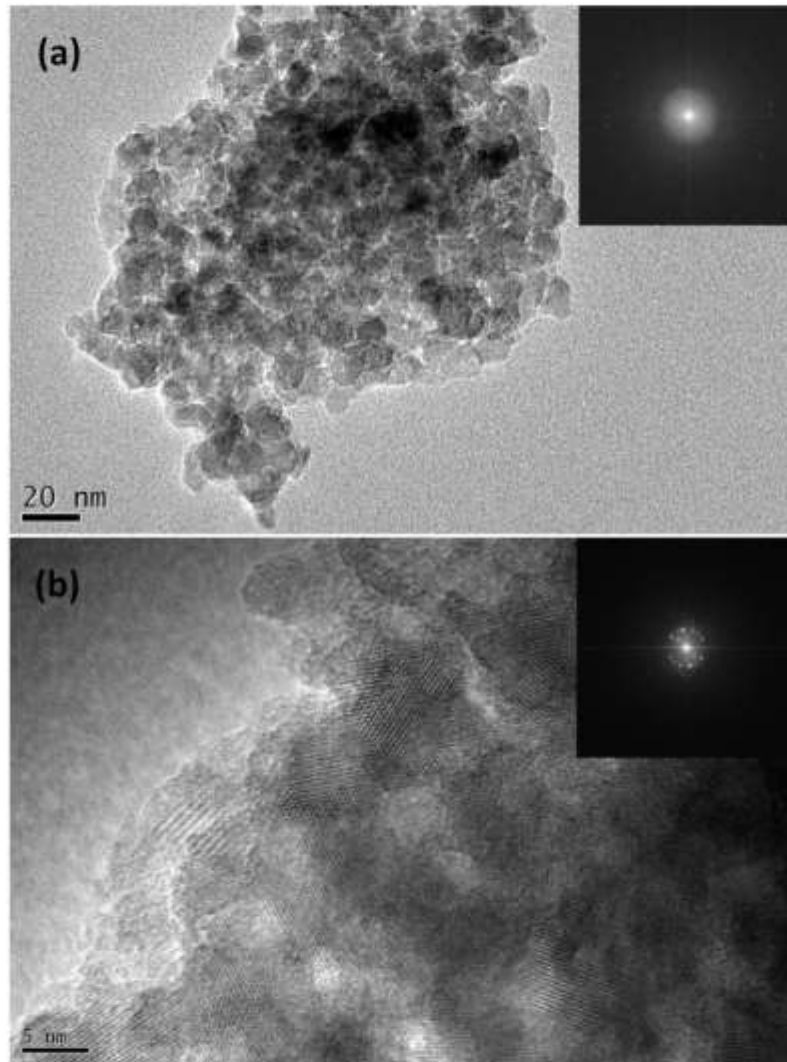
[30]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*



[31]

Fig. 4.



[32]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

Fig. 5.

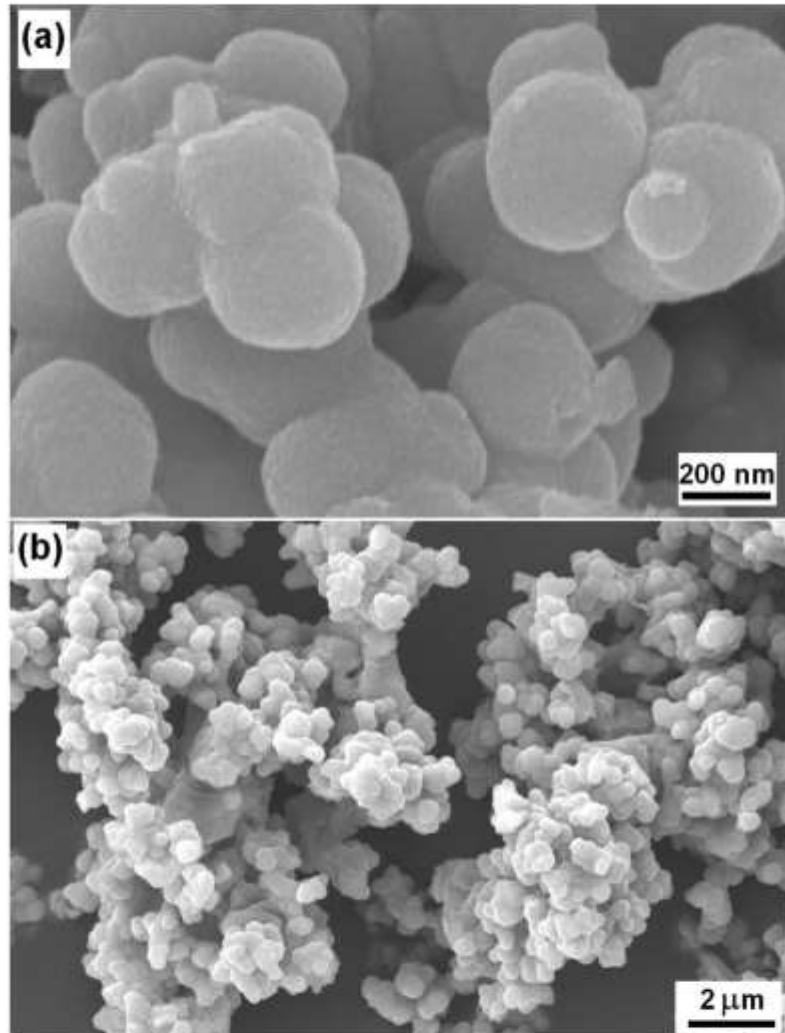


Fig. 6.

[33]

### 35. Synthesis of Chalcones Containing Quinoxalines acts as Synthons for Range of Heterocycles



Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

#### SYNTHESIS OF CHALCONES CONTAINING QUINOXALINE ACTS AS SYNTHONS FOR RANGE OF HETEROCYCLES.

**Sagar R. Shrimandilkar**

Post Graduate Department of Chemistry and Research Centre, New Arts, Commerce and Science College,  
Parner, District-Ahmednagar, 414103, India

**Dilip R. Thube**

Post Graduate Department of Chemistry and Research Centre, New Arts, Commerce and Science College,  
Parner, District-Ahmednagar, 414103, India

**Abstract:** Quinoxaline derivatives are found to highly effective as anti-inflammatory, antibiotics, cardiovascular agents and anti-cancer agents. A series of new chalcones containing Quinoxaline were synthesized by condensation. 1-(3-methylquinoxalin-2-yl)ethanone (c) and substituted benzaldehyde on Claisen-Schmidt condensation gave corresponding chalcones e(1-9) in excellent yield. In present report synthesis of chalcones by simple and convenient method is achieved. These reactions were monitored by TLC and compounds were characterized by <sup>1</sup>H-NMR spectroscopy. These synthesized chalcones e(1-9) will contribute as an important precursor for synthesis of different heterocyclic compounds by cyclization reactions.

**Keywords:** Chalcones, NBS, Quinoxaline.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Sagar R. Shrimandilkar

#### 1. Introduction :

Quinoxaline derivatives have been reported as biologically active compounds. They are possessing anti-inflammatory[1-2], antibiotics[2], cardiovascular agents[3] and anti-cancer[4-7] activities. Chalcones are active intermediates for synthesis of various biologically active heterocyclic compounds like pyrimidine, cyanopyridine, isoxazol. Chalcones are the biogenetic precursors of flavonoids and isoflavonoids, which are abundant in plants[8]. Chemically, Chalcone type molecules have scaffold of 1,3-diaryl-2-propen-1-one, and they are  $\alpha$ - $\beta$  unsaturated carbonyl compounds(Figure-1). Chalcones are active lead molecules in medicinal chemistry for the discovery of new drugs. They act as synthons by which a range of analogs and novel heterocycles with pharmaceutical structures can be targeted. Yuh-Heei et al. (2002) synthesized different series of chalcone derivatives[9], which are having 90% inhibitory activity against Mycobacterium tuberculosis. Synthesis of Quinoxaline derivatives by one pot method of synthesis from inexpensive 1,3 diketone and 1,2 diamine in

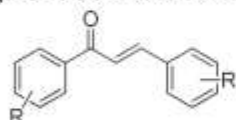
[97]



presence of solvent-water[10]. The synthesis of compound (c) is depicted by scheme-1 and the syntheses of chalcones containing Quinoxaline e (1-9) are depicted by scheme-2. Generally, use of ultra-sonication method[11-12], microwave conditions[13], alkali in ethanol and other synthetic strategies[14] have been reported for synthesis of chalcones. Duha Adan et al. 2020 synthesized chalcones by simple and solvent free procedure [15].

From the previous study of chalcones, we are interested to synthesize a new series of 1-(3-methylquinoxalin-2-yl)-3-phenylprop-2-en-1-one derivatives as a precursors for wide range of biologically active heterocyclic compounds.

**Figure-1: General Structure of Chalcone**



## 2. Material And Methods

Melting points of product (a) and e (1-9) were determined in open capillary tube method and were uncorrected. All reactions were monitored by Thin Layer Chromatography on silica gel coated on aluminium sheet and compound spots were identify by exposure to UV lamp. Products e(1-9) were purified by column chromatography using ethyl acetate and petroleum ether. <sup>1</sup>H-NMR of products e-2 and e-4 were recorded on Bruker Advance Neo 500 MHz NMR spectrometer.

### Synthesis of 1-(3-methylquinoxalin-2-yl)ethanone(a) [10]

2,4-pentandione (a) (1mmol), 30 ml water and NBS (1.5 mmol) were taken in a round bottom flask and stirred continuously for 20 to 30 minutes at 70° C. After 30 minutes 3-bromo-2, 4-pentadione (b) was formed. To the above mixture same after 30 minutes, 1,2- phenylenediamine (1.0 mmol) was added and stirred until completion of the reaction as indicated by TLC. The reaction mixture was extracted with ethyl acetate (20-30 mL). The organic layers were washed with water, saturated brine solution and dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>. The combined organic layers were evaporated under reduced pressure and the resulting crude product was purified by column chromatography.

### General procedure for synthesis of compounds e (1-9)

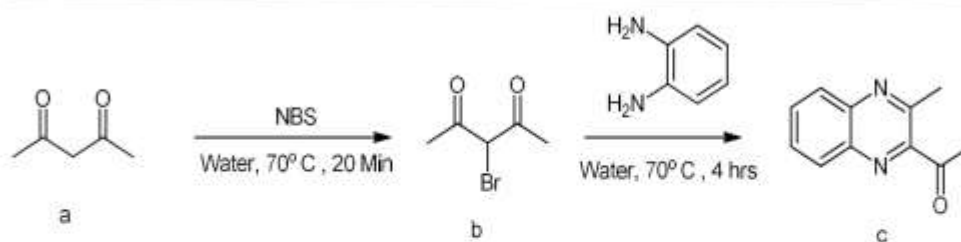
1-(3-methylquinoxalin-2-yl)ethanone(c) (1 mmol) was dissolved in 10 ml ethanol, in the above solution substituted benzaldehyde (d) (1 mmol) and 1 mole NaOH were added and stirred continuously for 2 to 5 min, at room temperature. Reaction of reaction is identified by TLC. After 5 minutes product chalcone (e 1-9) was filter and purified by column chromatography. Product was characterized by <sup>1</sup>H-NMR spectroscopy

3-(4-chlorophenyl)-1-(3-methylquinoxalin-2-yl)prop-2-en-1-one(e2): Yield 85 % ; mp 190°C ; color: white ; <sup>1</sup>H NMR ( CDCl<sub>3</sub>, 500 MHz) δ, ppm: 3.00 (s, 3H, CH<sub>3</sub>), 8.17 (dd, 1H, CH), 8.07 (dd, 1H, CH), 8.04 (d, 1H, CH), 7.75 to 7.85 (m, 3H, CH), 7.63 (d, 2H, CH), 7.40 (dd, 7.40, 2H).

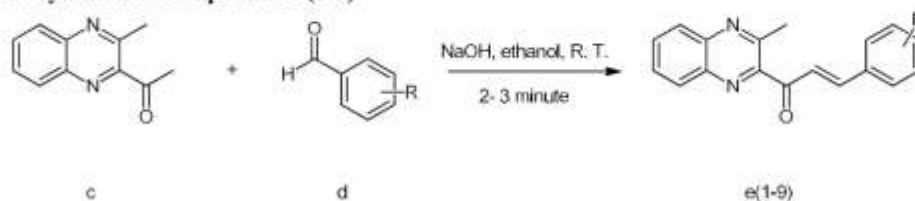
3-(4-fluorophenyl)-1-(3-methylquinoxalin-2-yl)prop-2-en-1-one(e4): Yield 88 % ; mp 174°C ; color: white ; <sup>1</sup>H NMR ( CDCl<sub>3</sub>, 500 MHz) δ, ppm: 3.0 (s, 3H, CH<sub>3</sub>), 7.1 (t, 2H, CH), 7.7 (t, 2H, CH), 7.78(d, 1H, CH), 8.0 (d, 1H, CH), 8.18 (d, 1H, CH), 7.76 to 7.84 (m, 3H, CH).

### Scheme-1: Synthesis of 1-(3-methylquinoxalin-2-yl)ethanone (c)

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)



## 2: Synthesis of compounds e (1-9)



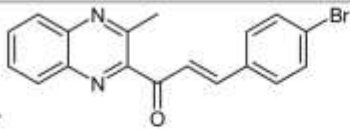
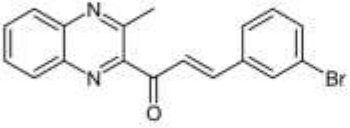
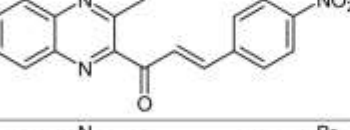
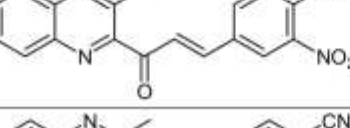
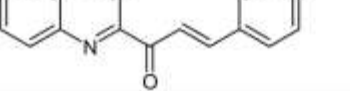
## 3. Result and Discussion:

**Table-1: Synthesis of chalcones containing quinaxaline e (1-9)**

Entry	Product (e)	Yield in %	M. P. (in °C)
1		84	154
2		85	190
3		79	183
4		88	174

[99]

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

5		87	176
6		81	165
7		90	162
8		86	156
9		88	194

In synthesis of 1-(3-methylquinoxalin-2-yl)ethanone[10], 3-bromo-2,4-pentandione(b) was prepared from 2,4-pentandione(a) and NBS in water at 70°C but this product was not isolated, in that same flask containing 3-bromo-2,4-pentandione(b), Diphenylamine was added and reaction mixture was heated at 70°C for 4 hrs. Finally, 1-(3-methylquinoxalin-2-yl)ethanone(c) was isolated by extraction in ethyl acetate and was purified by Column chromatography.

Initially reaction of synthesis of product e-1 was attempted with 1-(3-methylquinoxalin-2-yl)ethanone (c) and Benzaldehyde in presence of NaOH and good yield i.e. 84 % was obtained within 3 minute at room temperature. This reaction is Claisen-Schmidt condensation reaction. On the basis of preliminary result and reaction condition; we synthesized the chalcones f (1-9) from compound (c) and substituted benzaldehyde (d) with good yield mentioned in **Table-1**.

#### 4. Conclusion

Chalcones are adaptable scaffolds for synthesis of heterocycles and show broad range of pharmacological properties. The novel chalcones were synthesized by using Quinoxaline methyl ketone and different substituted benzaldehyde. In the present work a simple and convenient method was used for synthesis of new chalcones and these products (e) were confirmed by <sup>1</sup>H-NMR spectroscopy. Although, we have

[100]

synthesized chalcones by simple method but we get products with short time i.e. within 5 minutes at room temperature.

#### 5. Acknowledgement

Authors are thankful to New Arts, Commerce and Science College, Parner for providing laboratory facility and also thankful to SAIF Centre, Punjab University Punjab, India for providing NMR facility.

#### 6. References

- [1] He, W., Myers, M. R., Hanney, B., Spada, A. P., Bilder, G., Galzcinski, H., Amin, D., Needle, S., Page, K., Jayyosi, Z., & Perrone, M. H. (2003). Potent quinoxaline-based inhibitors of PDGF receptor tyrosine kinase activity. Part 2: The synthesis and biological activities of RPR127963 an orally bioavailable inhibitor. *Bioorganic and Medicinal Chemistry Letters*, 13(18), 3097–3100. [https://doi.org/10.1016/S0960-894X\(03\)00655-3](https://doi.org/10.1016/S0960-894X(03)00655-3)
- [2] Kim, Y. B., Kim, Y. H., Park, J. Y., & Kim, S. K. (2004). Synthesis and biological activity of new quinoxaline antibiotics of echinomycin analogues. *Bioorganic and Medicinal Chemistry Letters*, 14(2), 541–544. <https://doi.org/10.1016/j.bmcl.2003.09.086>
- [3] Mahapatra, D. K., & Bharti, S. K. (2016). Therapeutic potential of chalcones as cardiovascular agents. *Life Sciences*, 148, 154–172. <https://doi.org/10.1016/j.lfs.2016.02.048>
- [4] Lindsley, C. W., Zhao, Z., Leister, W. H., Robinson, R. G., Barnett, S. F., Defeo-Jones, D., Jones, R. E., Hartman, G. D., Huff, J. R., Huber, H. E., & Duggan, M. E. (2005). Allosteric Akt (PKB) inhibitors: Discovery and SAR of isozyme selective inhibitors. *Bioorganic and Medicinal Chemistry Letters*, 15(3), 761–764. <https://doi.org/10.1016/j.bmcl.2004.11.011>
- [5] Mahapatra, D. K., Bharti, S. K., & Asati, V. (2015). Anti-cancer chalcones: Structural and molecular target perspectives. *European Journal of Medicinal Chemistry*, 98, 69–114. <https://doi.org/10.1016/j.ejmech.2015.05.004>
- [6] Singh, P., Anand, A., & Kumar, V. (2014). Recent developments in biological activities of chalcones: A mini review. *European Journal of Medicinal Chemistry*, 85, 758–777. <https://doi.org/10.1016/j.ejmech.2014.08.033>
- [7] Ugwu, D. I., Ezema, B. E., Okoro, U. C., Eze, F. U., Ekoh, O. C., Egbujor, M. C., & Ugwuja, D. I. (2015). Synthesis and Pharmacological Applications of Chalcones- a Review. *Int. J. Chem. Sci*, 13(1), 459–500.
- [8] Rozmer, Z., & Perjési, P. (2016). Naturally occurring chalcones and their biological activities. *Phytochemistry Reviews*, 15(1), 87–120. <https://doi.org/10.1007/s11101-014-9387-8>
- [9] Lin, Y. M., Zhou, Y., Flavin, M. T., Zhou, L. M., Nie, W., & Chen, F. C. (2002). Chalcones and flavonoids as anti-tuberculosis agents. *Bioorganic and Medicinal Chemistry*, 10(8), 2795–2802. [https://doi.org/10.1016/S0968-0896\(02\)00094-9](https://doi.org/10.1016/S0968-0896(02)00094-9)
- [10] Anil Kumar, B. S. P., Madhav, B., Harsha Vardhan Reddy, K., & Nageswar, Y. V.D. (2011). Quinoxaline synthesis in novel tandem one-pot protocol. *Tetrahedron Letters*, 52(22), 2862–2865. <https://doi.org/10.1016/j.tetlet.2011.03.110>

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

- [11] Calvino, V., Picallo, M., López-Peinado, A. J., Martín-Aranda, R. M., & Durán-Valle, C. J. (2006). Ultrasound accelerated Claisen-Schmidt condensation: A green route to chalcones. *Applied Surface Science*, 252(17), 6071–6074. <https://doi.org/10.1016/j.apsusc.2005.11.006>
- [12] Jin, H., Xiang, L., Wen, F., Tao, K., Liu, Q., & Hou, T. (2008). Improved synthesis of chalconoid-like compounds under ultrasound irradiation. *Ultrasonics Sonochemistry*, 15(5), 681–683. <https://doi.org/10.1016/j.ultsonch.2008.01.006>
- [13] Zhou, J. (2010). Synthetic Communications : An International Journal for Rapid Communication of Synthetic Organic Chemistry Facile Method for One-Step Synthesis of. *Synthetic Communications*, April 2013, 37–41.
- [14] Farooq, S., & Ngaini, Z. (2019). Recent Synthetic Methodologies for Chalcone Synthesis (2013-2018). *Current Organocatalysis*, 6(3), 184–192. <https://doi.org/10.2174/2213337206666190306155140>
- [15] Adnan, D., Singh, B., Mehta, S. K., Kumar, V., & Kataria, R. (2020). Simple and solvent free practical procedure for chalcones: An expeditious, mild and greener approach. *Current Research in Green and Sustainable Chemistry*, 3(September), 100041. <https://doi.org/10.1016/j.crgsc.2020.100041>

[102]

### 36. Synthesis and Characterization of Y<sub>2</sub>O<sub>3</sub> Powders by Homogenous Co-precipitation Method



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

#### SYNTHESIS AND CHARACTERIZATION OF Y<sub>2</sub>O<sub>3</sub> POWDERS BY HOMOGENOUS CO-PRECIPIATION METHOD

**Sanjay R. Kale**

Department of Chemistry, Tuljaram Chaturchand College, Baramati, Dist. Pune,  
Maharashtra (INDIA), [kalesanjay29@gmail.com](mailto:kalesanjay29@gmail.com)

**Dilip R. Thube**

Department of Chemistry and Research Center, New Arts, Commerce and Science  
College, Parner, Dist. Ahmednagar, Maharashtra (INDIA)

#### Abstract:

In the present study, Y<sub>2</sub>O<sub>3</sub> powders were prepared by homogenous co-precipitation method (HCP), which is simple, eco-friendly and does not require much sophisticated instrumentation. It involves dissolution of Yttrium (III) nitrate hexahydrate, [Y(NO<sub>3</sub>)<sub>3</sub>.6H<sub>2</sub>O], in aqueous medium, followed by precipitation, using precipitating reagent, Oxalic acid dihydrate, (C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>.2H<sub>2</sub>O), in presence of CATB (Cetyl Trimethyl Ammonium Bromide), as a capping agent. Apart from the simplicity of this technique, the atomic rearrangements of constituents yield the final product of nearly perfect stoichiometry by adjusting the reaction conditions like concentrations of precursor solutions, temperature, precipitation rate, pH of medium and rate of calcination. The characterization of synthesized Y<sub>2</sub>O<sub>3</sub> powders were studied by XRD, FE-SEM, EDX, FTIR, UV-Visible spectroscopy, and TGA techniques. The XRD analysis indicate formation of the Y<sub>2</sub>O<sub>3</sub> cubic structure with average crystalline size upon calcination was ~50 nm. The FE-SEM studies confirms the spherical morphology while EDX gave acceptable elemental compositions. The FTIR, UV-Visible spectroscopic analysis confirms the purity and bonding characteristics and TGA gave information about thermal stability of thus synthesized powder. This report confirms the utilization of Y<sub>2</sub>O<sub>3</sub>, an attractive choice as a host material, for preparation RE doped / co-doped nanophosphors.

**Key words:** homogenous co-precipitation method, nanopowders, Yttrium oxide, (Y<sub>2</sub>O<sub>3</sub>),

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Sanjay R. Kale

#### 1. Introduction

In last few decades, nanosized inner transition metal oxides, with variety of morphologies have been attracted a great deal of attention of scientific community due to their efficient and superior physico-chemical properties required in the wide range of applications in optical devices, display technologies and biomedical field. In

[50]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

particular, the metal oxide phosphor has good luminescent characteristics, acceptable atmospheric stability, and low degradation property under applied voltages. Inorganic nanoparticles clearly show unique size and shape (surface to volume ratio) dependent properties and the quantum confinement effect, which depends on their crystallinity, defect contents, and synthesis techniques. Recently many studies have focused on controlling the size and morphology of Yttrium oxide, ( $Y_2O_3$ ) in order to obtain better optical performance of material. The development of novel luminescent phosphor material with controllable size, required shape and morphology has been a major focus in the field of photonics and optoelectronics.<sup>1</sup> Phosphor nano-crystallites are exceptionally promising materials in many fields of technology including luminescent displays, fluorescent lamps, lasers, cathodoluminescence and biotechnology.<sup>2</sup> The emission wavelength of rare-earth doped nanoparticles is independent of the particle size and depends only on the dopant type, leading to lower the cost of synthesis. They also offer higher chemical stability as well as excellent quantum yield. Different methods have been developed and used to fabricate core and core-shell nanocrystalline phosphors, such as molten salt method,<sup>3</sup> flame spray pyrolysis,<sup>4</sup> co-precipitation method,<sup>5</sup> liquid-phase method,<sup>6</sup> sol-gel method,<sup>7</sup> and solvothermal method,<sup>7</sup> Transient morphology method,<sup>8</sup> Modified Transient method,<sup>9</sup> Among these methods the homogenous co-precipitation method was well recognized green route for high yield production of spherical ceramic submicron particles with controllable sizes. Also the spherical-shaped particles can improve the optical performance due to the higher packing density and reduction of light scattering.<sup>10</sup>

Out of different sesquioxides, the  $Y_2O_3$  has been attracted widely as the host material for rare earth ion doping because of its thermomechanical properties, broad optical transparency range (0.2 to 8  $\mu m$ ), with a band gap of 5.6 eV, less annealing temperature (800°C), low maximum photon energy (380  $cm^{-1}$ ), high refractive index (~1.87) and thermodynamically stable crystal structures. Also the  $Y_2O_3$  is having some interesting physical properties, such as its crystallographic stability up to 2325°C (melting point of  $Y_2O_3$  is 2325°C), high mechanical strength, high thermal conductivity (0.13  $Wcm^{-1} K^{-1}$ ), high dielectric constant and very good protective behavior as a coating.<sup>11</sup> It has been considered as an alternative for  $SiO_2$  for dielectric films in electronic devices because of high dielectric strength ( $k = 18$ ) and low leakage current.<sup>12</sup>  $Y_2O_3$  can be used for coating the crucibles and moulds required to handle the highly reactive molten metals such as uranium, chromium, beryllium and their alloys. It also claimed to be stable with graphite up to 1600 °C.<sup>13</sup> Due to this it has been investigated widely useful as a host material for rare-earth (RE) ion doping in optical applications.<sup>4,5,7,9</sup> Furthermore, the similarities in the chemical properties, crystal structure, ionic radius and lattice constant with RE ions, the  $Y_2O_3$  make it an attractive choice as a host material<sup>10,14</sup> in the process of preparation of phosphor materials.

Nowadays, homogenous co-precipitation is most popular and well-established technique for well-controlled production of phosphor materials with high reaction rate. Having the advantages of lower sintering temperature, high production rate and lesser cost for instrumentation, this method is widely used to synthesize metal oxides at larger scale. For the preparation of nanophosphor powder by co-precipitation protocol, soluble metal salts (e.g. nitrates, sulphates, chlorides) are dissolved in aqueous medium to form a homogenous solution<sup>15</sup>. A suitable precipitating reagent is added into precursor solution in order to get the precipitate of metal cations as carbonates, oxalates, hydroxides etc.<sup>16</sup> After precipitation, the obtained solid product is filtered and washed with distilled water: and then dried by heating process<sup>17</sup>. Finally, to transform hydroxides into nanocrystalline oxide powder, a

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

further heat treatment is necessary, which is generally achieved by calcination process<sup>18</sup>. At higher temperature, the process leads to the formation of homogenous final product with narrow size distribution. This synthesis route is highly sensitive to reaction conditions such as initial concentration of precursors, solubility of different precursors, temperature of reaction, pH of solution and rate of precipitation.

In the present study, the homogenous co-precipitation method for synthesis was undertaken for the preparation of pure  $Y_2O_3$  submicron particles. The synthesized metal oxides are annealed to the temperature ranging from 400 °C to 800 °C in order to develop crystalline phases. The particle structure, morphology and its characterizations were investigated by various tools like, X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), and energy dispersive X-ray (EDX) spectroscopy. The studies on spectral properties was carried out using Fourier Transform Infrared spectroscopy (FTIR) while thermo-gravimetric analysis (TGA) was undertaken to determine its thermal stability.

## **2. Materials and Experimental Methodology**

This part of study covers various raw materials and synthesis route used for phosphor development in nano-regime. Further, the powder characterization techniques utilized for structural, morphological and optical investigation of synthesized nanophosphors are described in detail.

### **2.1 Raw Materials:**

Various characteristics features such as, chemical and structural composition, phase purity, crystallinity and dimension of nano-crystalline host material are the major factors responsible and accountable for phosphor's performance in various fields of applications. These features are directly related to the nature of precursors, presence of capping agent and the precipitant used for synthesis process. The luminescent output of synthesized nanomaterial is greatly affected by the presence of impurities in raw materials. Hence, the selection of chemically pure raw materials is an initial and essential factor to achieve the development of host nanomaterial.

In the present work, all the chemicals were purchased from Sigma-Aldrich (purity  $\geq 99\%$ ) and Alfa-Aesar (99.9%). The various chemicals utilized in this presented work are listed in Table 1.

### **2.2 Synthesis Method:**

In the present study the synthesis of  $Y_2O_3$  nanocrystalline material was carried out by homogenous co-precipitation method (HCP). It is simple, low cost, eco-friendly method, avoids use of organic solvents and requires heat treatments only at the latter parts of the synthesis. Therefore, this method can be adopted for large scale preparations. The flow chart representing stepwise synthesis of  $Y_2O_3$  by HCP is shown in figure 1.

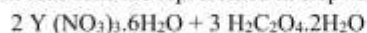
The nanocrystalline  $Y_2O_3$  was prepared by homogenous co-precipitation method (HCP) in aqueous medium offers comparatively low temperature route, higher crystal controllability. The starting material,  $[Y(NO_3)_3 \cdot 6H_2O]$ , Yttrium(III) nitrate hexahydrate, (99.9%),  $(H_2C_2O_4 \cdot 2H_2O)$ , Oxalic acid (AR grade) used as precipitant and CTAB (Cetyl Trimethyl Ammonium Bromide) as a capping agent/surfactant were purchased from Sigma-Aldrich. The aqueous solution of metal nitrate precursor  $[Y(NO_3)_3 \cdot 6H_2O]$  was prepared in 25 ml DI water. Thus, prepared solution was kept on magnetic stirrer for one hour at 40°C. Afterwards, the aqueous solution of oxalic acid (precipitant) was added drop wise (4 drops per minute) in above prepared aqueous solution of metal nitrate precursor in presence of 1-2 ml CTAB (capping agent) for 2 hours, with constant stirring on magnetic stirrer keeping temperature at about 40°C and pH about 6.5 to 7.0. After complete addition of oxalic acid, thus formed precipitate was removed by filtration, dried in an oven at about 100°C for 12 hours. After step



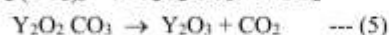
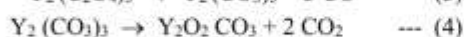
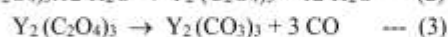
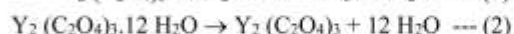
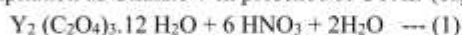
*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

wise sintering and calcinations at about 600°C - 800°C, for 4 hours respectively, a white powdered nanocrystalline material was obtained. For synthesis of Y<sub>2</sub>O<sub>3</sub> material, CTAB is used as capping agent / surfactant which can control the particle size, avoids agglomeration effectively by forming reverse micelle. It reduces the oxygen bridge bonds between the particles.

The chemical reactions are represented in stepwise manner as follows:



Precipitation as Oxalate ↓ In presence of CTAB (capping agent)



Here, step (1) is indicate formation of metal oxalate, step (2) is gives confirmation of removal of water molecules during heating at about 100°C, while steps (3) to (5), deals with decomposition of metal oxalate into metal carbonate and then to metal oxide by stepwise removal of carbon monoxide and carbon dioxide during heating upto 800°C. The confirmed formation of metal oxide can be ensured by heating the sample at 800°C for four hours in a muffle furnace. Thus formed pure Y<sub>2</sub>O<sub>3</sub> can be used as the host material for preparation of doped nanophosphor, after studding its structural, morphological, spectral and optical properties by various characterization techniques.

### 2.3 Characterization Techniques:

The characteristic investigation of thus synthesized Y<sub>2</sub>O<sub>3</sub> nanomaterial was done with the help of various instrumental techniques such as XRD, FE-SEM, EDX, FTIR, and TGA.

The XRD data sets were recorded at room temperature on the X-ray Diffractometer (powder method) Pananalyticals XPert Pro system using CuKα<sub>1</sub> (1.540 Å) radiation. The powder diffraction covered the 10° < 2θ > 80° range with minimum step size; 2θ = 0.0170.

The FESEM images were obtained using Scanning Electron Microscope model JSM 6100 (Joel) with image analyzer at various magnifications to study the surface morphology of Y<sub>2</sub>O<sub>3</sub> NPs.

The detail elemental composition was obtained by EDX using elemental analyzer for CHN (Thermo Scientific).

The FTIR spectra were obtained using Shimadzu IR-Affinity (Diamond ATR) FTIR spectrophotometer in the diffuse reflection mode. The studies on thermal stability of synthesized product by TGA unit in nitrogen atmosphere.

## 3. Results and Discussion

### 3.1. Determination of crystalline nature of Y<sub>2</sub>O<sub>3</sub> nanoparticles by XRD Analysis:

The XRD pattern of Y<sub>2</sub>O<sub>3</sub> powder as shown in Fig.2 In this diffractogram, no extra diffraction peaks corresponding to Y, Y(OH)<sub>3</sub> or other Y<sub>2</sub>O<sub>3</sub> phases are detected, it indicates the presence of pure Y<sub>2</sub>O<sub>3</sub> nanoparticles of cubic phase with crystalline nature. The peak intensity is sharp and narrow, confirming that the sample is highly pure with good crystallinity and fine grain size. This result is exactly matches with standard diffraction data of

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

cubic phase  $Y_2O_3$  as per the Joint Committee on Powder Diffraction Standards (JCPDS) Card No. 41-1105 and this can be used as the reference. The XRD patterns show that the intensities of five basic peaks of the (211), (222), (400), (441), and (622) planes are more than that of other peaks. The observed intense peaks refer the excellent growth of crystal size and assembly of larger clusters. The crystalline size (D) was estimated from the full width at half maximum (FWHM) of the strongest diffraction peak using the Debye-Scherrer formula<sup>19,20</sup>,

$$D = \frac{K\lambda}{\beta \cos \theta}$$

where, K is shape factor (K= 0.94),  $\lambda$  is the wavelength of the incident X-ray ( $\lambda=1.544\text{\AA}$ ),  $\theta$  is the corresponding Bragg's diffraction angle ( $2\theta = 29.1828^\circ$ ,  $\theta = 14.5914^\circ$ ) and  $\beta$  is the FWHM of the (222) peak (FWHM= 0.4499).

The calculated crystalline size is 38.60 nm while the average crystalline size is 36.08 nm.

Table 2 shows the XRD parameters and mean crystalline size of  $Y_2O_3$  NPs in different crystalline orientations. The significance of broadening of peaks evidences grain refinement along with the extra strain associated with the powder. The presence of impurities in crystal, changes the lattice energy and responsible to cause the excess strain in the lattice structure. The strain induced in the matrix powder due to crystal imperfection and distortion was calculated using Williamson-Hall equation<sup>21</sup>

$$\beta \cos \theta = \frac{k\lambda}{D} + 4 \varepsilon \sin \theta$$

Where  $\varepsilon$  is the strain and D is the mean size of the crystallite. The W-H plot is drawn with  $4 \sin \theta$  along the x-axis and  $\beta \cos \theta$  along the y-axis for as-prepared  $Y_2O_3$  NPs. From the linear fit to the data, the crystalline size was estimated from the y-intercept, and the strain, from the slope of the fit. The Williamson-Hall equation represents uniform deformation model (UDM), where the strain was assumed to be uniform in all crystallographic directions, thus considering the isotropic nature of the crystal, where the material properties are independent of the direction along which they are measured. The uniform deformation model for  $Y_2O_3$  NPs in the form of W-H plot is shown in fig. 3.

Thus, the strain is  $8.0 \times 10^{-4}$ , this low value of  $\varepsilon$ , shows almost absence of any other impurity in the crystal lattice and the calculated crystallite size D is 53 nm. The crystallite size calculated by using Scherrer's formula varies with the peak used. This variation is due to peak broadening observed at higher diffraction angle causes introduction of strain. In comparison, the crystallite size determined from W-H plot, does not changes according to peak positions.

### 3.2 Surface Morphology and Structural study of $Y_2O_3$ nanoparticles by SEM Analysis:

[54]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

The surface morphology of synthesized  $Y_2O_3$  NPs was studied by SEM. Figure 4 shows typical SEM micrographs of the calcinated pure selected synthesized samples. Some of these micrographs reveal that the product mainly consists of regular particle-like nanostructures. It can be seen that these nanoparticles are systematically oriented with uniform size distribution. There are some uniformly agglomerated nanoparticles having nearly spherical shape with an average size of approximately  $\sim 100$  nm. This is due to high surface energy of nanoparticles which leads to quite strong tendency to form agglomerates. The image under high magnification shows the presence of several irregular shaped small particles over the surfaces of large spherical particles. This formation of small particles is may be due to liberation of large amount of gases during the sintering and calcinations at higher temperature. The SEM images under high magnification confirmed that the  $Y_2O_3$  NPs are distributed randomly containing elliptically spherical particles with various sizes. Most of the NPs are homogenous and were well arranged while some of them are partially aggregated. The SEM analysis confirms the presence of plate/sheet-like and spherical particles of nearly uniform size however, agglomeration of particles is also indicated by some of the micrographs.

### 3.3. Elemental analysis of $Y_2O_3$ nanoparticles by EDX study:

Fig. 5 represents the EDX spectrum for elemental analysis of  $Y_2O_3$  sample prepared by homogenous coprecipitation method. In above EDX spectrum the vertical axis displays the number of X-ray counts while the horizontal axis displays energy in keV. Identification of the characteristic and distinct lines for the major emission energies of elemental yttrium (L) and oxygen (K) are displayed and these correspond to peaks in the spectrum. These observations give confidence that yttrium and oxygen has been correctly identified in thus prepared  $Y_2O_3$  sample.

### 3.4. Spectral analysis of $Y_2O_3$ nanoparticles by FTIR study:

In order to evaluate the bonding characteristics of synthesized  $Y_2O_3$  sample, Fourier transform infrared spectroscopy study was carried out. Figure 6 represents the FTIR spectrum of  $Y_2O_3$ . There are an absorption peaks at 1521, 1400, 556, 515, 461 and 416  $cm^{-1}$ . The peak at 1521 and 1400  $cm^{-1}$  are due to presence of stretching mode of  $CO_3^{2-}$  linkage. The intense peaks at 556 and 515  $cm^{-1}$  corresponds to the anti-symmetric Y-O-Y stretching mode of the surface-bridging oxide. The sharp peak appears at 461 and 416  $cm^{-1}$  assigned to symmetric stretching vibration O-Y-O linkage present in  $Y_2O_3$  nanoparticles.

### 3.5. Thermal analysis of dried sample of formed precipitate by TGA study:

The thermal stability of synthesized nanoparticles can be studied by TGA. Fig. 7, showed the thermo-gram obtained with the temperature dependent stepwise weight loss during sintering and calcination process. It represents the weight loss at a function of temperature. The sample is heated at a constant rate of  $4^\circ C$  per min, under  $N_2$  atmosphere. Here the use of inert atmosphere is essential to avoid any premature oxidation and combustion of capping agent. In TG analysis, there is gradual weight loss about 4.3% up to  $200^\circ C$  indicates the removal of adsorbed water molecules from the nanoparticles and then on further heating the weight loss about 3.7% up to  $500^\circ C$  and about 11% at  $700^\circ C$  denotes the breakdown and evaporation of water of crystallization and decomposition of organic constituents. After further heating up to  $775^\circ C$  very less weight loss about 0.4% was

[55]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

observed. Afterwards no significant weight loss was observed at and above 800°C which indicates formation of metal oxide, Y<sub>2</sub>O<sub>3</sub>. Thus the TG analysis confirmed the formation of crystalline Y<sub>2</sub>O<sub>3</sub> nanoparticles occurs at about 800°C.

#### 4. Conclusion:

The homogenous co-precipitation method is successfully applicable for the synthesis of pure Y<sub>2</sub>O<sub>3</sub> submicron particles. Due to the simplicity of the technique, it can be an alternative method to prepare the nanosized metal oxides at larger scale. The metal oxide obtained after annealing, within the temperature range from 400 °C to 800 °C shows the development of crystalline phases. Thus, synthesized Y<sub>2</sub>O<sub>3</sub> nanomaterial was characterized for its crystallinity, particle structure, surface morphology, elemental composition, bonding characteristics and thermal stability by various tools. The XRD shows sharp, narrow, and intense peaks which confirms pure quality product with good crystallinity and fine grain size. The crystalline size (D) estimated by Debye-Scherrer formula, is ~ 35-40 nm while by W-H analysis, it is about 53 nm with minimum strain. The SEM analysis confirms the presence of homogenous spherical particles of nearly uniform size while EDX analysis provides identification of yttrium (Y) and oxygen (O) in prepared Y<sub>2</sub>O<sub>3</sub> sample. The FTIR study reveals the O–Y–O linkage in sample and TGA indicate the complete cubic phase formation in thermally stable Y<sub>2</sub>O<sub>3</sub> nanoparticles. Thus, this study confirms that the homogenous coprecipitation method was successfully utilized for synthesis of pure cubic phased spherical Y<sub>2</sub>O<sub>3</sub> nanocrystallite of uniform size, mostly useful as a host material for fabrication of doped / codoped luminescent nanophosphors.

#### Acknowledgement:

Authors are grateful to authorities of T. C. College, Baramati and New A. C. S. College, Parner for providing the laboratory facilities for this research work. The authors would like to acknowledge SAIF, Panjab University, Chandigarh, for the service provided during instrumental analysis.

**Conflicts of interest:** The authors declare no conflict of interest.

#### References:

1. Das G.K., Tan TTY., (2008) Rare-Earth-Doped and Codoped Y<sub>2</sub>O<sub>3</sub> Nanomaterials as Potential Bioimaging Probes, *J. Phys. Chem. C*, 112, 11211- 11217.
2. Yang P., Gao S., Liu Y., Wang W., Li C., Lin., (2011) Characterization and photoluminescence of Lu<sub>2</sub>O<sub>3</sub>-Eu<sup>3+</sup> nano-phosphor prepared by modified solution combustion method, *J. Inorg. Chem.* 50, 2182 -2190.
3. Jae- Young Hyun, Ki- Hyun Kim, Jae- Pil Kim, et al., (2021), Enhancement of Luminescence Efficiency of Y<sub>2</sub>O<sub>3</sub> Nanophosphor via Core/Shell Structure, *Nanomaterials*, 11, 1563.
4. Qin x., Yokomori T., Ju Y. (2007), An investigation of the thermal sensitivity and stability of the β-NaYF<sub>4</sub>: Yb, Er upconversion nanophosphors, *J. Appl. Phys. Lett.* 90, 073104.
5. Jong- Ho Park, Min- Gi Kwak, Chung Sik Kim, et al., (2006) Synthesis and Spectral Properties of Rare-Earth Ions-Doped Nano-Sized Y<sub>2</sub>O<sub>3</sub> Phosphors, *J. Korean Phys. Soc.*, 48 (6), 1369-1373.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

6. Tu D., Liang Y., Liu R., Li D., (2011), Eu/Tb ions co-doped white light luminescence  $Y_2O_3$  phosphors, *J. Lumin.* 131, 2569 - 2573.
7. Wang H., Yang J., Zhang C. M., Lin J. (2009), Synthesis and characterization of monodisperse spherical  $SiO_2@RE_2O_3$  (RE = rare earth elements) and  $SiO_2@Gd_2O_3: Ln(3+)$  (Ln = Eu, Tb, Dy, Sm, Er, Ho) particles with core-shell structure, *J. Solid State Chem.* 182, 2716- 2724.
8. J. Mouzon and M. Oden, (2007), Alternative method to precipitation techniques for synthesizing yttrium oxide nanopowders, *Powder technology*, 177, 77-82.
9. Zobadeh Momeni Larimi, Ahmad Amirabadizadeh, (2011), Synthesis of  $Y_2O_3$  Nanoparticles by Modified Transient Morphology Method Int. conference on chemistry and chemical process, IPCBEE, 10 86-90.
10. Atabaev T.S., Vu H- HT, Piao Z., Kim H-K, Hwang Y-H. (2012), Color-tunable properties of  $Eu^{3+}$ - and  $Dy^{3+}$ -codoped  $Y_2O_3$  phosphor particles *J. Alloys Compd.* 541, 263-268.
11. R. J. Gaboriaud, F. Pailloux, P. Guerin and F. Paumier, (2000) Yttrium oxide thin films,  $Y_2O_3$ , grown by ion beam sputtering on Si, *Appl. Phys.* 33, 2884-2889.
12. Jennifer A. Nelson and Michael J. Wagner, (2002) Yttrium Oxide Nanoparticles Prepared by Alkalide Reduction, *Chem. Mater.* 14, 915-917.
13. P.V.A. Padmanabhan, S. Ramanathan, K.P. Sreekumar, R.U. Satpute, T.R.G. Kutty, M.R. Gonal, (2007), Synthesis of thermal spray grade yttrium oxide powder and its application for plasma spray deposition, *Mater. Chem. Phys.* 106, 416-421.
14. Flores-Gonzales M.A., Ledoux G., Roux S., Lebbou K., Perriat P., et.al., (2005), Preparing nanometer scaled Tb-doped  $Y_2O_3$  luminescent powders by the polyol method *J. Solid State Chem.* 178, 989-997.
15. D. W. Johnson Jr., Nonconventional powder preparation techniques, (1981), *Am. Ceram. Soc. Bull.* 60, 221.
16. Y. Lin, Z. Zhang, F. Zhang, Z. Tang and Q. Chen, (2000) Preparation of the Ultrafine  $SrAl_2O_4: Eu, Dy$  Needle-like Phosphor and its Optical Properties," *Mat. Chem. and Phys.* 65, (1), 103- 106.
17. J. S. Kim., (2009), Synthesis of  $SrAl_2O_4: Eu, Dy$ -based phosphors by coprecipitation and characterization of their photoluminescence *J. Ceram. Process. Res.* 10-4, 443.
18. X. Hu, S. Yan, L. Ma, G. Wan, and J. Hu, (2009). Preparation of  $LaPO_4: Ce, Tb$  phosphor with different morphologies and their fluorescence properties, *Powder Technol.* 192 (1), 27-32.
19. Link S. El-Sayad M.A. (2003), Optical Properties and Ultrafast Dynamics of Metallic Nanocrystals, *Annul. Rev Phys. Chem* 54, 331-66.
20. K. Wang-Jin Jeong Dong-sik Bae, (2012), Synthesis and Characterization of  $Y_2O_3$  Powders by a Modified Solvothermal Process, *Kor.J.Mater.Res.*22, 2, 78-81.
21. Suhir Abd-Alaziz Jabir and Khalid Hellal Harbbi, (2020), A comparative study of Williamson-Hall method and size-strain method through X-ray diffraction pattern of cadmium oxide nanoparticle, *AIP Conference Proceedings* 2307, 020015

**Tables:**

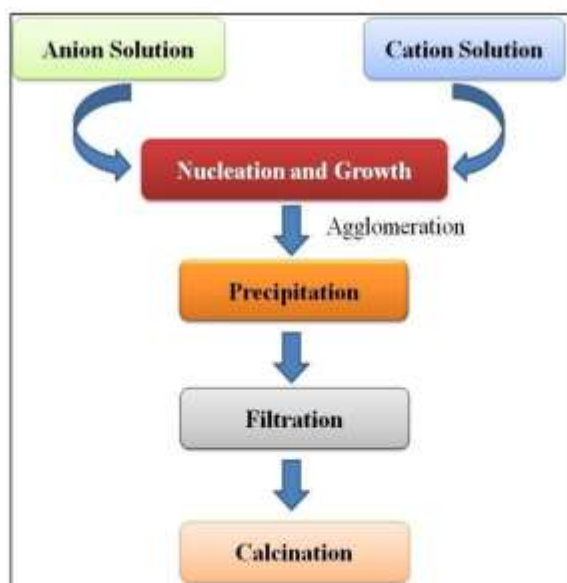
**Table -1:** Raw materials used for the synthesis of nanopowders.

Sr. No.	Raw Material	Mol. Formula	Mol. Wt.
1	Yttrium (III) nitrate hexahydrate,	[Y(NO <sub>3</sub> ) <sub>3</sub> .6H <sub>2</sub> O]	383.01
2	Oxalic acid dihydrate	C <sub>2</sub> H <sub>2</sub> O <sub>4</sub> .2 H <sub>2</sub> O	126.07
3	CTAB (Cetyl Trimethyl Ammonium Bromide)	C <sub>19</sub> H <sub>42</sub> BrN	364.45

**Table - 2:** The XRD parameters and mean crystalline size of Y<sub>2</sub>O<sub>3</sub> NPs

Plane ( <i>hkl</i> )	2 $\theta$ (deg)	Rel. Int. (%)	FWHM	d (obs) Å	D (nm) S. F.
( 211 )	20.5643	8.49	0.5349	4.31551	35.63
( 222 )	29.1828	100.00	0.4499	3.05755	<b>38.60</b>
( 400 )	33.8125	20.95	0.5288	2.64876	34.74
( 441 )	48.5293	39.15	0.4725	1.87443	37.55
( 622 )	57.6078	21.25	0.5709	1.59875	33.89

**Figures:**



[58]

Fig. -1: Schematic representation of HCP method.

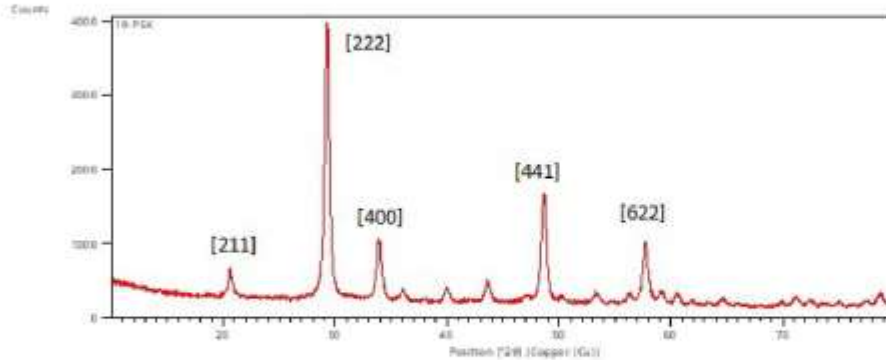


Fig. -2. X-ray diffractogram for Y<sub>2</sub>O<sub>3</sub> nanoparticles synthesized by HCP method

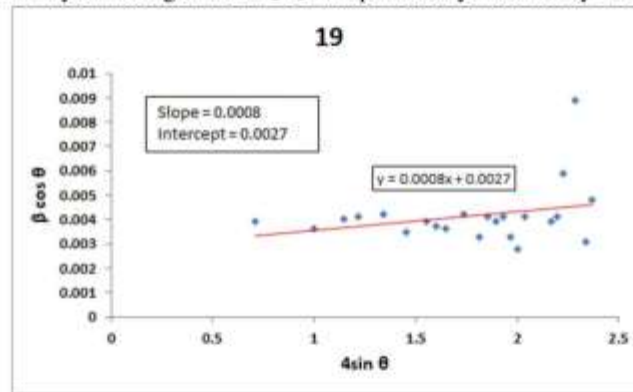


Fig. -3. The W-H plot for as-prepared Y<sub>2</sub>O<sub>3</sub> NPs

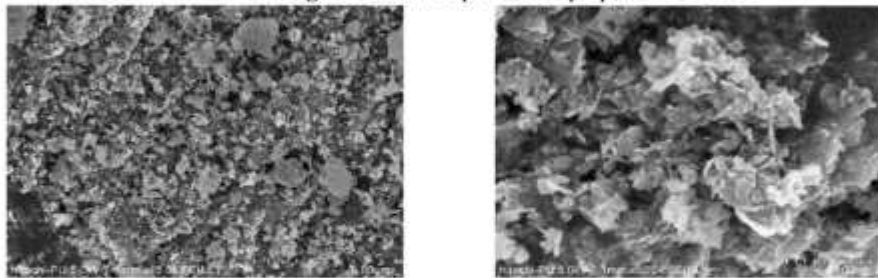


Fig. -4. FE-SEM micrographs of as-prepared Y<sub>2</sub>O<sub>3</sub> NPs

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

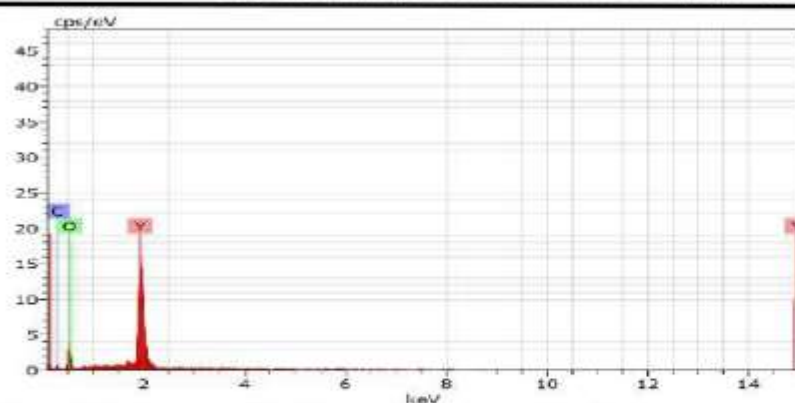
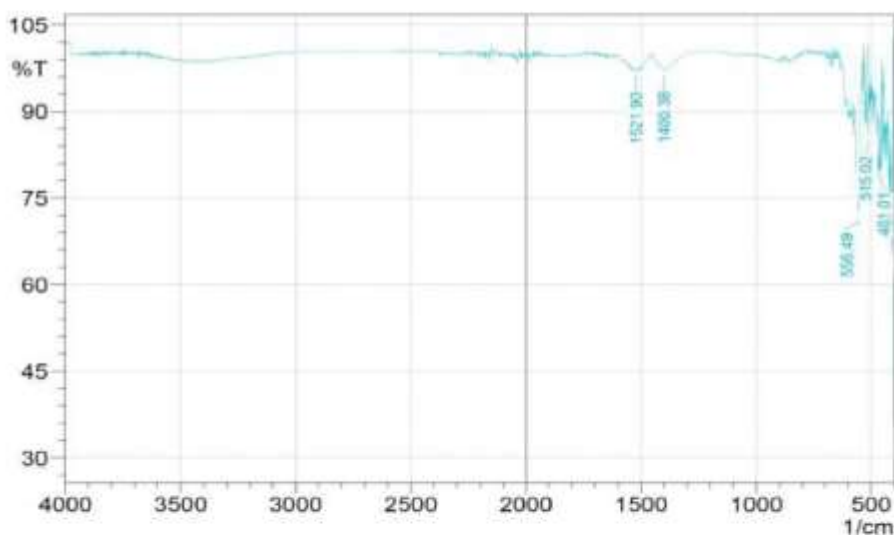


Fig. -5. EDX spectrum for elemental composition of  $Y_2O_3$  sample



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	416.64	72.803	10.667	418.57	414.71	0.398	0.094
2	461.01	79.735	4.299	462.94	460.04	0.244	0.042
3	515.02	65.899	7.324	518.87	513.09	0.208	0.081
4	556.49	72.634	12.21	564.2	545.88	1.648	0.611
5	1400.38	97.207	0.157	1404.24	1398.45	0.069	0.002
6	1521.9	97.024	0.313	1524.79	1519.97	0.06	0.004

Fig. -6. FTIR spectrum for bonding characteristics of  $Y_2O_3$  sample

[60]



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

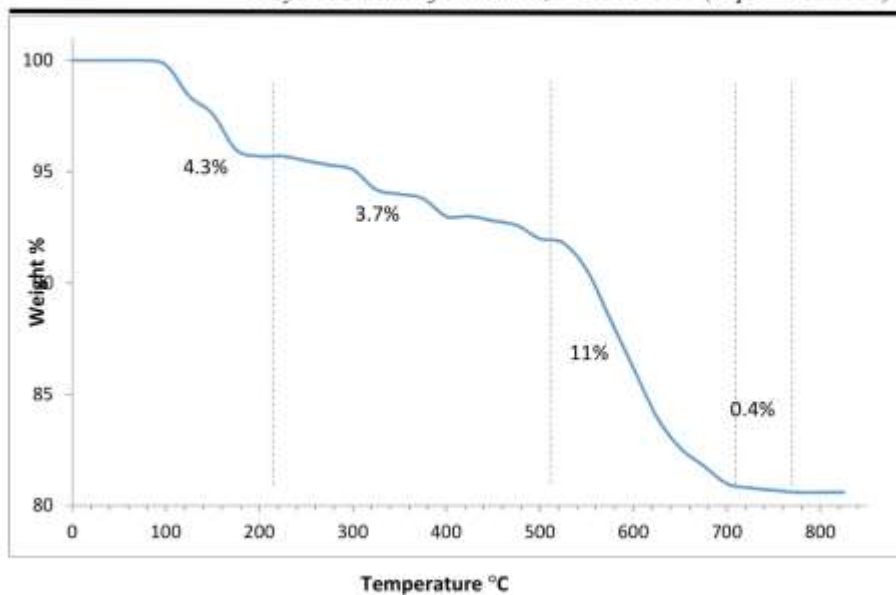


Fig. 7. Thermal gravimetric analysis (TGA) curve of dried metal complex.

[61]

### 37. Synthesis and Characterization of Some New Thiazolyl Schiff Base-Metal Complexes



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

#### SYNTHESIS AND CHARACTERIZATION OF SOME NEW THIAZOLYL SCHIFF BASE-METAL COMPLEXES

**Vaibhav P. Landage**

Department of Chemistry, Anekant Education Society's Tuljaram Chaturchand College, Savitribai Phule Pune University, Baramati, Pune, India

**Rahul S. Bhondwe**

Department of Chemistry, Anekant Education Society's Tuljaram Chaturchand College, Savitribai Phule Pune University, Baramati, Pune, India

**Bhausahab K. Karale**

Department of Chemistry, Rayat Shikshan Sanstha's Radhabai Kale Mahila Mahavidyalaya, Savitribai Phule Pune University, Ahmednagar, India

**Dilip R. Thube**

Department of Chemistry, Ahmednagar Jilha Maratha Vidya Prasarak Samaj's New Arts, Commerce and Science College, Savitribai Phule Pune University, Parner, Ahmednagar, India

Email: [drthube@rediffmail.com](mailto:drthube@rediffmail.com)

#### ABSTRACT:

Our present work focused on the synthesis and characterization of Copper and Nickel metal complexes containing thiazolyl Schiff bases obtained by condensation of the ligands 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide and aromatic aldehyde by refluxing together in alcohol to get new series of thiazolyl Schiff base. The synthesized metal complexes were characterized by various spectroscopic techniques including elemental analysis, UV, FT-IR, <sup>1</sup>HNMR and XRD. Geometries of the Cu (II) and Ni (II) complexes were determined by indicated spectroscopic values. X-ray powder diffraction confirms that the complexes are crystalline in nature.

**KEY WORDS:** Schiff base, Thiazole, XRD.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dilip R. Thube

#### INTRODUCTION:

[112]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Schiff's bases and their derivatives have excellent physicochemical and biological properties. They are proven to be a promising industrial material and used in chemical sensors, optics and catalysis (Sahin et al., 2018), (Anacona et al., 2021; Bursal et al., 2021; Chaviara et al., 2004). They are an excellent drug candidate as antibacterial agents, fungicidal, antitumor and anticancer agents (Anacona et al., 2021; Damercheli et al., 2019; Manimohan et al., 2020; Shi et al., 2020; Singh & Barman, 2021). Diverse derivatization of transition metal Schiff's base complexes can be achieved due to the ease of synthesis by condensation of amines and aldehydes. These ligands coordinate with numerous metals and stabilize in several oxidation states. Schiff base ligands with heterocyclic moiety are "privileged ligands" due to their excellent therapeutic utility (Chaviara et al., 2004; Karatepe & Karatas, 2006; Pontiki et al., 2008; Yernale & Bennikallu Hire Mathada, 2014). Especially the ligands with N and S have drawn attention of many researchers due to the excellent chelation properties.

Thiazoles are an important class of heterocyclic compounds contains N and S atoms. Thiazoles are found in many natural products such as Dolastatin 10, Tubulysin, Largazole, Apratoxin [4] and in pharmacophore of many blockbuster drugs for instance sulphathiazole Fentinol (anti-inflammatory), Cambendazole (fungicide), Niridazole (schistozomicidal) and Ritonavir (anti-HIV, Covid-19) (Alsharif & Alam, 2017). Since last few decades researchers are attracted towards field of bioinorganic chemistry and coordination chemistry of thiozoyl schiff's base metal complexes. Recently Cozzi nicely reviewed the importance of Schiff base complexes in catalysis (Cozzi, 2004). M.M. Abd-Elzaher reported the synthesis and anticancer activity of Schiff base complex with thiazole moiety (Abd-Elzaher et al., 2016). P. Kavitha et al studied the biological activity and DNA cleavage of Co (II) Schiff's base complexes (Kavitha et al., 2016).

In our pursuit to explore the field of bioinorganic chemistry we have synthesized thiazolyl Schiff bases by condensation of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide and substituted aromatic aldehydes. Their Cu(II) and Ni(II) complexes were prepared and characterized by sophisticated spectroscopic techniques such as UV, FTIR, <sup>1</sup>H NMR and XRD.

**EXPERIMENTAL:**

The chemicals used were of AR grade. Melting Points were determined by open capillary method and are uncorrected. IR spectra were recorded on a FT-IR spectrophotometer RZX (Perkin Elmer) and Mass spectra were recorded on a Q- TOF MICRO WATER, MS ES+3.79e3. <sup>1</sup>H spectra on a BRUKER AVANCE NEO 500 NMR spectrometer with DMSO-*d*<sub>6</sub> as a solvent and chemical shift (δ) are expressed in ppm using TMS as internal standard. UV-Visible spectra were recorded on Shimadzu UV-1800 instrument.

**Synthesis of thiazolyl Schiff base ligand**

Equimolar mixture of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide (0.01 mole) **3** and aromatic aldehyde **4** (0.01 mole) with 3 drops of Conc.H<sub>2</sub>SO<sub>4</sub> were refluxed in alcohol about 1-2 hrs (checked by TLC). After cooling, solid product thus obtained, it was filtered and recrystallized in alcohol to get Schiff base **5**. [Figure 1]

**5D: (E)-N'-(2-chlorobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide.**

IR (KBr): 3245 (N-H), 3058 (C-H), 1653 (C=O), 1090 (Ar-Cl), 832 (disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 390 (M+1)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.77 (s, 3H, CH<sub>3</sub>), 7.48 (d, 2H, Ar-H), 7.54 (dd, 1H, Ar-H), 7.62 (d, 2H, Ar-H),

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

8.03 (m, 3H, Ar-H), 8.55 (s, 1H, N=C-H), 12.08 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>OCl<sub>2</sub>N<sub>3</sub>S: C, 55.39; H, 3.36; N, 10.77. Found: C, 55.37; H, 3.34; N, 10.75 %.

**5H: (E)-N'-(2-nitrobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide.**

IR (KBr): 3165 (N-H), 3051(C-H), 1657 (C=O), 1528 (Ar-NO<sub>2</sub>), 1092 (Ar-Cl), 832 (disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 401.29 (M+1)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.76 (s, 3H, CH<sub>3</sub>), 7.60 (d, 2H, Ar-H), 7.70 (dd, 1H, Ar-H), 7.89 (s, 1H, N=C-H), 8.02 (d, 1H, Ar-H) 8.11 (dd, 1H, Ar-H), 8.14 (d, 1H, Ar-H), 12.18 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>O<sub>3</sub>ClN<sub>4</sub>S: C, 53.94; H, 3.27; N, 13.98. Found: C, 53.97; H, 3.29; N, 13.95 %.

**Synthesis of Schiff base metal (II) complex**

A solution of metal salt (0.01 mole) with 15 ml of ethyl alcohol is added to a solution of (0.01 mole) Schiff base in 10 ml of ethyl alcohol with stirring. The reaction mixture was heated under reflux for 1-1.5 hr. The solid thus obtained was filtered off and then dried, to get Schiff base metal complex. [Figure 2]

**RESULTS AND DISCUSSION:**

The Schiff base ligand (5) was prepared from the condensation of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide and substituted aromatic aldehydes in good yield [Table 1]. The ligand and its metal complexes are stable at room temperature.

FTIR analysis showed a strong band a 1657 cm<sup>-1</sup> was assigned to amide carbonyl group. The band at 1528 cm<sup>-1</sup> was attributed to nitro group and bands at 3165 cm<sup>-1</sup> and 3051 cm<sup>-1</sup> are allocated to the NH and CH stretching.

<sup>1</sup>HNMR shown singlet at 2.77 ppm for methyl group, peaks at 7.48, 7.54, 7.62 and 8.03 are for aromatic protons and most down field proton at 8.55 ppm accounts for azomethine (N=C-H) proton. The broad singlet at 12.08 ppm is due to NH group.

Mass spectra of ligand shown the molecular ion peak at 429.1 [M+1]

UV absorption of Cu (II) and Ni (II) metal complexes shown at the bands λ<sub>max</sub> at 325 and 328 nm respectively.

The bands are assigned to n-π\* and charge transfer of azomethine group and thiazole ring nitrogen atom. The magnetic moment of Cu and Ni complex are 1.73 B.M. and 2.82 B.M. indicates octahedral geometries for both complexes (Gull & Hashmi, 2017).

Powder X-ray analysis of Cu (II) and Ni (II) metal complexes shown that the complexes are crystalline in nature. X-Ray diffractogram shows 25 reflections with maxima at 25.58 Å and 26.17 Å for Cu (II) and Ni (II) metal complexes respectively (Gull & Hashmi, 2017). [Figure 3 and 4]

**CONCLUSION:**

We have synthesized Schiff base ligand in good yield. Spectroscopic techniques FTIR, mass and <sup>1</sup>HNMR confirms its formation whereas UV and XRD reveals that the Cu (II) and Ni (II) metal complexes are crystalline in nature and geometries are octahedral for both the complexes. In conclusion, the versatile Cu (II) and Ni (II) metal complexes have excellent properties and worth for further studies on its biological activities.

**ACKNOWLEDGEMENT:**

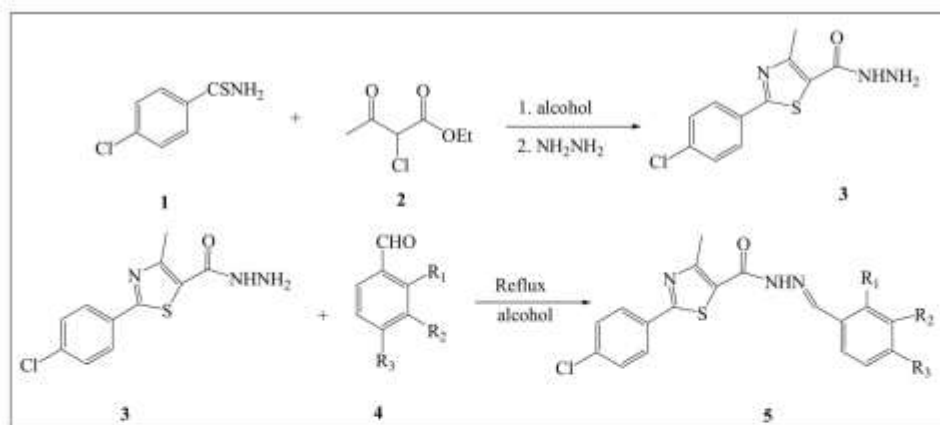
Authors thanks to the Principal and Head, Department of Chemistry, Tuljaram Chaturchand College Baramati, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar and New Arts, Commerce and Science College, Parner, Ahmednagar for providing necessary laboratory facilities and chemicals. Authors also thank to the Director, SAIF, Punjab University Chandigarh for FTIR, <sup>1</sup>HNMR and XRD analysis.

**REFERENCES:**

1. Abd-Elzaher M. M., Labib A. A., Mousa, H. A., Moustafa S. A., Ali, M. M. & El-Rashedy A. A., (2016) Synthesis, anticancer activity and molecular docking study of Schiff base complexes containing thiazole moiety, *Beni-Suef University Journal of Basic and Applied Sciences*, 5(1), 85-96. <https://doi.org/https://doi.org/10.1016/j.bjbas.2016.01.001>
2. Alsharif Z. A. & Alam M. A., (2017) Modular synthesis of thiazoline and thiazole derivatives by using a cascade protocol [10.1039/C7RA05993K], *RSC Advances*, 7(52), 32647-32651. <https://doi.org/10.1039/C7RA05993K>
3. Anacona J. R., Santaella J., Al-Shemary R. K. R., Amenta, J., Otero A., Ramos C. & Celis F., (2021) Ceftriaxone-based Schiff base transition metal(II) complexes, synthesis, characterization, bacterial toxicity, and DFT calculations. Enhanced antibacterial activity of a novel Zn(II) complex against *S. aureus* and *E. coli*. *J Inorg Biochem*, 223, 111519. <https://doi.org/10.1016/j.jinorgbio.2021.111519>
4. Bursal E., Turkan F., Buldurun K., Turan N., Aras A., Colak N., Murahari M. & Yegeri M. C., (2021) Transition metal complexes of a multidentate Schiff base ligand containing pyridine: synthesis, characterization, enzyme inhibitions, antioxidant properties and molecular docking studies, *Biometals*, 34(2), 393-406. <https://doi.org/10.1007/s10534-021-00287-z>
5. Chaviara A. T., Cox P. J., Repana K. H., Papi R. M., Papazisis K. T., Zambouli D., Kortsaris A. H., Kyriakidis D. A. & Bolos C. A., (2004) Copper(II) Schiff base coordination compounds of dien with heterocyclic aldehydes and 2-amino-5-methyl-thiazole: synthesis, characterization, antiproliferative and antibacterial studies. Crystal structure of CudienOOC12, *J Inorg Biochem*, 98(8), 1271-1283. <https://doi.org/10.1016/j.jinorgbio.2004.05.010>
6. Cozzi P. G., (2004) Metal–Salen Schiff base complexes in catalysis: practical aspects [10.1039/B307853C], *Chemical Society Reviews*, 33(7), 410-421. <https://doi.org/10.1039/B307853C>
7. Damercheli M., Mahdi M., Mehravi B. & Shafiee Ardestani M., (2019) Bioactive Salen-type Schiff Base Transition Metal Complexes as Possible Anticancer Agents, *Iran J Pharm Res*, 18(4), 2055-2066. <https://doi.org/10.22037/ijpr.2019.12792.11151>
8. Gull P. & Hashmi A. A., (2017) Synthesis, XRD and spectroscopic characterization of pharmacologically active Cu(II) and Zn(II) complexes, *Journal of Molecular Structure*, 1139, 264-268. <https://doi.org/https://doi.org/10.1016/j.molstruc.2017.03.053>
9. Karatepe M. & Karatas F., (2006) Antioxidant, pro-oxidant effect of the thiosemicarbazone derivative Schiff base (4-(1-phenylmethylcyclobutane-3-yl)-2-(2-hydroxybenzylidenehydrazino) thiazole) and its metal complexes on rats, *Cell Biochem Funct*, 24(6), 547-554. <https://doi.org/10.1002/cbf.1266>
10. Kavitha P., Rama Chary M., Singavarapu B. V. V. A. & Laxma Reddy K., (2016) Synthesis, characterization, biological activity and DNA cleavage studies of tridentate Schiff bases and their Co(II) complexes, *Journal of Saudi Chemical Society*, 20(1), 69-80. <https://doi.org/https://doi.org/10.1016/j.jscs.2013.03.005>
11. Manimohan M., Paulpandiyar R., Pugalmani S. & Sithique M. A., (2020) Biologically active Co (II), Cu (II), Zn (II) centered water soluble novel isoniazid grafted O-carboxymethyl chitosan Schiff base ligand metal

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

- complexes: synthesis, spectral characterisation and DNA nuclease activity, *Int J Biol Macromol*, 163, 801-816. <https://doi.org/10.1016/j.ijbiomac.2020.06.278>
12. Pontiki E., Hadjipavlou-Litina D. & Chaviara A. T., (2008) Evaluation of anti-inflammatory and antioxidant activities of copper (II) Schiff mono-base and copper(II) Schiff base coordination compounds of dien with heterocyclic aldehydes and 2-amino-5-methyl-thiazole, *J Enzyme Inhib Med Chem*, 23(6), 1011-1017. <https://doi.org/10.1080/14756360701841251>
13. Sahin O., Ozdemir U. O., Seferoglu N., Genc Z. K., Kaya K., Aydiner B., Tekin S. & Seferoglu Z., (2018) New platinum (II) and palladium (II) complexes of coumarin-thiazole Schiff base with a fluorescent chemosensor properties: Synthesis, spectroscopic characterization, X-ray structure determination, in vitro anticancer activity on various human carcinoma cell lines and computational studies, *J Photochem Photobiol B*, 178, 428-439. <https://doi.org/10.1016/j.jphotobiol.2017.11.030>
14. Shi S., Yu S., Quan L., Mansoor M., Chen Z., Hu H., Liu D., Liang Y. & Liang, F., (2020) Synthesis and antitumor activities of transition metal complexes of a bis-Schiff base of 2-hydroxy-1-naphthalenecarboxaldehyde, *J Inorg Biochem*, 210, 111173. <https://doi.org/10.1016/j.jinorgbio.2020.111173>
15. Singh A. & Barman P., (2021) Recent Advances in Schiff Base Ruthenium Metal Complexes: Synthesis and Applications, *Top Curr Chem (Cham)*, 379(4), 29. <https://doi.org/10.1007/s41061-021-00342-w>
16. Yernale N. G. & Bennikallu Hire Mathada M., (2014) Synthesis, characterization, antimicrobial, DNA cleavage, and in vitro cytotoxic studies of some metal complexes of schiff base ligand derived from thiazole and quinoline moiety, *Bioinorg Chem Appl*, 2014, 314963. <https://doi.org/10.1155/2014/314963>



**Figure 1: Synthesis of Schiff base ligand**

[116]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

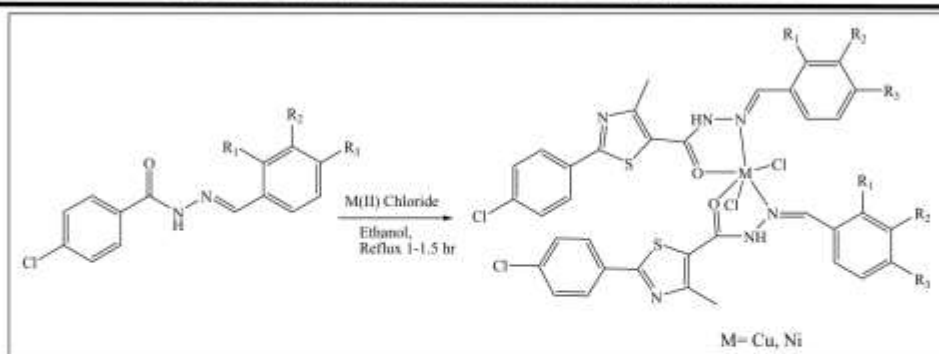


Figure 2: Synthesis of Schiff base metal complexes

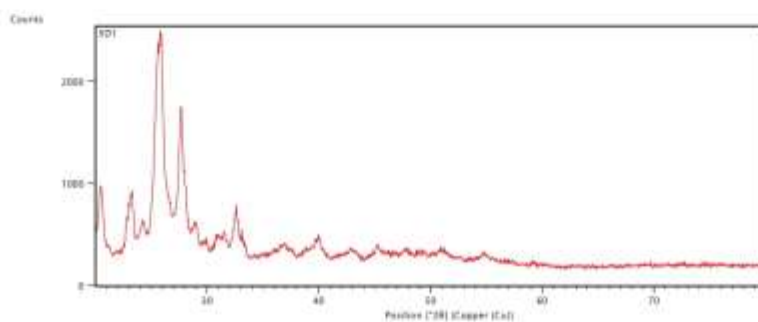
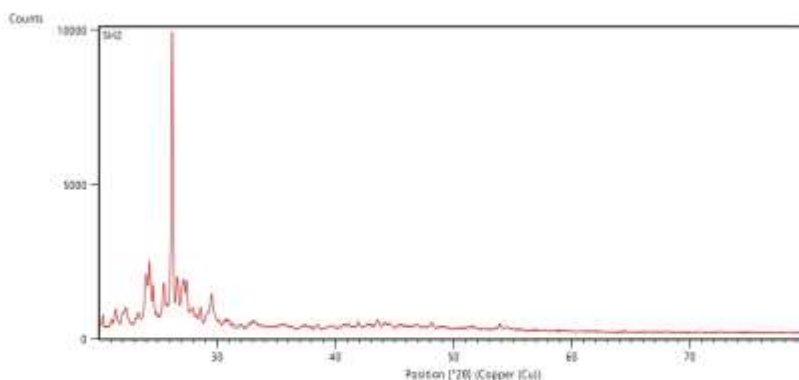


Figure 3: X-Ray diffractogram of Cu (II) complex

[117]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*



**Figure 4: X-Ray diffractogram of Ni (II) complex**

Table-

1:

Compds	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	M.P. (°C)	Time (min.)	Yield (%)
5A	H	H	Cl	278-280	80	66
5B	H	H	Br	286-288	80	63
5C	H	H	OH	266-268	90	68
5D	Cl	H	H	280-282	80	65
5E	H	H	H	250-252	85	70
5F	H	H	OCH <sub>3</sub>	260-262	90	61
5G	H	H	NO <sub>2</sub>	288-290	75	77
5H	NO <sub>2</sub>	H	H	282-284	75	75

**Physical data of synthesized Schiff bases**



### 38. Synthesis, Characterization of novel rhodamine 6G capped gold nanoparticles and sensing of reactive Oxygen species



Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

#### SYNTHESIS, CHARACTERIZATION OF NOVEL RHODAMINE 6G CAPPED GOLD NANOPARTICLES AND SENSING OF REACTIVE OXYGEN SPECIES

**Rohidas Gopale**

Department of Chemistry, New Arts, Commerce and Science College, Parner- 414 302, Ahmednagar, India

**Rahul Diggikar**

Department of Chemistry, New Arts, Commerce and Science College, Parner- 414 302, Ahmednagar, India,  
rahuldiggikar73@gmail.com

#### Abstract

Herewith, presented the citrate stabilized novel Rhodamine 6G (R6G) capped fluorescence gold nanoparticles (AuNPs) for sensing reactive oxygen species (ROS) like superoxide ( $O_2^{\cdot-}$ ), hydroxyl radical ( $\cdot OH$ ), hydrogen peroxide ( $H_2O_2$ ) synthesized by chemical reduction method. R6G attached to the surface of stable fluorescence AuNPs by nitrogen used for detection of ROS ultimately used for determination of glucose from serum. It is confirmed by techniques like UV-Visible spectroscopy (UV-Vis.), Transmission Electron Microscope (TEM), selected area diffraction (SAED) pattern and fluorescence spectrometer characterization. The peak in UV-Vis. spectra at 520 nm indicates surface plasmon resonance of capped R6G AuNPs and TEM study reveals the formation of AuNPs in the range ~10 - 14 nm in size. The SAED pattern indicates AuNPs are cubic in structure. The fluorescence spectrometer study indicates the increased intensity at 466 nm of R6G – AuNPs are in bonding. Excellent agreement observed in theory and experiments. The reaction of  $\cdot OH$  radical with 2 ME was followed by fluorescence detection and first order rate constant calculated for this reaction from the plot of  $\ln C_0/C$  versus time (minutes) was found to be  $0.05288 \text{ min}^{-1}$

**Keywords:** AuNP, Capping, Fluorometer, Rhodamine 6G, ROS, TEM

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Rahul Diggikar

**1.Introduction:** The dyes like Rhodamine are fluorescent in nature. It is used extensively in biotechnology applications in general and enzyme linked immunosorbent assay (ELISA) used for the detection of antibodies from the blood in particular.<sup>1</sup> Rhodamine 6G (R6G) obtained in three phases of color with different chemical properties. However, R6G tetrafluoroborate is obtained in maroon crystals.<sup>2</sup> Gold metal chemically is inert so that obtained elemental form in earth crust scientifically presented by the symbol "Au" at a micro level. Economically it is very prestigious, but in the modern days of research and development it shows very great applications from

[57]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

all sections for human beings at nano level in electronic<sup>3</sup>, medical and biological activity<sup>4</sup>. Biosensing is one of the significant applications of capping AuNP (Nanoparticles).<sup>5</sup> Due to the capping of AuNPs, its biomedical applications much more improved in addition with optical, plasmonic and photothermal properties.<sup>6</sup> Capping of AuNPs by R6G shows improved multi spectroscopic and bioimaging properties in bovine serum albumin<sup>7</sup>.

Reactive oxygen species (ROS) are the components that kill the immune system during microbial invasion. The metabolic reactions in the body depend on the rate of formation of ROS so that the formation of glucose<sup>8</sup>. The production of ROS results from pollutants, UV light, cigarette, and radiation may cause structural alterations in deoxyribo nucleic acid (DNA).<sup>9</sup> Antioxidants are widely used as ingredients in dietary supplements and have been investigated for the prevention of diseases such as cancer, coronary heart disease and even altitude antioxidant scavenging ROS activity.<sup>10</sup> Oxidative stress occurs when the balance between ROS and antioxidants is disrupted by excessive ROS or deficient antioxidants. ROS is implicated with the pathogenesis of various human diseases and conditions including aging, mutagenesis, chronic inflammation and certain types of cancers.

Herewith, from the state of art, we have presented for the first time, the novel <sup>11</sup> R6G capped AuNPs for the detection of reactive oxygen species (ROS) and so that for detection of glucose from serum. Detection of glucose from serum has become an essential tool in the present scenario to all.

## **2. Experimental Section:**

### **2.1 Material and Methods:**

#### **2.1.1 Purchase of Chemicals as a precursor:**

Hydrogen tetrachloroaurate (III) hydrate and R6G is purchased from Sigma-Aldrich, Trisodium citrate, Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is purchased from RANKEM chemicals, Trisodium phosphate (Na<sub>3</sub>PO<sub>4</sub>), Sodium hydrogen orthophosphate dihydrate (Na<sub>2</sub>HPO<sub>4</sub>) is obtained from Merck and 2-Mercaptoethanol (2-ME) is obtained from Sisco research laboratory (SRL). The respective solutions were prepared in double distilled water.

#### **2.1.2 Synthesis of Rhodamine 6G Capped Gold Nanoparticles:**

The R6G capped gold nanoparticles were prepared by chemical reduction of metal precursors (HAuCl<sub>4</sub>). For this, on reflux, 25 mL 38.9 millimole (mM) of trisodium citrate was vigorously added into the 1 mM 250 mL for 15 minutes, in the progression of reaction the color of mother liquor of gold particles changes from colorless to deep red. The stability of the gold particles occurs by the trisodium citrate and 20 $\mu$ L 1mM R6G was added to the solution. Finally, the resulting mixture was equilibrated overnight at minimum temperature (4<sup>o</sup>C).

#### **2.1.3 Characterization of Rhodamine 6G Capped Gold Nanoparticles:**

Transmission electron microscopic (TEM) study is the advanced technique used for the confirmation of NPs. The facility available for the same is obtained from Indian Institute of Technology (IIT), Mumbai from Sophisticated Analytical Instrument Facility (SAIF) Division (Philips Make, CM 200 Model) at applied voltage 200 kV. The samples were loaded on a carbon coated copper grid having mesh size 300 and air dried prior to the analysis. For surface plasmon study the UV-Vis. Spectrophotometer of Shimadzu (UV 1800) is used in the region 200-800 nm. The fluorescence spectrophotometer (Hitachi, Tokyo, Japan) F- 4500 is used from the Department of Chemistry, Savitribai Phule Pune University, Pune for the study of capped R6G - AuNPs study of ROS sensing sets excitation wavelength at 466 nm. It requires fluorescent agents loaded in the cuvette. Centrifuge was carried out by using suppliers from Global laboratory instruments.

### 3. Results and Discussion:

#### UV-Vis. spectroscopy study:

Fig. 1 shows the absorption spectra of AuNPs capped R6G obtained in suitable solvent. The sharp, smaller peak at 520 nm indicates the surface plasmon resonance (SPR) of capped R6G AuNPs. The sharp SPR peak is concerned with the synthesis method (aqueous), the effect of capping agent and narrow size distribution.<sup>12</sup> The symmetrical shape of spectra indicates there is reduction of size of AuNPs due to the R6G. The single peak obtained in the range of 450 -700 nm indicates the formation of NPs.<sup>13</sup> This is the best agreement with the TEM micrograph study proposed in the next paragraph.

#### Transmission Electron Microscopic (TEM) study:

Fig.2 shows the (a) TEM images and (b) SAED pattern of the capped R6G AuNPs. Fig. 2(a) illustrated the average size in the order of ~ 10 - 14 nm of capped R6G AuNPs with spherical shape, most of the transition metals in nanosized shows different morphology, The effect of R6G as a capping agent is clearly observed as it is synthesized in aqueous medium. The spherical shape and size of capped R6G AuNPs is similar to the capping agent reported elsewhere.<sup>14,15</sup> The SAED pattern of capped R6G AuNPs is presented in Fig.2 (b). The diffraction rings are presented as the cubic structure of AuNPs (Fig.2 (b)).

#### Sensing of ROS in presence of 2- ME:

Detection of ROS like H<sub>2</sub>O<sub>2</sub>, hydroxyl (OH<sup>•</sup>) radicals are carried out using AuNPs with production or redox balance where 2-ME exacerbated the toxicity of metal nanoparticles.<sup>16</sup> In the present work it is important to understand the concept of 2- ME / 2 – ME disulfide is produced on the oxidation to ROS can be understood by fluorometric method. The fluorescence spectra of AuNPs with 2ME and ROS is recorded. While in the case of the solution containing the mixture of 1μM 2-ME and R6G, the supernatant obtained after centrifugation showed an increased intensity in the fluorescence recorded at 466 nm. The supernatant solution obtained after centrifugation of R6G capped AuNPs indicates extremely low fluorescence intensity at 466 nm indicated that R6G was not released into solution. This suggests that 2-ME has a stronger binding to AuNPs along with R6G.

Fig.3 shows the different fluorescence spectra of A) R6G capped AuNPs B) R6G capped AuNPs and 2 ME and C) R6G AuNPs and H<sub>2</sub>O<sub>2</sub> treated 2-ME. The higher intensity of fluorescence spectra of R6G capped AuNPs and 2-ME, due to displacement of R6G by thiol from the surface of Au. While intensity decreases due to oxidation of 2- ME by ROS. That is, fewer R6G molecules may be available in the supernatant solution. This highlights the presence of ROS.<sup>17</sup>

#### Effect of the concentration of 2- ME on H<sub>2</sub>O<sub>2</sub>:

To understand the effect of concentration of 2 ME, different concentrations (10<sup>-7</sup> to 10<sup>-2</sup> Molar, M) of 2-ME were prepared in phosphate buffer solution (pH-12) and in 10<sup>-4</sup>M H<sub>2</sub>O<sub>2</sub>. For ROS sensing, 500μl, 2 ME and 100μl H<sub>2</sub>O<sub>2</sub> was allowed to react for 20 minutes then incubated with 400μl, R6G AuNPs (2mM) for 30 minutes. After incubation, the resulting solution was centrifuged at 8000 rpm for 20 min. ROS concentration measured accurately up to micro molar level. The analytical data presents, the higher concentration of H<sub>2</sub>O<sub>2</sub> favors the oxidation of 2- ME<sup>17</sup> as predicated in Fig.4

#### Quantification of ROS:

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

For quantification of ROS, different concentrations of H<sub>2</sub>O<sub>2</sub> (0-100µM) were prepared in Milli Q water. To ROS sensing, 500µL, 2 ME and 100µL, H<sub>2</sub>O<sub>2</sub> was reacted for 20 minutes. Then the mixture was incubated with 400µL, R6G – AuNPs (2mM) for 15 minutes. After incubation, the resulting solution was centrifuged at 8000 rpm for 20 min. Fluorescence spectra show that the intensity at 469 nm of the supernatant gradually increases with increased H<sub>2</sub>O<sub>2</sub> concentration.

#### **Radiation induced generation of •OH radical as a ROS:**

Oxidizing conditions are attained by saturating water with N<sub>2</sub>O. Such a system on radiolysis will contain 90% •OH and N<sub>2</sub>O converts e<sub>aq</sub><sup>-</sup> into •OH radicals as represented by reaction.<sup>18</sup>



Oxidizing conditions can be also obtained using N<sub>2</sub>O/O<sub>2</sub> saturation conditions. Under these condition e<sub>aq</sub><sup>-</sup> is converted to OH<sup>-</sup> radicals as shown in above reaction with a rate constant  $k = 9.1 \times 10^9 \text{ mol dm}^{-3} \text{ s}^{-1}$

For generation of OH<sup>-</sup> radical, 500 µL, 2 ME solution was purged with N<sub>2</sub>O in a test tube. The sample was then irradiated for 10 minutes. (Dose rate 3 Gray/Minutes). The mixture was incubated with 400µL, R6G – AuNPs (2nM, nanoM) for 15 minutes. After incubation, the resulting solution was centrifuged at 8000 rpm for 20 min. Dose dependent fluorescence spectra of the supernatant (Fig.5) shows decrease in the intensity of the peak at 466 nm after irradiation. This decrease could be attributed to formation of disulfide, due to which, the displacement of R6G from the surface of AuNPs doesn't take place as a result the concentration of R6G released into the supernatant is reduced.

Studies were carried out to understand the effect of increasing dose on this (R6G - AuNPs + 2- ME + •OH) reaction. The samples were subjected to <sup>60</sup>Co (Cobalt) gamma irradiation within a dose range of 0 - 60 Gray. Dose dependent fluorescence spectra recorded for the supernatant (Fig.6 ) shows that intensity at 466 nm decreases with increasing irradiation time. The first order rate constant calculated for this reaction from the plot of ln C<sub>0</sub>/C versus time (min) was found to be 0.05288 minutes (Fig.7).<sup>19</sup>

#### **4. Conclusion**

Capped R6Gs AuNPs are synthesized by chemical reduction method. At the surface citrate capped AuNPs where the nitrogen of R6G forms a bond directly to the Au. R6G plays the role of capping agent and citrate makes the AuNPs stable. Fluorescence detection of ROS using the prepared R6G capped AuNPs has been achieved by the oxidation of 2-ME to disulfide. On the addition of 2-ME to the solution of R6G – AuNPs, R6G molecules are released from the Au surface due to displacement of amine group of a R6G by thiol group of 2 – ME. The released R6G gives strong fluorescence after removal of the AuNPs by centrifugation. Addition of ROS to 2-ME, produced disulfide is incapable of displacing R6G from the Au surface. The R6G molecules are not relieved into the solution therefore; the supernatant contains only 2- ME-disulfide that does not exhibit fluorescence. So this method could be applied for determination of glucose in serum successfully. <sup>60</sup>Co gamma source has been used for the generation of •OH radicals as a reactive oxygen species. The reaction of •OH radical with 2 ME was followed by fluorescence detection and first order rate constant calculated for this reaction from the plot of ln C<sub>0</sub>/C versus time (min) was found to be 0.05288 min<sup>-1</sup>. This research opens a new Avenue for researchers.

#### **Acknowledgement**

[60]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

RG is sincerely thankful to Dr.Smt. Geetarani Sharma, Department of Chemistry Savitribai Phule Pune University, Pune and Principal, BJS College, Pune, SAIF Unit IIT-Mumbai.

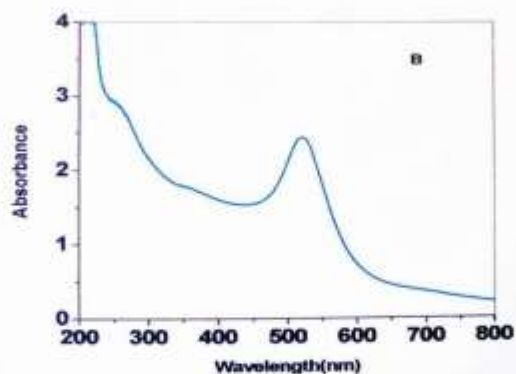
**References:**

1. Hyemi Kim, Sunho Lee, Jihyun Lee and Jinsung Tae, *Org. Lett.* **2010**, 12
2. Florian M. Zehentbauer , Claudia Moretto , Ryan Stephen , Thangavel Thevar, John R. Gilchrist , Dubravka Pokrajac , Katherine L. Richard, Johannes Kief, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* , **2014**,147–151
3. Luana M. Sousa , Luana M. Vilarinho , Gabriel H. Ribeiro , André L. Bogado, Luis R. Dinelli, *R. Soc. open sci.* **2018**, 4: 170675
4. Xiaopei Hu, Yuting Zhang, Tingting Ding, Jiang Liu, Hang Zhao, *Frontiers in Bioengineering and Biotechnology*, **2020**, 8
5. Cecilia Fernández-Ponce, Juan P. Muñoz-Miranda, Desiré M. de los Santos, Enrique Aguado, Francisco García-Cozar ,Rocio Litrán , *Journal of Nanoparticle Research* , **2018**, 20, 305
6. Karen Bolaños1–3 Marcelo J Kogan2,3 Eyleen Araya1,2, *International Journal of Nanomedicine*, **2019**, 14, 6387-6406
7. N. Manjubaashinia , Mookkandi Palsamy Kesavanb , Jegathalaprathaban Rajeshb , T. Daniel Thangadurai *Journal of Photochemistry and Photobiology B, Biology*, **2018**, 183, 374-384
8. Couee I., Sulmon C., Gousbet G., Amrani A., *Journal of Experimental Botany*, **2006**, 57, 449–459
9. Yoshio Nosaka and Atsuko Y. Nosaka, *ACS Chem.Rev.***2017**, 117, 11302-11336
10. Sen Li, Guowei Chen, Chao Zhang, Man Wu, Shugan Wu, Qing Liu, *International Journal of Clinical and Experimental Medicine*,**2014**, 110-116
11. Rabia Javed , Muhammad Zia., Sania Naz , Samson O. Aisida., Noor ul Ain, Qiang Ao, *Journal of Nanotechnology*, **2020**, 18, 172
12. Priyanka U. Londhe, Madhuri More, N. B. Chaure, International Conference on Advanced Nanomaterials & Emerging Engineering Technologies (ICANMEET-2013), *IEEE*, **2013**, 317-319
13. Norfazila Mohd Sultan, Mohd Rafie Johan, *Scientific World Journal*, **2014**, 184604, 7
14. Rahul S. Diggikar, Milind V. Kulkarni, Girish M. Kale, Bharat B. Kale, *J. Mater. Chem. A*, **2013**,1, 3992-4001
15. Ch. Kanchana Latha , Mucherla Raghasudha , Y. Aparna , Ramchander. M , D. Ravinder , Jaipal. K , P. Veerasomaiah , D. Shridhar, *Materials Research*. **2017**, 20, 256-263
16. Karen Wolfreys , David B. G. Oliveira, *Eur. J. Immunol.* **1997**, 27, 297-306
17. Cheng-Yan Lin, Cheng-Hao Liua, Wei-Lung Tseng, *Anal. Methods*, **2010**, 2, 1810–1815
18. David C. Grills,Dmitry E. Polyansky, Etsuko Fujita BNL-114372-2017-JA
19. M. Ben Kacem, M.A. Benadjaoud, M. Dos Santos, F. Soysouvanh, V. Buard1, G.Tarlet, B. LeGuen, A. François, O.Guipaud, F. Milliat, V. Paget , *Scientific report*, 2020, 10,7021

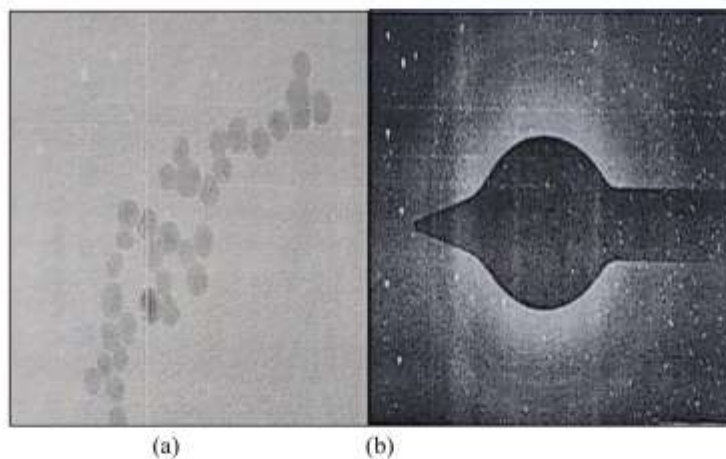
**Figures**

[61]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*



**Fig. 1 UV- Vis. spectrum of R6G capped AuNPs**



**Fig. 2 (a) TEM image and (b) selected area diffraction (SAED) pattern of R6G capped AuNPs**

[62]

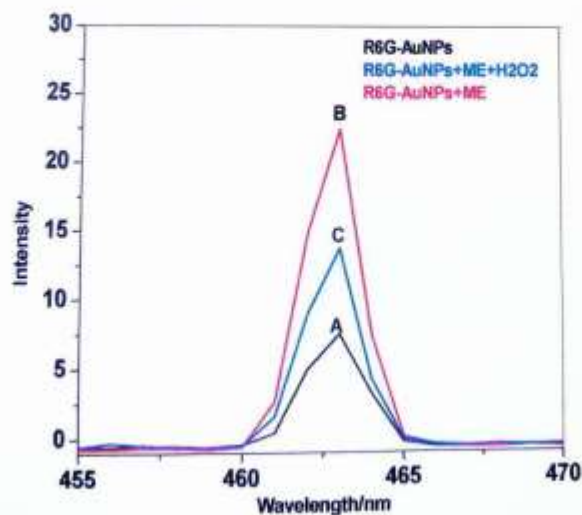


Fig.3: Fluorescence spectra of the supernatant obtained after the centrifugation of A) R6G capped AuNPs B) R6G capped AuNPs and 2 ME and C) R6G AuNPs and H<sub>2</sub>O<sub>2</sub> treated 2-ME.

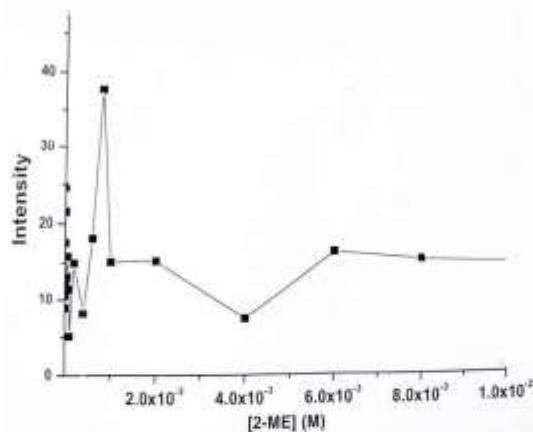


Fig. 4: Concentration variation effect of 2- ME on H<sub>2</sub>O<sub>2</sub>

[63]

Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

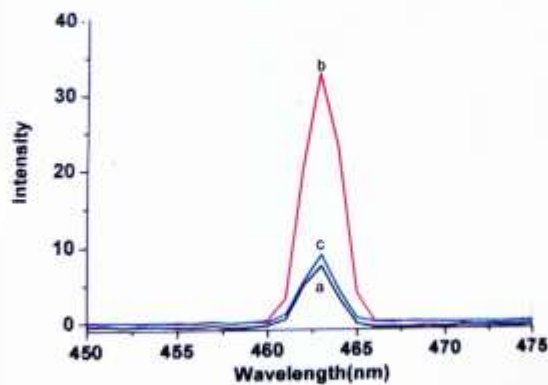


Fig. 5 :Fluorescence spectra of a) R6G – AuNPs b) R6G – AuNPs + 2- ME c) R6G- AuNPs + 2- ME +  $\cdot$ OH

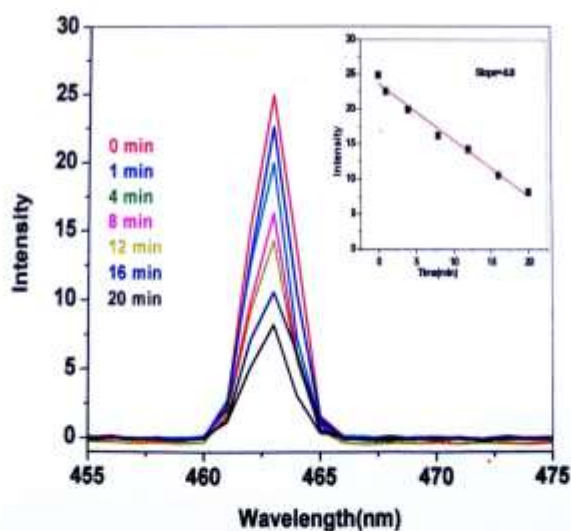
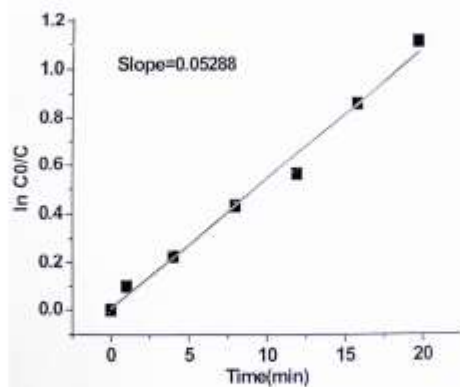


Fig. 6: Dose dependent fluorescence spectra of R6G - AuNPs + 2- ME +  $\cdot$ OH, Dose rate 3 Gy/ Minutes

[64]



*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*



**Fig 7 First order plot for the Fluorescence spectra of R6G - AuNPs + 2- ME + ·OH. Dose rate 3 Gray/Minutes**

[65]

**39. Knoevenagel condensation catalyzed by triethanolamine***Wesleyan Journal of Research*, Vol.14 No.24 (September 2021)**KNOEVENAGEL CONDENSATION CATALYZED BY TRIETHANOLAMINE**C. D. Bhenki<sup>1,2\*</sup>, S. S. Karhale<sup>1,3</sup>, T. S. Thopate<sup>4</sup>, K. N. Patil<sup>5</sup>, M. A. Patil<sup>6</sup>, V. B. Helavi<sup>1</sup><sup>1</sup>Department of Chemistry, Rajaram College, Kolhapur, (M.S.), India.<sup>2</sup>Department of Chemistry, Shri S. H. Kelkar College, Devgad, Sindhudurg, (M.S.), India.<sup>3</sup>Department of Chemistry, Karmaveer Bhaurao Patil Mahavidyalaya (Autonomous), Pandharpur, Solapur, (M.S.), India<sup>4</sup>Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar (M.S.), India<sup>5</sup>Department of Chemistry, Dr. Ghali College, Gadhinglaj, (M.S.), India<sup>6</sup>Department of Chemistry, Sanjay Ghodawat University Kolhapur (M.S.), India

\*Corresponding author E-mail: cdbhenki@gmail.com

**ABSTRACT**

An efficient and rapid green procedure has been developed for Knoevenagel condensation of substituted aromatic aldehydes and malononitrile using triethanolamine (TEOA) as an organocatalyst and ethanol as solvent at room temperature with good to excellent yield. Cleaner reaction profile, recyclable catalysts, practical simplicity, no use of hazardous organic solvents, metal-free environment are some remarkable features of this method.

**Keywords:** Green procedure, Room temperature, Metal-free reaction, Organocatalyst, Knoevenagel condensation.

**Article History**

\* Received: 22/08/2021; Accepted: 09/09/2021

Corresponding author: C. D. Bhenki

**1. INTRODUCTION**

In the context of green chemistry, there is always a need for the development of new processes that are environmentally benign, have high atom economics, and are high yielding [1]. Considering the intensive impact of increasing environmental pollution on living systems, developing chemical processes using more environmentally acceptable chemicals, solvents, catalysts, atom efficient procedures, and new energy inputs have been introduced as subjects of innovation in green chemistry. A significant part of this innovation is avoiding or minimizing the use of transition metals in chemical processes, since they are often toxic and difficult to dispose of properly in large quantities. Due to contamination of the final product with transition metals, the separation of the product becomes difficult. The presence of transition metals has harmful side effects on health nowadays [2]. The unexpected catalytic activity for the carboxylative cyclization of propargylic amines with CO<sub>2</sub>, Triethanolamine has been reported for experimental and theoretical study. TEOA is a cheap, water soluble, metal-

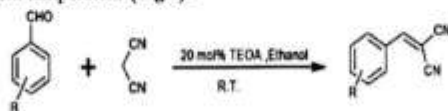
*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

free, biodegradable, commercially available, and recyclable catalyst [3]. The most important feature of this reagent is, it is soluble in water and the resultant solution is basic. Furthermore, the reagent is non-toxic, biodegradable, inexpensive, and readily available at an extremely low cost. These parameters were attractive for us to test the feasibility of TEOA as a novel basic, organocatalyst in the Knoevenagel condensation. The metal-free catalytic process can reduce the cost and avoid the pollution caused by metals, and is thus regarded as the greener process.

Knoevenagel condensation is useful to generate a variety of intermediates that are used in the synthesis of pharmaceutical precursors; because of this, Knoevenagel condensation has been extensively studied by researchers. Scientists, and academicians are still inventing novel methods and catalysts for Knoevenagel condensation [4]. Products of this reaction are  $\alpha, \beta$ -unsaturated compounds, which have been widely used as final substances or intermediates in the synthesis of fine chemicals [5], pharmaceuticals [6], natural products [7], and agrochemicals [8].

Consequently, many methods for the synthesis of these compounds have been reported including the use Ni(NO)<sub>2</sub> [9], Pb(II)MOF [10], ammonium acetate [11], Copper [12], Zirconium oxide [13], Calcium ferrite [14], Choline chloride/Urea [15]. Each of the above methods has its own merits, while some methods have been associated with drawbacks such as prolonged reaction time, tedious catalyst preparation, workup, poor product yields, effluent pollution, long reaction times, unavailability, toxic catalyst, and vast employment of hazardous organic solvents, which is significantly harmful to the environment. Consequently, there is a scope to search for alternative methods for Knoevenagel condensation which are both high efficiency and environmentally friendly. Therefore, the development of new organocatalytic processes that can operate under the conditions of room temperature, low pressure, and a metal-free environment is an urgent task. As a class of low-cost and biodegradable base, alkanol amines have been used in a wide variety of industrially important processes such as adhesives, natural gas stripping, acid neutralization, surfactants paint stripping, and derivatives in drug formulations, TEOA was shown to be a highly efficient catalyst. Moreover, the recovery of the catalyst from the reaction system is carried and then it is reused without obvious activity loss.

Thus, in view of the importance of Knoevenagel condensation, the development of a simple, efficient, and versatile method for the Knoevenagel condensation is an active area of research and there is a scope for further improvement towards higher product yields using milder reaction conditions. Several methods are reported on the Knoevenagel condensation, still, there is a need to develop a new methodology that matches the green chemistry protocols. As a continuation of our research devoted to the development of green chemistry and one-pot synthesis of various heterocyclic compounds [16-19], herein, we report a rapid and green procedure for the Knoevenagel condensation via a one-pot reaction of substituted aromatic aldehydes and malononitrile in the presence of TEOA as a catalyst in ethanol at room temperature (Fig.1).



[21]

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

**Fig.1. Knoevenagel condensation of aromatic aldehydes with malononitriles**

**2. MATERIAL AND METHODS**

**2.1. Experimental**

Triethanolamine (Spectrochem), aromatic aldehydes (Spectrochem and Thomas Baker), and malononitrile (Thomas Baker) were used as received. All the reactions were carried out under an open atmosphere in dried glassware. Using a hot paraffin bath the melting points of all synthesized compounds were recorded and are uncorrected. The NMR spectra were recorded on a Bruker Avance (400 MHz for  $^1\text{H}$  NMR and 100 MHz for  $^{13}\text{C}$  NMR) spectrometer using  $\text{CDCl}_3$  as solvent using Tetramethylsilane (TMS) as an internal standard. Chemical shifts ( $\delta$ ) and coupling constants ( $J$ ) are expressed in parts per million (ppm) values and in hertz (Hz) respectively with the TMS as an internal reference.

**2.2. General Procedure for the Knoevenagel Condensation**

To a well stirred solution of an aromatic aldehyde (1 mmol), malononitrile (1 mmol) in ethanol (5 mL) was added TEOA (20 mol %), and stirring was continued at ambient temperature for 10 -30 min. The Reaction products formation was monitored by TLC. After completion of the reaction, the reaction mixture often solidifies in the round bottom flask. The solid mixture was filtered and washed with cold water to remove the catalyst, and then dried to obtain the products. In general, for solid product no further purification was required. All the products were previously reported, and were characterized by melting point determination,  $^1\text{H}$  NMR, and  $^{13}\text{C}$ MR spectroscopy.

**2.3. Spectral data of representative compounds**

2-(4-methoxyphenylmethylene)malononitrile (Table 3,4d)

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.02 (d, 2H, Ar H), 7.93 (d, 2H, Ar H), 7.68 (s, 1 H), 3.94 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  55.83, 78.54, 113.37, 114.46, 115.16, 124.04, 133.48, 158.90, 164.85.

2-(2-furylphenylmethylene)malononitrile (Table 3,4l)

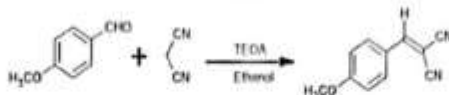
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.78 (d, 1H, Ar H), 7.32 (d, 1H, Ar H), 6.84 (t, 1 H, Ar H), 7.53 (s, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  112.67, 113.89, 114.47, 123.80, 143.22, 148.07, 149.69.

**3.RESULT AND DISCUSSION**

The metal-free organocatalyzed Knoevenagel condensation by the reaction of aryl aldehyde and malononitrile is one of the effective green catalytic synthetic protocol. At a first step, to find the best optimal reaction conditions, condensation of 4-methoxybenzaldehyde (1 mmol) and malononitrile (1 mmol) was chosen as the model reaction (Fig.2).

[22]

Wesleyan Journal of Research, Vol.14 No.24 (September 2021)



**Fig.2. Knoevenagel condensation of 4-methoxybenzaldehyde with malononitrile catalyzed by TEOA**

To optimize the reaction conditions, we have studied the effect of different solvents and amount of the incorporated catalyst and the reaction temperature on the model reaction of 4-methoxy benzaldehyde and malononitrile. Initially, a model reaction of 4-methoxy benzaldehyde and malononitrile, was carried out at room temperature in the presence of TEOA (30 mol %) as a catalyst to obtain the corresponding product, using different solvents. Moreover, we have tested the effects of various solvents for Knoevenagel condensation. Among the screened solvent systems, ethanol was found to be the solvent of choice for the Knoevenagel condensation. The comparative result using different solvents are summarized in Table 1 and it was found that a brief screening of solvent showed that chloroform, methanol, acetonitrile were less effective than ethanol. Ethanol is a greener, economical non-toxic, relatively less expensive solvent, and efficient solvent for the present protocol.

**Table 1: Optimization of the reaction conditions using different solvents.<sup>a</sup>**

Entry	Solvent	Catalyst	Yield (%) <sup>b</sup>
1	Chloroform	TEOA	50
2	Acetonitrile	TEOA	68
3	Methanol	TEOA	78
4	Ethanol	TEOA	92

<sup>a</sup>Reaction conditions: 4-methoxybenzaldehyde (1 mmol), malononitrile, and TEOA (30 mol%) in solvent (5 mL) at given temperature, <sup>b</sup> Isolated yield.

After we came to know that the reaction performed in ethanol at room temperature, is the best reaction condition. Next, we optimized the quantity of catalyst required for the reaction. There is only a trace amount of product when the reaction is proceeds in the absence of a catalyst. Then we started from 5 mol% of TEOA catalyst, when the reaction could be completed in 30 min with 60% yield. In this way catalyst amount was increased up to 30 mol%, with an increment of each reaction. It was observed that with an increase in the amount of catalyst loading, a gradual increase in the yield of the desired product was noticed. No improvement in yield was observed even by increasing the amount of catalyst. It was also observed that the higher amount of catalyst did not improve the results. The optimum amount of catalyst was found to be 20 mol% at room temperature conditions. The comparative result using different amounts of catalyst are summarized in Table 2.

**Table 2: Effect of the amount of TEOA on the yield of the model reaction.<sup>a</sup>**

Entry	Catalyst (mol %)	Time (min.)	Yield (%) <sup>b</sup>
1	No catalyst	20	Trace
1	05	20	60

[23]

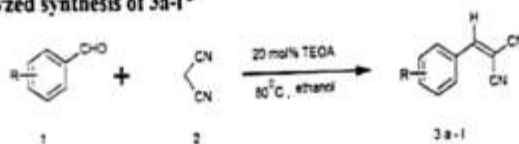
Wesleyan Journal of Research, Vol.14 No.24 (September 2021)

2	10	20	72
3	15	20	80
4	20	20	92
5	30	20	92

**\*Reaction conditions:** 4-methoxy benzaldehyde (1 mmol), malononitrile, and TEOA (20 mol%) in ethanol (mL) at room temperature, <sup>b</sup> Isolated yield.

The generality of this process was demonstrated by the wide range of substituted and structurally diverse aryl aldehydes carrying either electron-withdrawing or electron-donating groups, which were used for Knoevenagel condensation of aryl aldehydes and malononitrile using a TEOA as an organocatalyst in an environmentally benign solvent. Under optimized conditions the scope and efficiency of the process were explored. We have examined the reaction by various aromatic aldehydes containing electron-withdrawing, electron-donating groups as reactants gave the expected results with good to excellent yields. The results are listed in Table 3.



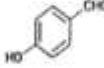
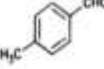
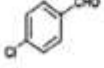
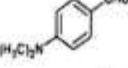


Table 3: TEOA catalyzed synthesis of 3a-l\*



Entries	Aryl aldehyde	Product	Time (min)	Yield <sup>b</sup> %	Mp (°C) (Reported)	Ref.
1		4a	10	98	81-82 (83-84)	20
2		4b	10	94	160-162 (159-160)	23
3		4c	15	98	100-102 (100-101)	21
4		4d	20	92	112-113 (114-115)	23

[24]

Wesleyan Journal of Research, Vol.14 No.24 (September 2021)

5		4e	15	90	95-97 (96-98)	22
6		4f	15	92	153-155 (153-154)	22
7		4g	30	90	184-185 (183-184)	21
8		4h	30	94	135-136 (133-134)	20
9		4i	25	94	158-160 (159-160)	21
10		4j	25	92	180-181 (180-82)	22
11		4k	30	90	98-100 (101-103)	22
12		4l	20	94	70-72 (68-69)	20


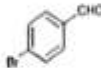
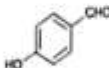
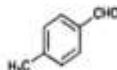
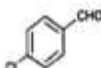
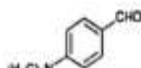


**\*Reaction conditions:** Arylaldehyde (1 mmol), malononitrile, and TEOA (20 mol%) in ethanol(5 mL) at reflux temperature, <sup>b</sup> Isolated yield

From Table 3, we observed that the condensation of aldehydes with electron-withdrawing groups such as -Cl and -NO<sub>2</sub> in the aromatic ring, with active methylene compounds, could be carried out in relatively shorter times and higher yields than electron-donating groups such as -N(CH<sub>3</sub>)<sub>2</sub>, -OH and -OCH<sub>3</sub>. The advantage of the procedure is milder reaction conditions, better yield, shorter reaction time, and easier workup.

A plausible mechanism for the Knoevenagel condensation using TEOA in ethanol is outlined in Scheme 3. Based on this mechanism; TEOA is an effective catalyst for the formation of olefin I, readily prepared by Knoevenagel condensation of aryl aldehyde and active methylene compound [24, 25]. Due to the strong basicity of TEOA and hydrogen bond formed between the hydroxyl group of the side chain of TEOA and carboxyl moiety of aldehydes, the dual activation of methylene ingredients and aldehydes facilitate the formation of a Knoevenagel condensation product I (Fig.3).

[25]

Wesleyan Journal of Research, Vol.14 No.24 (September 2021)

5		4e	15	90	95-97 (96-98)	22
6		4f	15	92	153-155 (153-154)	22
7		4g	30	90	184-185 (183-184)	21
8		4h	30	94	135-136 (133-134)	20
9		4i	25	94	158-160 (159-160)	21
10		4j	25	92	180-181 (180-82)	22
11		4k	30	90	98-100 (101-103)	22
12		4l	20	94	70-72 (68-69)	20

\*Reaction conditions: Arylaldehyde (1 mmol), malononitrile, and TEOA (20 mol%) in ethanol(5 mL) at reflux temperature. <sup>b</sup> Isolated yield

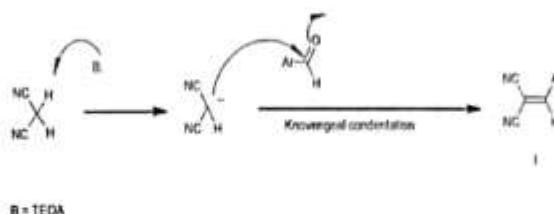
From Table 3, we observed that the condensation of aldehydes with electron-withdrawing groups such as -Cl and -NO<sub>2</sub> in the aromatic ring, with active methylene compounds, could be carried out in relatively shorter times and higher yields than electron-donating groups such as -N(CH<sub>3</sub>)<sub>2</sub>, -OH and -OCH<sub>3</sub>. The advantage of the procedure is milder reaction conditions, better yield, shorter reaction time, and easier workup.

A plausible mechanism for the Knoevenagel condensation using TEOA in ethanol is outlined in Scheme 3. Based on this mechanism; TEOA is an effective catalyst for the formation of olefin I, readily prepared by Knoevenagel condensation of aryl aldehyde and active methylene compound [24, 25]. Due to the strong basicity of TEOA and hydrogen bond formed between the hydroxyl group of the side chain of TEOA and carboxyl moiety of aldehydes, the dual activation of methylene ingredients and aldehydes facilitate the formation of a Knoevenagel condensation product I (Fig.3).

[25]



Wesleyan Journal of Research, Vol.14 No.24 (September 2021)



**Fig.3. A Plausible mechanism for Knoevenagel condensation catalyzed by TEOA**

The possibility of recycling the catalyst was examined using the reaction of *p*-methoxybenzaldehyde and malononitrile under the optimized conditions, after establishing a general protocol for the Knoevenagel condensation. In this context, we summarized that catalyst recovery for possible reuse would be tedious, as well as expensive, because the catalyst is completely soluble in the reaction medium, hence we checked the reusability of the reaction medium. After the isolation of the product by filtration, the filtrate obtained were reused for the next reaction. Aryl aldehyde and malononitrile was directly added into the filtrate without adding further catalyst and solvent, resulted in the formation of the expected product with slight loss of catalytic activity at least up to the fifth run. Only a slight decrease in the yields of the expected product was observed (94% - 85%). The reaction medium was reused five times in the Knoevenagel condensation reaction of 4-methoxybenzaldehyde and malononitrile with a slight loss of catalytic activity was noticed from the 5<sup>th</sup> time of reuse. Therefore, catalyst can be reused for at least five consecutive runs for the developed protocol as shown in Table 4.

**Table 4: Reusability of TEOA for the yield of the model reaction.<sup>a</sup>**

No. of Cycle	Time (min)	Yield (%) <sup>b</sup>
1	20	94
2	20	92
3	20	90
4	20	88
5	20	85

<sup>a</sup>Reaction conditions: *p*-Nitrobenzaldehyde (1 mmol), malononitrile, and TEOA (20 mol%) in ethanol(5 mL) at room temperature. <sup>b</sup> Isolated yield

#### 4. CONCLUSION

In summary, we have developed an environmentally friendly green procedure for the Knoevenagel condensation by the reaction of substituted aromatic aldehydes with malononitrile using TEOA as an organocatalyst, in environmentally benign solvent ethanol at room temperature. The current strategy offers several advantages such as high yields, purity of products, low amount of catalyst, safe, cheap, shorter reaction time, environmentally benign solvent, an easy experimental workup procedure, fully green procedure, and clean reaction profile. The reactions using ethanol as solvent, at room temperature conditions, and metal-free

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

environment allowed Knoevenagel condensation reactions to be performed in a very simple, clean, and green manner.

#### 5. ACKNOWLEDGEMENTS

The author will like to thank Principal, Shri S. H. Kelkar College of Art's, Commerce and Science, Devgad, Dist. Sindhudurg, for encouragement and Head, Department of Chemistry, Rajaram College, Kolhapur for providing necessary facilities. We are grateful to the Department of Chemistry, Solapur University, Solapur, Maharashtra, India, for providing spectral data.

#### 6. REFERENCES

1. Anastas P. T. & Warner J. C., (1998) *Green Chemistry: Theory and Practice*, Oxford University Press, New York.
2. Dekamin M. G & Eslami M., (2014) *Highly efficient organocatalytic synthesis of diverse and densely functionalized 2-amino-3-cyano-4H-pyrans under mechanochemical ball milling*. *Green Chem.* (16) 4914-4921.
3. Zhao Y., Qiu J., Li Z., Wang H., Fan M. & Wang J., (2017) *New Copper(I)/DBU Catalyst System for the Carboxylative Cyclization of Propargylic Amines with Atmospheric CO<sub>2</sub>: An Experimental and Theoretical Study*. *Chem. Sus. Chem.* (10) 2001-2007.
4. Jones, G., (2004) The Knoevenagel condensation. In: *Organic reactions*, Wiley, New York., (15) 204-599.
5. Dhakshinamoorthy A., Opanasenko M., Čejka J. & Garcia H., (2013) *Metal organic frameworks as heterogeneous catalysts for the production of fine chemicals* *Catal. Sci. Technol.* (3), 2509-2540.
6. Walker S.D., Borths C.J., DiVirgilio E., Huang L, Liu P., Morrison H., Sugi K., Tanaka, M., Woo J.C.S., & Faul M.M., (2011) *Development of a Scalable Synthesis of a GPR40 Receptor Agonist Org Process Res Dev.* (15) 570-580.
7. Jung J. C., Lim E., Lee Y., Min D., Ricci J., Park O.S. & Jung M., (2012) *Total Synthesis of Flocoumafen via Knoevenagel Condensation and Intramolecular Ring Cyclization: General Access to Natural Products Molecules.* (17) 2091-2102.
8. Gouda M.A. & Abu-Hashem A.A., (2012) *An eco-friendly procedure for the efficient synthesis of arylidinemalononitriles and 4,4'-(arylmethylene)bis(3-methyl-1-phenyl-1H-pyrazol-5-ols) in aqueous media*. *Green Chem Lett Rev.* (5) 203-209.
9. Sonawane J. P., Chaudhari S. B., Patil, S. S. & Sonawane M.V., (2015) *A Facile and Efficient Green Protocol for the Knoevenagel Condensation in Aqueous Media IJCPS*, (4), 60-63.
10. Almasi, M.; Zelenak, V.; Opanasenko, M.V.; Čejka, J., (2018) *Efficient and Reusable Pb(II) Metal-Organic Framework for Knoevenagel Condensation*. *Cat. Lett.* (148) 2263-2273.

[27]

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

11. Bhuiyan M. M. H., Hossain M.I., Alam M. A. & Mahmud M.M., (2012) Microwave Assisted Knoevenagel Condensation.Synthesis and Antimicrobial Activities of Some Arylidene-malononitriles, *Chemistry Journal* (2) 31-37.
12. Schneider E.M., Zeltner M., Kranzlin N., Grass R. N., Stark W. J., (2015) Base-free Knoevenagel condensation catalyzed by copper metal surfaces. *Chem. Commun.* (51), 10695—10698.
13. Heravi M.R.P.& Piri S., (2013) Efficient Knoevenagel Condensation Reactions Catalyzed by Activated Gel Zirconium(IV) Oxide. *Journal of Chemistry* Article ID 652805.
14. Pippal P. & Singh P. P., (2017) Calcium ferrite, an efficient catalyst for Knoevenagel condensation(A green approach) . *Orient. J. Chem.* (33) 1736-1743.
15. Harishkumar H. N., Mahadevan K. M., Kiran Kumar H. C.& Satyanarayan N. D.(2011) *Org. Commun.* (4) 26-32.
16. Karhale S., Patil K.,Bhenki C. Rashinkar, G.& Helavi V., (2016) Zirconocene catalyzed synthesis of 2-substituted benzimidazole derivatives. *Res. Chem. Intermed.* (42) 7257-7268.
17. Karhale, S., Survase D., Bhat R., Ubale P. & Helavi V.(2017) A practical and green protocol for the synthesis of 2,3-dihydroquinazolin-4(1H)-ones using oxalic acid as organocatalyst . *Res. Chem. Intermed.* (43) 3915 -3924.
18. Bhenki C., Karhale S.& Helavi V., (2016) 5-sulfosalicylic acid as an efficient organocatalyst for environmentally benign synthesis of 2-substituted benzimidazoles *Iran. J. Catal.* (6) 409 -313.
19. Karhale S., Bhenki C., Rashinkar G.& Helavi V., (2017) Covalently anchored sulfamic acid on cellulose as heterogeneous solid acid catalyst for the synthesis of structurally symmetrical and unsymmetrical 1,4-dihydropyridine derivatives *New J. Chem.* (41) 5133-5141.
20. Xu D-Z., Liu Y., Shi S.& Wang Y., (2010) A simple, efficient and green procedure for Knoevenagel condensation catalyzed by [C4dabco][BF4] ionic liquid in water *Green Chem.* (12), 514-517.
21. Zhang J., Jiang T., Han B., Zhu A.& Ma X., (2006) Knoevenagel Condensation Catalyzed by 1,1,3,3-Tetramethylguanidium Lactate. *Synth. Commun.* (36), 3305-3317.
22. Rong L., Li X., Wang H., Shi D., Tu S.& Zhuang, Q., (2006) Efficient Green Procedure for the Knoevenagel Condensation under Solvent-Free Conditions *Synth. Commun.* (36) 2407-2412.
23. Keityhell S., Moirangthem N.& Laitonjam W. S., (2015) A simple and efficient procedure for the Knoevenagel condensation catalyzed by [MeHMTA]BF<sub>4</sub> ionic liquid, *Ind. J. Chem. Sec. B.* (54B) 1157-1161.

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

---

24. **Hu H., Qiu F., Ying A., Yang J.& Meng H., (2014) An Environmentally Benign Protocol for Aqueous Synthesis of Tetrahydrobenzo[b]Pyrans Catalyzed by Cost-Effective Ionic Liquid. *Int. J. Mol. Sci.*(15) 6897-6909.**
25. *Khoraamabadi-zad A., Azadmanesh M., Karamian R., Asadbegy M.& Akbarib, M., (2014) Triethanolamine as an inexpensive and efficient catalyst for the green synthesis of novel 1H-pyrazolo[1,2-a]pyridazine-5,8-diones under ultrasound irradiation in water and their antibacterial activity. *RSC Adv.* (4) 47721–47725.*

## 40. Boronsulphonic acid-catalyzed an efficient synthesis and antibacterial study of N-substituted phenyl maleimides



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

### BORON SULFONIC ACID-CATALYZED AN EFFICIENT SYNTHESIS AND ANTIBACTERIAL STUDY OF N-SUBSTITUTED PHENYL MALEIMIDES

**T. S. Thopate**

Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar 414302 (MS) India,  
[thopatenc1@rediffmail.com](mailto:thopatenc1@rediffmail.com)

**C. D. Bhenki**

Department of Chemistry, S. H. Kelkar College, Devgad, Sindhudurg, (MS), India

**R. N. Deshmukh**

Department of Botany, New Arts, Commerce and Science College, Parner, Ahmednagar 414302 (MS) India

**S. B. Katariya**

Department of Chemistry, SIES College, Sion, Mumbai 400 022, (MS), India

#### Abstract:

A series of N-substituted phenyl maleimide derivatives were synthesized using Boron Sulphonic Acid (BSA) in high yield at ambient temperature. All the synthesized compounds were characterized by IR, <sup>1</sup>H NMR, and <sup>13</sup>C NMR and evaluated for their antimicrobial activities against selected bacteria. All the compounds possess a broad spectrum of antimicrobial activity as compared with penicillin.

**Keywords:** Antibacterial activity, Boron Sulfonic Acid, N-substituted phenyl maleimide.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: T. S. Thopate

#### 1. Introduction

The multistep synthesis of natural products and useful organic compounds is a vital field of organic chemistry (1-2). N-Substituted maleimide derivatives (RMIs) and their polymers possess excellent thermal stability and these polymers have been reported for n type organic semiconducting materials as organic transistors (3-8). N-Substituted phenyl maleimide (NRPMI) is a class of functional polymer material modifiers. As a component of the heat resistant copolymer, it can significantly increase heat resistance of PVC, ABS, MMA, St-AN – MMA Resin, etc. Accordingly, it is widely used for the preparation of heat resistant resin, coating adhesives, photosensitive resins, rubber vulcanization agent of reform, insulating paint, etc. (9-10). In addition, important biological properties concerning bactericidal, fungicidal, and anticancer have been reported for some imides (11-14). There have been many methods in previous literature about the synthesis of N-phenyl maleimide (15-20).

[99]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Among all the methods, the acetic anhydride method with acetic anhydride and azeotropic dehydration method with organic solvent is most used (21-23).

Kiasat et al. has introduced Boron sulfonic acid (BSA) as a novel solid acid catalyst for useful organic transformations (24). Recently, we have reported the synthesis of N-phenyl maleimide using Silica Sulfuric Acid (SSA) as a reusable catalyst (25). Here, we wish to report the use of Boron Sulfonic Acid (BSA) in the synthesis of some new N-Substituted phenyl maleimide and screened for their antibacterial activities against two reference bacteria, viz. *Escherichia coli* and *Staphylococcus aureus*.

## 2. Material and Methods (Experimental)

Melting points were uncorrected as taken in open capillaries. The compounds was used as received. IR spectra ( $\text{cm}^{-1}$ ) were recorded on Bruker Avance 27 FTIR using KBr disc as a sample,  $^1\text{H}$  MNR and  $^{13}\text{C}$  NMR spectra were recorded on Bruker 500 HZ spectrometer in a  $\text{CDCl}_3$  or  $\text{DMSO-d}_6$  solvents using TMS as reference. The synthesized compounds were screened for their antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* by filter paper disc technique.

### Synthesis of Maleamic Acid (3a):

To a stirred solution of maleic anhydride (0.590 g, 6 mmol) and BSA (0.100 g, 0.033 mmol) in ethanol (10 mL) was added the solution of aniline (0.470 g, 5 mmol) in ethanol (5 mL). The reaction mixture was stirred for 20 min under nitrogen at room temperature. The reaction was monitored by TLC. Ice-cold water (30 mL) was added furnished almost pure pale yellow powder product. Further, it was filtered, washed with ice-cold water, and recrystallized by ethanol and the yield was 98.3%.

### Synthesis of N-substituted phenyl maleimide (4a):

To a stirred solution of maleamic acid (5 mmol) in ethanol (10 mL) was added BSA (0.500 g, 0.165 mmol) and it was stirred for 35 min. under nitrogen at room temperature. The reaction was monitored by TLC and on completion of reaction ice-cold water (30 mL) was added furnished almost the pure product. It was filtered, and washed the crystallized product with ice-cold water (50 mL) was added furnished almost the pure product. Further, it was washed with a saturated solution of  $\text{NaHCO}_3$  results the target product (Yield 97.2 %).

## 3. Results:

The structure of NRPMI is given in Fig.1, which represents the reaction of NRPMI. The N-substituted phenyl maleimide derivatives were synthesized through ring opening addition of maleic anhydride and substituted aniline to give maleamic acid derivatives 3 and followed by cyclodehydration to give N-substituted phenyl maleimide 4.

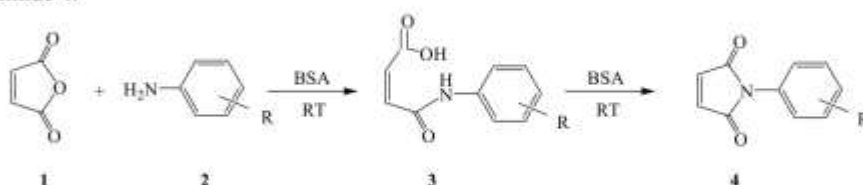


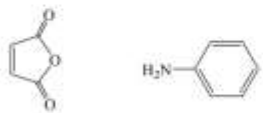
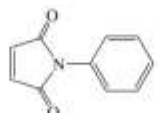
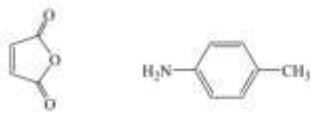
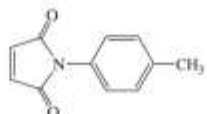
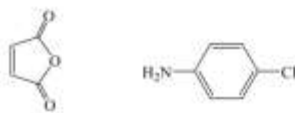
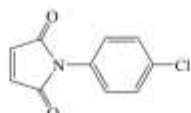
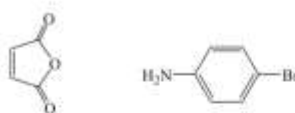
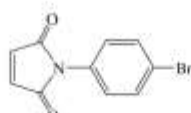
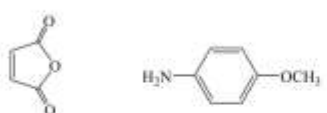
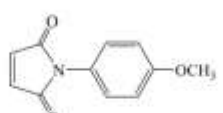
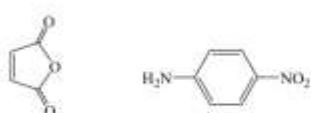
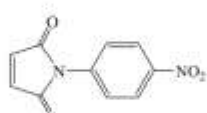
Fig.1. Reaction of N-RPMI

[100]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

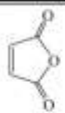
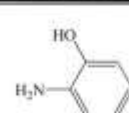
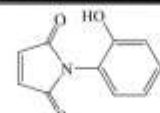
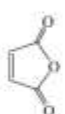
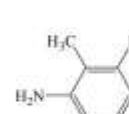
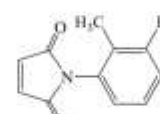
The composition and properties of the corresponding products are summarized in **Tables-1** and **Table-2**. The compound **4** can be easily synthesized using BSA in catalytic amount and get a higher yield of desired product at ambient temperature. However, substituted anilines show the effect on yield and time required for the completion of reaction. On the whole, the electron-donating group shows a shorter reaction time and excellent yield of the desired product and *vice versa*.

**Table-1. BSA catalyzed synthesis of Substituted N-RPMI**

Entry	Reactants	Product	Time (min.)	Yield <sup>a</sup> (%)
4a			35	97.2
4b			30	98.4
4c			40	91.4
4d			40	92.6
4e			25	98.6
4f			90	82.3

[101]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

4g				40	90.6
4h				35	89.7

Yield<sup>a</sup> is the isolated yield of the product and reaction time is in min.

#### Spectral data of some representative N-Substituted Phenyl Maleimides:

Compound	Spectral data
4a	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 1307.79(C-N), 1708.99 (CO)</p> <p><b><sup>1</sup>H NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 6.38 (s, 2H, imide), 7.28 (t, 1H, Ph), 7.36 (d, 4H, Ph)</p> <p><b><sup>13</sup>C NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 160.35 (CO), 131.25 (C-N), 126.58(C), 127.41(C), 126.62(C)</p>
4b	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 640.62 (C-Br), 1721.01(CO), 1322.08 (C-N)</p> <p><b><sup>1</sup>H NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 6.90 (s, 2H, imide), 7.62(d, 2H, Ph), 7.31 (d, 2H, Ph)</p> <p><b><sup>13</sup>C NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 169.10 (CO), 132.31 (C-N), 130.29 (C), 127.39 (C), 121.62 (C)</p>
4c	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 688.43(C-Br), 1717.88 (CO), 1324.71 (C-N)</p> <p><b><sup>1</sup>H NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 2.15(s, 3H, CH<sub>3</sub>), 6.99 (s, 2H, imide), 7.44 (d, 1H, Ph), 7.51 (d, 1H, Ph),</p> <p><b><sup>13</sup>C NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 162.10 (CO), 133.32 (C-N), 131.38 (C), 128.57(C), 125.52 (C), 126.62(C), 15.11(CH<sub>3</sub>)</p>
4d	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 684.34(C-Br), 1716.06 (CO), 1351.36(C-N)</p> <p><b><sup>1</sup>H NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 2.15 (s, 3H, CH<sub>3</sub>), 6.38 (s, 2H, imide), 7.29 (s, 1H, Ph), 7.65(s, 1H, Ph),</p> <p><b><sup>13</sup>C NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 160.51(CO), 137.22 (C), 133.82(C), 133.23(C-N), 123.25 (C), 116.418(C), 14.35 (CH<sub>3</sub>).</p>
4e	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 1377.7 (C-N), 1575.11 (N=O), 1725.03 (CO)</p> <p><b><sup>1</sup>H NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 6.93 (s, 2H, imide), 7.79 (d, 2H, Ph), 8.19 (d, 2H, Ph),</p> <p><b><sup>13</sup>C NMR</b> (CDCl<sub>3</sub>), <math>\delta</math>: 161.84(CO), 143.38(C), 137.55(C-N), 128.21(C), 123.59(C)</p>
4f	<p><b>IR</b>, <math>\tilde{\nu}</math> /<math>\text{cm}^{-1}</math>: 682.14 (C-Cl), 1345.09 (C-N), 1711.24 (CO)</p>

[102]



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

<sup>1</sup>H NMR (CDCl<sub>3</sub>), δ: 6.93 (s, 2H, imide), 7.89 (s, 2H, Ph), 7.36 (d, 1H, Ph), 7.24 (d, 1H, Ph)

<sup>13</sup>C NMR (CDCl<sub>3</sub>), δ: 162.75 (CO), 134.54 (C), 133.64 (C-N), 133.21 (C), 130.24 (C), 130.24(C), 127.84 (C), 126.45(C).

#### 4. Discussion (Antibacterial Study):

The synthesized compounds were screened for their antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* by filter paper disc technique, using penicillin as a standard. The bacteria were grown in the sterile nutrient broth 24 hours before the experiment. The culture medium (about 0.1 mL) was inoculated on the nutrient agar plate uniformly. The test compounds were prepared to 10 mg L<sup>-1</sup>, using N, N-Dimethylformamide (DMF) as a solution, for it doesn't have any antibacterial activity. Then 0.1 mL of this solution was added to the plate using a micropipette. The incubation of plates were done at 37 °C for 24 h. The zone of inhibition around the papers was checked and measured.

#### Antibacterial Activities Evaluation:

The antibacterial activities are presented in Table 4. As shown in Table 4, we can see that all the compounds have a certain degree of antibacterial activity on account of their common structure the Sub amide ring. But the effect of N-substituted phenyl Maleimide on Gram positive bacteria is better than that on Gram negative bacteria. So we can conclude that maybe the antibacterial mechanism of these compounds lies in that they can penetrate the cell wall of Gram positive bacteria more easily. In addition, compared with penicillin, N-substituted phenyl Maleimide derivatives have a better antimicrobial activity to both Gram positive bacteria and gram negative bacteria. In a word, maleimide can be considered a nonspecific toxic compound. Moreover, this inexpensive library of N-substituted phenyl maleimides could be interesting candidates for the formulation of new antibacterial agents.

**Table-2. Antibacterial activity of N-Substituted Phenyl Maleimides.**

Compound	<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>
4a	++	+++
4b	++	+++
4c	+	++
4d	++	++
4e	++	+
4f	+	+
4g	+++	++
4h	+++	+++
penicillin	+	++++

Zone of inhibition diameter in mm (% inhibition): +, 6-10 (26%-45%); ++, 10-14 (46 %-65 %); +++, 14-18 (66 % -83 %); +++++, 18-22 (84 % -100 %). Inhibition percentages are relative to the zone of inhibition of the most active compound (22 mm) with 100 % inhibition.

[103]

**5. Conclusions:**

Eight new N- substituted phenyl Maleimide derivatives were synthesized with a high yield. Through the antibacterial test against *Escherichia coli* and *Staphylococcus aureus*, we found that N-substituted phenyl Maleimide derivatives have a broad spectrum antimicrobial activity to both Gram positive bacteria and gram negative bacteria, and it could be interesting candidates for the formulation of new antibacterial agents.

**Acknowledgments:**

One of the authors wishes to thank the Korea Research Institute of Chemical Technology (KRICT), the Republic of South Korea for the Post-Doctoral Fellowship, and the financial support and Trustees of parent Institutes, AJMVP Samaj, Ahmednagar.

**References:**

1. Taber D.F., (2004) Organic Chemistry Highlights [www.organic-chemistry.org/Highlights](http://www.organic-chemistry.org/Highlights)
2. a) Nicolaou, K.C.; Sorensen, E.J., (1996) Classics in Total Synthesis: Targets, Strategies, Methods; Wiley-VCH: New York, NY.  
b) Nicolaou, K.C.; Snyder, S.A., (2003) Classics in Total Synthesis II: More Targets, Strategies, Methods; Wiley-VCH: Chichester.  
c) Nicolaou, K.C.; Chen, J.S., (2011) Classics in Total Synthesis III: Further Targets, Strategies, Methods; Wiley-VCH: Hoboken, NJ.
3. Katz, H. E., Lovinger, A. J., Johnson, J., Llock, C., Siegrist, T., Li, W., Lin, Y. Y. & Dodabalapur, A., (2000) A soluble and air-stable organic semiconductor with high electron mobility. *Nature*, 404, 478–481.
4. Malenfant, P. R. L., Dimitrakopoulos, G. J. D., Kosbar, L. L., Graham, T. O., Curioni, A. & Andreoni, W., (2002) N-type organic thin-film transistor with high field-effect mobility based on a N, N'-dialkyl-3,4,9,10-perylene tetracarboxylic diimide derivative. *Appl. Phys. Lett.* 80, 2517–2519.
5. Unni, K. N. N., Pandey, A. K., Alem, S. & Nunzi, J. M., (2005) Ambipolar organic field-effect transistor fabricated by co-evaporation of pentacene and N, N-ditridecylperylene- 3,4,9,10-tetracarboxylic diimide. *Chem. Phys. Lett.* 421, 554–557.
6. Chen, H. Z., Shi, M.- M., Aernouts, T., Wang, M., Borghs, G. & Heremans, P., (2005) A novel organic n-type material: fluorinated perylene diimide. *Sol. Energy Mater. Sol. Cells* 87, 521–527.
7. Letizia, J. A., Salata, M. R., Tribout, C. M., Facchetti, A., Ratner, M. A. & Marks, T. J., (2008) N-Channel polymers by design: optimizing the interplay of solubilizing substituents, crystal packing, and field-effect transistor characteristics in polymeric bithiopheneimide semiconductors. *J. Am. Chem. Soc.* 130, 9679–9694.
8. Guo, X. & Watson, M. D., (2008) Conjugated polymers from naphthalene bisimide. *Org. Lett.* 10, 5333–5336.
9. Masayuki, O., Motoo, K., Hikotada, T., & Nobuhito, K., (1983) N-Substituted phenyl maleimides. US 4400521.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

10. Balwant, S., & Robert, J.T., (1994) Heat resistant resin composition comprising polymers of N-(substituted) maleimides and improved process for the preparation of said maleimide. US 5314950.
11. Wang, J. J., Lee, J.Y., Chen Y.C., & Chern, Y.T., (2006) The Antitumor Effect of a novel Differentiation Inducer, 2, 2-Bis (4-(4-amino-3-hydroxyphenoxy) phenyl) adamantane (DPA), in Combinatory Therapy on Human Colon Cancer. *International Journal of Oncology*. 28 (4), 1003-1012.
12. Machado, A. L., Lima, L. M., Araujo Jr., J. X., & Barreiro, E. J., (2005) Design, synthesis and antiinflammatory activity of novel phthalimide derivatives, structurally related to thalidomide, *Bioorg. Med. Chem. Lett.* 15 (4), 1169-1172.
13. Frederic, Z., Alain, V., Regis, L. G., Roger, L., Anne, G. M., & Danielle, S., (2002) Further studies on analgesic activity of cyclic imides. II *Farmaco*, 57 (5), 421-426.
14. Alaa, A. M., & Abdel, A., (2007) Novel and versatile methodology for synthesis of cyclic imides and evaluation of their cytotoxic, DNA binding, apoptotic inducing activities and molecular modeling study. *Eur. J. Med. Chem.* 42 (5), 614-626.
15. Chen, G. Q., Wu, Z. Q., Wu, J. R., Li, Z. C., & Li, F. M., (2000) Synthesis of alternating copolymers of N-substituted maleimides with styrene via atom transfer radical polymerization. *Macromolecules*, 33 (2), 232-234.
16. Dharam, P. J., Vikas, B., Birinder, J., Nalin, K., Sheetal, G., Ranju, B., Anja, P. & Rolf, W.H., (2005) Synthesis and study of some new N-substituted imide derivatives as potential anticancer agents. II *Farmaco*, 60 (4), 283-290.
17. Halberf, N.C., Clayinoni, Wilhehn, F. G., & Wilmington. (1964) Preparation of N-phenylene dimaleimide. US 3127414.
18. Frederic, Z., Regis, L. G., Roger, L., Danielle, S., Boris, L. & Alain, V., (2004) Syntheses, in vitro antibacterial and cytotoxic activities of a series of 3-substituted succinimides. II *Farmaco*, 59 (11), 879-886.
19. Frederic, Z., Alain, V., Regis, L. G., Roger, L., Anne, G. M., & Danielle, S., (2002) Synthesis and antimicrobial activities of N-substituted imides. II *Farmaco*, 57 (5), 421-426.
20. Matsuura, N., Kawasaki, K., (1985) Preparation of N-phenyl maleimide compound. JP 60100554.
21. Bastin L. D., Nigam M., Martinus S., Maloney J.E., Benyack L. L, Gainer B., (2019) Synthesis of substituted N-phenyl maleimides and use in a Diels–Alder reaction: a green multi-step synthesis for an undergraduate organic chemistry laboratory. *Green Chemistry Letters and Reviews*, 12, (2), 127-135.
22. Matuszak N., Muccioli G. G., Labar G., Lambert D. M., (2009) Synthesis and in Vitro Evaluation of N-Substituted Maleimide Derivatives as Selective Monoglyceride Lipase Inhibitors. *J. Med. Chem.* 52, 7410–7420.
23. Imamura K., Matsushima M., Yamabuki K., Oishi T., (2010) Synthesis and properties of N-substituted maleimides conjugated with 1, 4-phenylene or 2,5-thienylene polymers. *Polymer Journal* 42, 290–297.
24. Kiasat AR, Fallah-Mehrjardi M., (2008) B(HSO<sub>4</sub>)<sub>3</sub>: A Novel and Efficient Solid Acid Catalyst for the Regioselective Conversion of Epoxides to Thiocyanohydrins under Solvent-Free Conditions. *J. Braz. Chem. Soc.*, (19), 1595-1599.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

25. Thopate T. S., (2018) Silica Sulfuric Acid: An Efficient, Reusable, Solid Acid Catalyst for Synthesis of N-substituted phenyl maleimide. Indo Asian Research Reporter, III, V, 91-92.

## 41. An Assessment of Tourism Potential: A Case Study of Parner Tehsil, Ahmednagar



Wesleyan Journal of Research, Vol.14 No.11 (November 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

### AN ASSESSMENT OF TOURISM POTENTIAL: A CASE STUDY OF PARNER TAHSIL, DIST. AHMEDNAGAR(MS)

**Dr. Sambhaji M. Kale**

Dept. of Chemistry and Research Centre, New Arts, Commerce and Science College,  
Parner, Dist.- Ahmednagar(MS), Email: [sambhajikale@gmail.com](mailto:sambhajikale@gmail.com)

**Dr. Manohar R. Erande**

Dept. of Geography, Shri Mulikadevi Mahavidyalaya, Nighoj, Tal.- Parner, Dist.  
Ahmednagar(MS).

#### Abstract

Tourism has become a fashionable universal free time activity. Tourism has important contribution in sustainable development, economic upliftment and social benefits, if planned systematically. Since the last decade it has become a major thrust area in India to address the aforesaid issues, to utilize its wide variety of destination resources and also to optimize the level of financial involvement for developing tourist infrastructure in a constraint economic domain. Tourism industry in Maharashtra has a tremendous potential for growth, given the availability of basic infrastructure and the variety of tourist themes offered by various destinations in Maharashtra. Parner is one of the most famous cities of Southern Ahmednagar. Parner, in Ahmednagar, is situated at approximate distance of 40 to 42 km from Ahmednagar as well as 70 km from Pune. The present study aims to identify various determinants of tourism potential of the Parner Tahsil. The secondary data as well as personal interview was conducted from the tourist visited to Parner tahsil tourist place. It has been observed that, good accessibility, food facilities, road, and infrastructure facilities, other entertainment facility etc. attracts large number of tourist towards Parner. Now a day's Parner Tahsil had develop potential growth in tourism and economy.

**Keywords:** WTO, Tourism, Sustainable development, potential of growth.

#### Article History

\* Received: 09/11/2021; Accepted: 29/11/2021

Corresponding author: Dr. Sambhaji M. Kale

#### 1. Introduction

'The Vedic Indians had a great love for nature and animal life and the preservation of what nature has bestowed on us. There can be no better example of this love than the following Sanskrit mantra from the Atharvaveda.' Natural tourist centers are abundant in natural scenery and unique geographical features. It can be defined as 'responsible journey to natural areas which conserves the environment and improves the well being of local

[1]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

people'. Thus, ecotourism demands a responsible travel so that the impacts of ecological footprints are minimized and the benefits of this travel are passed on to the local people.

The Government of India has realized the importance of eco-tourism in the National Tourism Policy 2002. Government of Maharashtra has also followed the same by forest department. The researcher has choose the following natural tourist centers, they are - Bhandardara, Mula Dam, Kalsubai Pick, Nizameshwar, Randha fall, Harishchandragad, Ratangad, Shri Hari Hareshwar Devastan, Vrudheshwar, Pempari, Nighoj and Pravara Sangam-Toka.

'India is a vast land with varieties of villages that give us an ample scope for village tourism. As per 2001 Census, 74% of Indians live in 638,365 different villages. The size of these villages varies considerably. Most villages have their own temple, mosque or church, proving unity in diversity. The world Tourism organization (WTO) defines of the tourists "Travelling to and staying in places outside their environment for not more than one consecutive year for leisure, business and other purposes". Tourism has become fastest growing industry and popular global free time activity, develops job opportunities to the local people. Tourism also increases the foreign exchange and increase the standard of living (Shrivastava, 2011). There is no much difference in tourism and travel, in general both terms are used as synonyms (Nanthakumar *et al.*, 2008) Tourism industry in Maharashtra has a tremendous potential for growth. The tourism activities increased due to availability of basic infrastructure and the variety of tourist schemes offered by various destinations in Maharashtra. (Tourism Department Report, 2003). Tourism Potential "is a widely used and accepted term in tourism domain, however, sometimes create misunderstanding as potential expresses some territorial capabilities, which holds a little narrower domain. (Mamun, 2012) As prescribed (Formica, 2000) the term "potential" may be replaced by "Attractiveness" which clearly indicates the relations between demand and supply of tourism. However, several other researches follow the term Potential though this may be assumed to be synonymous to Attractiveness. The river Mula and Kukadi flows through the Tahsil. The Malganga temple was constructed on the banks of kukadi have made Nighoj and Takali Haji Village one of the holiest places for Hindus all over the India.

## **2. Materials and Methods**

In the present study, the emphasis is given to identify various determinants of tourism potential of the Nighoj Village and to assess the various facilities.

### **2.1 Study Area**

The Parner Tahsil is situated in the District of Ahmednagar, in the western Maharashtra, between 19°00'18" North latitude and 74°26'34" East longitudes. It is connected by road to Ahmednagar (40 km.) and to Pune (70 km). Parner tahsil is very famous for its Onion and pomegranate growing. The tahsil has become the centre of attraction because of its beautiful surroundings and cool, calm, pleasant climate. Parner has a personality of its own due to its mythological, historical, social and cultural importance. The village is vibrant and active on the industrial, political, social and cultural fronts. Many great personalities such as Maharshi Parashar, Semapati Bapat, Anna Hazare etc. were initially immersed from Parner Tahsil.

### **2.2 Methodology**

[2]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

Methodology is one of the important parts of analysis. Output or result of analysis highly depends on the methodology will be used for the data processing or analysis purpose. the following methodology will be adopted:-

**Step -I** Primary data will be collected; exhaustive literature survey of the topic of investigation is to be undertaken. Published literature, reports will be collected from various libraries, Institutes and government departments etc. Besides this relevant literature will also reference books, bulletins, reviews will also be etc.by obtained through Internet.

**Step -II** various places were identified which having determinates of tourism potential of the Nighoj. Like as accessibility, health facilities, road, and infrastructure facilities, other entertainment facility

**Step -II** with the help of health facility, education facility, entertainment facilities etc. tourism potential of Nighoj Village was assess.

### **3. Results and Discussion**

In the Nighoj tourism potential is very good condition of

#### **3.1 Tourist Place in the Parner Tahsil**

Several places such as Shiddheshwar, Korthan Khandoba, Ralegan Shiddhi, Nighoj Pot Holes, Chincholi, Karandi, Ganesh Khind, Jamgaon, Takali Dhokeshwar (Dhoki), Palashi, Vadgaon Darya, etc. were the famous tourist places situated in the different parts of the Parner Tahsil.

#### **3.2 Special Events and Festivals**

By far the most spectacular of all the events is four day Malaganga yatra in Nighoj. The famous Rath Yatra of goddess Malganga, Large number of hindus take part in this Rath Yatra and they pull the Rath by hands. In Navratri a fair is occurred near Ambika Devi Temple in devibhyore. People gather together to worship the goddess Ambika and celebrate the victor of Maa Durga"s victory over Maheshasur and God Rams victory over Ravana. Same type of fare is occurred near Siddheswar temple in the month of February on the occasion of Shivratri.

#### **3.3 Nearest Tourist Place of Parner**

So many famous tourist places were situated near Parner city. The Shiddheshwar situated near about 2 km away from the Parner city. Ganesh Khind, which is famous for Ganesh Mandir situated 65 km away from the Nashik city. The chandvad city is famous for Renuka Mata Mandir, which is 5 km away from the city. The famous Ralegan Shidhi was situated 10 km from Parner city. The Korthan is famous as hill station and highest rain fall is occurred there in Parner. The Korthan is only 35 km away from the Parner city. Nighoj is located 25 km away from Parner taluka to west side and 24 km from Shirur taluka to north side. This village is famous for the naturally created potholes on the riverbed of river Kukadi. Experts from all over the world come here every year to study the phenomenon of their formation. It is said that many years ago there was a huge amount of rainfall in this area and the River Ghod flood from the gorge-like structure with such force that erosion of the rocks took place and resulted in the formation of these potholes.

[3]

*Wesleyan Journal of Research, Vol.14 No.11 (November 2021)*

### **3.4 Accessibility**

Parner is well connected by State highways; Parner – Supa, Bhalawani, Shirur, Alkuti to major cities of Maharashtra like Mumbai, Pune and Ahmednagar. The nearest railway station for Parner is Ahmednagar Railway Station and nearest airport is Chhatrapati Sambhaji Maharaj International Airport, Pune 70 km away from the Parner.

### **3.5 Education Facility**

As per the provision of Bombay Provincial Municipal Corporation act 1949 facility of primary education for the welfare of poor people is mandatory. There are total 450 primary and 82 Secondary schools in the tahsil with a student population of 34367 for primary and 8685 for secondary schools. In addition to this education department has around 171 Pre-Primary education center called as “Anganwadi” for children below age group 5 years. Beside this Parner tahsil had senior colleges, Engineering colleges, Agricultural colleges etc.

### **3.6 Health Facility**

For the purpose of health services to the poor communities our health department has provided with 7 Primary health center, 41 sub centers and 114 Privet Hospitals. These hospitals are equipped with facility of treatment for major illness of the poor category citizens. Along with this government is also having primary health center at around 49 locations in the tahsil. Beside this number of private hospitals were situated all over the tahsil area.

### **3.7 Social Infrastructure (Entertainment Facility)**

#### **3.7.1 Sport Complex**

Parner Tahsil Sport Department has developed one sport complex in Parner area with facility of indoor stadium, cricket ground, football, badminton, and volleyball.

#### **3.7.2 Recreational Park**

For the recreation of the citizens as well as tourist a full fledge recreation park in the name of Vadgaon Darya, Nighoj. This recreation center is equipped with the facility of a big garden. In these villages two big exhibition halls, a mini auditorium and a food mall is also developed.

#### **3.7.3 Drama Theater / Town Hall**

A full fledge hall in sitting capacity 1000 is constructed by various trust in Nighoj, Korthan, Ralegaon Shiddhi. These facilitate the citizen for their cultural and social and amusement activities. There is two more Town Hall one in Korthan area having sitting capacity 5000 and other in Palashi area having sitting capacity 500. One mini auditorium with sitting capacity 250 is constructed in Ralegaon Shiddhi area also.

#### **3.7.4 Community Centers, Gymnasiums, Jogging Tracks**

For day-to-day cultural & social activities in various pockets of the city local trust has constructed 10 no of Community Centers, 7 no of Gymnasiums and 3 no of Jogging tracks.

#### **3.7.5 Library & Study Rooms**

Local trust has constructed number of study rooms to facilitate the student from poor community & lower & middle class of the society. Such library is constructed at Malganga Trust, Nighoj, Hind Seva trust Ralegaon Shiddhi and also 3 other location. This study rooms are provided with library facilities. The total no. of a study rooms are 9 in the whole tahsil.

[4]



**3.7.6 Gardens**

There is total 5 no. of small gardens constructed in the different location of the tahsil. There are also major gardens for the recreational activities as below – 1) Kund Paryatan Nighoj, 2) Korthan Kandoba, Pimpalgaon Rotha, 3) Ralegaon Shiddhi, 4) Vaogaon Darya, 5) Nageshwar Garden, Parner,

**3.7.7 Sanitation and Toilet Facilities**

For the use of some dwellers and urban poor of the tahsil local trust has constructed public toilets and urinals as below

- 1) Total No. of toilets sheets constructed by trust – 50 no.
- 2) Sulabh Type Toilets on non-payment basis – 10 blocks
- 3) Urinals – 40 seat.

**3.7.8 Other Local Infrastructure**

In the Parner tahsil Entertainment facilities ,Telephone, Internet, Post Office, Civic Amenities, Eating Joints Medical, Travel Agents, Taxi Operator, ATM etc.

**4. Conclusion**

Parner tahsil like other major tahsil of Ahmednagar, hosts many industrial giants like Kanhhya Milk Pvt. Ltd. Co. Nighoj, Dere Farm, Alkuti, Supa MIDC etc. Parner is also a good education centre with Arts, Commerce, Science, Pharmaceutical and Agricultural institutions. Moreover, PARner is also famous for its Pomegranate and onion produce. Thus, the dependency on tourism for employment is not much, especially in Parner Tahsil. Parner will remain as peaceful, clean, green and artistic cultural center apart from the busy industrial and tourism activity.

**References**

1. Abdulla Al Mamun, Soumen Mitra."A Methodology for Assessing Tourism Potential: Case Study Murshidabad District, West Bengal, India", International Journal of Scientific and Research Publications, 2:9 (2012) 1-8.
2. H. Effat and M.N.Hegazy, "Cartographic Modeling and Multi Criteria Evaluation for Exploring the Potentials for Tourism Development in the Suez Governorate, Egypt", Environmental Issues, Sustainable Development, Millennium Development Goals, pp-11-18
3. M. Constantin, C. Daniela-Luminia, G. Mihaela, "Tourism Potential and the Diminishing of Regional Disparities in Romania", economy-and-business-administration volume /2009 /v2- pp-151-155.
4. S. Formica "Destination Attractiveness as a Function of Supply And Demand Interaction", A PhD Dissertation submitted to the Faculty of the Virginia Polytechnic Institute (2000),
5. Surabhi Shrivastava (2011) Economic potential of tourism: A case study of Agra, *Tourismos*, Vol. 6, No. 2, pp 139-158.
6. Nanthakumar, L., Ibrahim, Y. & Harun, M.(2008). Tourism development policy, strategic alliances and impact of consumer price index on tourist arrivals: The case of Malaysia. *Tourismos*, Vol. 3, No.1,pp.83-98.

## 42. Analysis of Water Quality Using Physico-Chemical Characters, Lower Terna Reservoir, Near Makhani, Dist. Osmanabad, Maharashtra, India



Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

### ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL CHARACTERS, LOWER TERNA RESERVOIR, NEAR MAKHANI, DIST. OSMANABAD, MAHARASHTRA, INDIA.

**Dr. Sambhaji M.Kale**

Dept. of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner, Dist. - Ahmednagar(MS).Email: sambhajikale@gmail.com

**Dr. Swapna S. Patil**

Dept. of Zoology, Dada Patil Mahavidyalaya, Karjat, Dist Ahmednagar

**S. R. Kshirsagar**

Dept. of Chemistry, Dada Patil Mahavidyalaya, Karjat, Dist. Ahmednagar

#### **Abstract:**

Water resources have been most important for all living beings. The study of fresh water resources is called limnology. The Lower Terna Reservoir is located in Osmanabad District near Makhani Village. It is an important water resource for Osmanabad district as well as Latur district. So study of physicochemical analysis of this water resource is need of time. This work presents the study of Physico-chemical Characteristics like Water temperature, TDS, Electronic conductivity, Transparency, pH, Dissolve Oxygen, Free Carbon dioxide, Alkalinity, Total Hardness are analyzed for a one-year duration from June 2018 to May 2019. For analysis, water is collected from different sites of the study area in the last week of month up to one year. The water temperature and pH was analyzed with help of pocket pH meter at site and other parameters are estimated in laboratory by using standard methods. Monthly variations in the physicochemical characters were observed on different sites. The result indicates that the Lower Terna reservoir is pollution free and it can be used for Fisheries, Irrigation and agriculture also, so their is a need of awareness among the people for water conservation and management.

**Keywords:** Lower Terna reservoir, Physico-chemical Characters, Monthly Variation.

#### **Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dr. Sambhaji M.Kale

**Introduction:**

The study of freshwater bodies like river, ponds and lakes is called Limnology. In the branch of limnology, Physico-chemical characters of waters are studied. There are many branches of limnology in which Physico-chemical and biological characters of water are studied. The main aspect of hydro biological study is the analysis of physiochemical parameter. They can help in utilizing the water bodies in particular manner, that is maintenances and management of water bodies and also conserve the aquatic biodiversity. Most of the industries are developed on the bank of freshwater resources and industrial wastes are mostly dumped in the nearest water bodies which increase the toxic level of water, which is dangerous for aquatic ecosystem. In some time, nutrients are washed down to irrigation field and drainage channels are mixed with freshwater bodies. There are serious problems of natural resource because growth of population and economic development has made so. Hence it is very important to do planning, development and management of water. The need for the integrated development and management of the lakes, reservoirs, river basin and wetlands has been recognized not only to harness the optimal benefits of this system but also to maintain the ecosystem that they indicate. Many researchers have worked on physico- chemical and biological characteristics of Rivers and dam water. The regular study of hydrobiology is very important part as they increases the productivity and conservation, also studies the pollution if any.

**1. Material and Methods:****Study Area:**

In the given paper we have studied Analysis of Water Quality with respect to Physico chemical Characters of Lower Terna Reservoir, Near Makhani, Dist. Osmanabad, and Maharashtra, India. (Fig. 1) It is situated in 18°01'21.47"N to 76°29'49.57"E Latitude and longitude. The water in reservoir is basically used for Agriculture, irrigation and domestic purposes. There are several researchers who have done work on Physico chemical characters of the water but lower terna reservoir was neglected for the study. The given study was done in one year duration i. e. from June 2018 to May 2019.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*



Figure 1: Study area showing sampling sites

The water sample was collected from four sites of Lower Terna reservoir in the morning in can and using BOD bottles for every month. The collected water sample were immediately carried to the laboratory for the analysis of various Physico-chemical characters like water temperature, TDS, Transparency, electronic conductivity, pH, Dissolve Oxygen, free CO<sub>2</sub>, Total Alkalinity, Total hardness of water. Water temperature, pH and TDS was recorded during collection of samples by using pocket thermometer, pH meter and secchi disc. Remain parameter was analysed in laboratory by using standard literature like APHA, Trivedy and Goel etc.

## 2. Results and Discussion:

The results are arranged in below (Tab.1). The Temperature was found in the range of 140c to 400c. The minimum temperature of site A in the month of January and the maximum temperature was also site A in the month of May. The transparency was in the range of 28 to 104. The minimum transparency was site B in the month of June and the maximum transparency was at site D in the month of December. The T.D.S. was in the range of 68 to 192. The minimum value was at site A in the month of November and the maximum value was site D in the month of May. The pH was found in the 6.6 to 8.2 range. The minimum pH was at site C in the month of December and the maximum value was site D in the May. The Dissolve Oxygen was found in the range 3.3 Mg/L to 7.0 Mg/L. The minimum pH was at site A in the December and the maximum pH was at site D in the June month. The free CO<sub>2</sub> was in the range of 1.8 to 5.1 Mg/L. The minimum free CO<sub>2</sub> was found at

[11]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

site C in the month of July and maximum value was found at site D in the month May. The total alkalinity was in the range of 110 to 176 Mg/L. The minimum range was at site D in the December and the maximum range was at site C and D in the month February. The hardness was in the range of 120 Mg/L to 210 Mg/L. The minimum value at site B in the month December and the maximum value was at site C in the December.

Table 1: Physico-chemical Parameters of Lower Terna Reservoir June2018 to May2019

Months	Collection site	Temperature	Transparency	TDS	pH	DO	CO <sub>2</sub>	Total Alkalinity	Total Hardness
June	A	34.30	29	168	7.7	6.5	2.1	126	142
	B	34.70	28	168	7.9	6.8	2.3	129	141
	C	34.50	29	169	7.8	6.9	2.2	129	143
	D	34.60	30	170	7.8	7.0	2.1	131	145
July	A	27.50	33	105	7.6	6.1	1.9	131	146
	B	27.70	34	105	7.5	6.0	2.0	130	145
	C	27.70	35	107	7.5	6.1	1.8	133	147
	D	27.90	33	109	7.6	6.1	1.9	133	153
August	A	28.70	27	102	7.4	5.1	2.5	145	146
	B	28.80	28	101	7.4	5.0	2.8	146	145
	C	28.70	29	100	7.3	5.0	2.9	146	152
	D	28.70	30	100	7.5	5.0	2.7	146	150
September	A	30.10	32	86	7.1	4.8	2.8	168	129
	B	30.10	33	88	7.0	4.5	2.9	168	123
	C	30.40	34	90	7.3	5.3	3.2	169	125
	D	30.20	34	90	7.3	4.2	3.5	170	127
October	A	32.20	60	76	6.9	4.4	3.5	146	140
	B	32.00	62	78	6.8	4.2	3.8	147	140
	C	32.01	62	78	7.1	4.1	3.6	147	141
	D	32.06	61	78	7.1	4.0	3.7	147	148
November	A	25.40	83	68	6.8	4.9	3.7	136	130
	B	25.30	83	69	6.7	4.9	3.8	138	121
	C	25.30	86	69	6.7	4.8	3.9	138	128
	D	25.40	85	69	6.9	5.0	3.9	135	125
December	A	19.60	101	70	6.7	5.5	3.2	110	127
	B	19.70	103	69	6.7	5.7	3.2	113	120

[12]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

	C	19.70	104	69	6.6	5.7	3.1	112	122
	D	19.80	104	69	6.7	5.5	3.3	110	128
January	A	14.30	90	81	7.5	6.3	3.6	120	133
	B	14.50	92	83	7.5	6.4	3.5	123	132
	C	14.50	92	87	7.4	6.7	3.5	123	134
	D	14.70	92	87	7.3	6.7	3.3	121	136
February	A	21.10	81	124	7.3	4.7	4.2	170	178
	B	21.30	81	126	7.2	4.7	4.2	172	177
	C	21.50	80	128	7.1	4.9	4.2	176	182
	D	21.70	83	127	7.1	4.8	4.6	176	181
March	A	28.80	58	152	7.6	4.5	4.4	167	180
	B	28.30	58	158	7.5	4.4	4.4	166	179
	C	28.50	59	157	7.4	4.4	4.3	166	181
	D	28.50	60	157	7.5	4.5	4.2	166	183
April	A	35.60	42	176	7.6	5.0	4.7	161	204
	B	35.40	43	176	7.7	5.0	4.5	163	203
	C	35.40	43	179	7.7	4.9	4.8	168	210
	D	35.40	41	178	7.7	4.8	4.8	161	207
May	A	40.20	38	191	8.0	4.2	5.0	158	181
	B	40.10	37	193	8.1	3.9	4.9	159	180
	C	40.10	37	192	8.1	4.1	4.9	159	182
	D	40.10	39	192	8.2	3.3	5.1	159	183

[13]

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)



[14]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Figure 2: Graph of Physico-chemical characters of water with monthly variation

The monthly variation in physico-chemical characters in different month at different sites graphically represented in Fig. 2. In the given figure, we observed that the Dissolve Oxygen and water temperature showed an invert relationship with each other from the other literature study, it is found that minimum temperature is in the month November to February and the maximum temperature was in the month March to May and somewhat October also and an unfavourable connection between dissolve oxygen the water temperature was interpreted in the given observation. For determining dissolve oxygen, the temperature and turbidity plays important role. Increase the concentration of oxygen that can be dissolved in water is function of temperature. there for dissolve oxygen content of water may vary from place to place and time to time the water hardness was minimum in November to January and maximum in April and May. A many factors and geological conditions affect the correlations between different pairs of physico - chemical parameters of water samples directly or indirectly. The aquatic temperature effect on the aquatic organism and ecosystem. The seasonal variation of temperature is effect on other parameters.

**Conclusion:**

In the present research monthly variation in the physicochemical characters was alkaline and the dissolve oxygen is in normal limit, it can be concluded the water quality can be maintained by sustainable use of reservoir. this can be done by regular monitoring and proper management of water reservoir.

**References**

1. Abd Ellah R.G et.al (2020): study of Physical properties of inland lakes and their interaction with global warming: A case study of Lake Nasser;46(2):103-115.
2. APHA 1995. Standard methods of examine water and wast water.
3. Chapman J.L. and Reiss M.J. (1995), Book, Ecology: Principles and applications, Cambridge University press, Page no-222 to 227.
4. Dayal Gopal et. al (1992): Limnological studies on Kitham lake of Agra an assessment of water quality. Ind. J. of Env. Prot. 12(2) pp 102-104.
5. Kulkarni Rajendra Rao and et. al (2002): Diurnal variation of physico-chemical aspects of pollution in Khushavathi river at Quepam, Goa, J. Aqua. Biol. Vol. 17(1), pp. 27-28.



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

6. Patil and Sadu Abbasi SA and et.al (1996): Studies on Limnology of Kuttadi lake (North Kerala), *Eco. Env. Cons.*, 2,17-27.
7. Pawar B. A., Mane U.H. Hydrobiology of Sadatpur lake near Pravaranagar, Ahmednagar District, Maharashtra. *J Aqua Biol.* 2006;21(1):101-104.
8. Prasad N.R. and Patil J.M. (2008): A study of physico-chemical parameters of Krishna River water, *Rasayan Journal of Chemistry (RJC)*, vol.1(4):2008, pp. 943-958.
9. R.K. Trivedy and P.K. Goel (1986): Study of Chemical and Biological method for water pollution . *Envi. Publ.*, Karad(India).
10. Reddy Vasumathi. K, et. al (2009): Study of Physico-chemical parameters of Pakhal Lake of district Warangal, A.P, India. *J. Aqua. Biol.*, 24 (1): 77-80.
11. Trivedi et.al (2009): Study of Water Quality, Physico – Chemical Characteristics of Ganga River at Kanpur by using Correlation Study. *Nature and Science*, 2009;1(6): 91-94.
12. Trivedy RK, PK Goyal and CL Trishal (1998): *Practical methods in Ecology and Environmental Science*. Env. Media Publications, Karad.
13. Venkatasubramani R, Meenambal T (2007). Study of surface water quality in Mattupalayam Taluk of Coimbatore district Tamil Nadu. *Nat. Environ. Poll. Tech.* 6: 307-310

**43. Detection of elements and fertilizer management during crop season***Wesleyan Journal of Research*, Vol.14 No.25 (September 2021)

ISSN - 0975-1386

Research article: (Chemistry)

**DETECTION OF ELEMENTS AND FERTILIZER MANAGEMENT DURING CROP SEASON****Dr. Sambhaji. M. Kale**

Dept. of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Maharashtra, India, E-mail: sambhajikale@gmail.com

**Mr. Akshay K. Meher**

New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Maharashtra, India

**Abstract**

The agricultural field is mainly dependent on soil. Soil plays a main role to provide a platform for the better enhancement of crops. Therefore soil analysis is the very first and preeminent step to consider regarding the production of crops, including the study of various components present in the soil. Soil having the proper proportion of various elements leads to High productivity and nutrients rich crops. So basically we should focus on analyzing the soil and maintaining its nutritional value using the proper proportion of fertilizer at the time of taking the crop. The key cardinal elements such as Nitrogen (N), Potassium (k), Phosphorus (P), Sulphur (S), Magnesium (Mg), and Calcium (Ca) are highly necessary in adequate proportion throughout the life cycle of crops. Many fundamental processes such as photosynthesis, respiration, plant nutrition, plant hormone function, tropism, nastic movement, photoperiodism, photomorphogenesis keeps on continuously taking place throughout the life span of a crop in which they are associated by elements. Hence the nutrients which play this important role in the process make it foremost to study them and also maintain their proper proportion and make the process of crop yielding fruitful. If the level of any specific nutrient is found to be less than that specific nutrient is to be added to the soil and hence the best quality of the crop is obtained by it.

Detection of nutrients and fertilizers management is primarily important step in the high and quality production of crops. Before the yielding of crop, the level of soils nutrients and various components are to be studied and taken in adequate proportion and thereafter only it is suggested to take the crop, which will be more beneficial for the crops. The use of fertilizers is to be done in specific amounts as the large amount of fertilizers can adversely affect the crops as well as the soil. So the study of deficiency of nutrients and how to overcome them by adding various manure and fertilizers with a specific amount to regain the proper growth of the crop and increase its productivity is very important. This detection of elements and use of proper fertilizer management at the time of taking the crop will also ultimately avoid the unwanted expenditure of farmers.

**Keyword:** -kjeldahl method, fertilizers, Bray's method, Oslen's method, flame photometer, Turbidimetric determination, Complexometric titration- EDTA, Soil sampling extractant, Quality enhancement.

[103]

*Wesleyan Journal of Research, Vol 14 No 25 (September 2021)*

### Article History

\* Received 24/08/2021, Accepted 16/09/2021

Corresponding author: Dr. Sambhaji M. Kale

### Introduction

Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Magnesium (Mg), and Calcium (Ca) are highly important nutrients required for plant growth and development. Nitrogen and Phosphorus are not directly available for plants. The deficiency of these elements can adversely affect the quality and health of the plants. Hence the analysis of soil becomes highly important to decide the fertilizer proportion with its management for better crop quality and production during the respective crop season. Soil analysis is also important in nutrient management and planning (eg-making best use of manures, Amount of fertilizers used & application, Rotational plans) for prevention of long term nutritional and health problems of crops. It also helps in prevention of various diseases and avoiding derogation regarding the use of restricted inputs. Soil analysis should be done on regular basis after a standard interval of time to identify the nutrients and adjust them with fertilizer management accordingly.

**The major nutrients, or macronutrients, supplied by the soil in restricted manner are**

1. Nitrogen(N)
2. Phosphorus(P)
3. Potassium(K)
4. Sulphur(S)
5. Magnesium(Mg)
6. Calcium (Ca)

### 1 Nitrogen(N):-

#### **The role of nitrogen in crops:-**

Nitrogen is an important component of many essential structural, genetic and metabolic compounds in plant cells. It is also an elementary constituent of numerous important organic compounds including amino acids, proteins, nucleic acids, enzymes, and the chlorophyll molecules. It normally produces the greatest yield response in crop plants, promoting rapid vegetative growth and giving the plant a healthy green color. Adding nitrogen is not recommended for legume crops such as soybean, because they manufacture their own nitrogen supply. Nitrogen-fixing soil organisms (rhizobium) are associated with the roots of legumes capturing atmospheric nitrogen and make it available to the plant.

*Wesleyan Journal of Research, Vol 14 No 25 (September 2021)*

#### **Nitrogen deficiency symptoms on the crop:-**

Pale green to yellow leaves indicates the nitrogen deficiency. Nitrogen is mobile in plants and moves wherever it is needed. The older and lower leaves are always the first one to show symptoms of nitrogen deficiency. This deficiency leads to reduced crop yield and lower protein content. Increased root growth and stunted shoot growth results in a low shoot root ratio.

#### **Experimental section for Nitrogen (N):-**

We have tested soil samples with the help of kjeldahl method. And we found out that some soil samples were having deficiency of Nitrogen from which we suggested farmers, to add Nitrogen to the soil.

#### **How to add Nitrogen (N) to Soil:-**

Add Composted Manure. Use a Green Manure Crop. Plant Nitrogen -Fixing Plants. Mix Coffee Grounds in the Soil. Use Fish Emulsion. Spread Grass Clippings As Mulch. Use an Actual Plant Fertilizer.

#### **2. Phosphorus (P):-**

Phosphorus is a component complying having various enzymes and proteins. It plays an important role in capturing and converting the sun's energy into useful plant compounds. It is also important in building proteins and other compounds essential for plant structure, seed production, and genetic transfer. It helps in Stimulated root development, increased stalk and stem strength, improved flower formation and seed production, more uniform and earlier crop maturity, increased nitrogen-fixing capacity of legumes. It majorly helps in improvement of crop quality, and increases the resistance of plants to various plant diseases.

#### **Symptoms of phosphorus deficiency:**

Deficiency of phosphorus in plant shows slow growth appears stunted and the plant is weak. Older leaves will have a dark green color and purple pigmentation. Since phosphorus is mobile in the plant, the bottom leaves are always affected first and show the earliest signs of deficiency.

#### **Experimental section for Phosphorus (P):-**

We have tested soil samples by Bray's method (for acidic soils) and Olsen's method (for neutral, alkaline and calcareous soils) for the analysis of Phosphorus (P) level in soil. In which we founded out that some soil samples were having deficiency of phosphorus. Over which we suggested farmers to add Phosphorus (P) into the soil.

#### **How to Add phosphorus to the Soil: -**

In organic farming systems, phosphorus is supplied mainly through recycling of on-farm organic materials such as composts, green manures and animal manures. These organic materials contain phosphorus mineralized by soil organisms, making this macronutrient easier for plants to use.

**Bone meal** – A fast acting source that is made from ground animal bones which is rich in phosphorous

**Rock phosphate** – a slower acting source where the soil needs to convert the rock phosphate into phosphorous that the plants can use

**Phosphorus Fertilizers** – applying a fertilizer with a high phosphorous content in the NPK ratio (example: 10-20-10, 20 being phosphorous percentage)

**Organic compost** – adding quality organic compost to your soil will help increase phosphors content.

[105]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

**Manure** – as with compost, manure can be an excellent source of phosphorous for your plants.

**Clay soil** – introducing clay particles into your soil can help retain & fix phosphorus deficiencies.

Ensure proper soil pH – having a pH in the 6.0 to 7.0 range has been scientifically proven to have the optimal phosphorus uptake in plants.

### 3. Potassium (K):-

Potassium increases yields and improves the quality of crops. Potassium also increases the ability of plants to resist diseases, insect attacks, cold and drought stresses and other adverse conditions. It helps in the development of a strong and healthy root system and increases the efficiency of the uptake and use of nitrogen and other nutrients. It helps in photosynthesis process through which the sugars and energy that the plant needs for its development are formed and converted. It also controls the opening and closing of the leaf stomata, which regulate the water status in the plant.

#### Symptoms of potassium deficiency:-

Plants deficient in potassium bends over at ground level make them difficult to harvest. Potassium deficiency makes a plant susceptible to various plant diseases. The edges of older leaves appear to have burned edges (scorching) and, since potassium is mobile in the plant, the bottom and older leaves show deficiency symptoms first.

#### Experimental section for Potassium (K):-

We have tested soil by using flame photometer for analysis of Potassium (K) level in soil. In which we saw that some soil samples are having the deficiency of potassium (K). From which we suggested farmers to add Potassium (K) in to the soil.

#### How to add Potassium (K) to soil: -

Banana peels are very high in potassium instead of using a Commercial Fertilizer. If you wish to add potassium to your soil at home, you can do so in several ways without having to use potash or other commercial potassium fertilizer. Compost made primarily from food by-products is an excellent source of potassium. Add Kelp Or Seaweed To Your Soil. Using Wood Ash add the same Compost to Your Soil

### 4. Sulphur(S):-

Sulphur is an essential element in forming proteins, enzymes, vitamins, and chlorophyll in plants. It is crucial in development and efficient nitrogen fixation in legumes. Sulphur is also important in photosynthesis and contributes to crop in winter hardness. It also helps in Formation of chlorophyll that permits photosynthesis through which plants produce starch, sugars, oils, fats, vitamins and other compounds required for crop production.

#### Symptoms of sulphur deficiency: -

Plants deficient in sulphur have leaves that are pale green color, beginning first on younger leaves. Eventually, the whole plant can have a light yellow-green appearance.

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

#### **Experimental section for Sulphur (S):-**

We have tested soil samples with the help of Turbidimetric method, based on precipitation as barium sulphate, and measured 0.5 ppm sulphur in soil. Extracts were treated with charcoal before analysis to remove organic matter which otherwise would have seriously suppressed barium sulphate precipitation. After this we find out that some soil samples were having the deficiency of Sulphur(S). Then we suggested the farmers to add sulphur into the soil.

#### **How to add Sulphur (S) to soil:-**

Sulphur source for plants is manure. Animal manures are an excellent source of sulphur.

#### **5. Magnesium (Mg):-**

Magnesium helps in capturing the sun's energy for growth and production through photosynthesis. Photosynthesis takes place in chlorophyll, the green pigment in plants, having magnesium as the central atom of the chlorophyll molecule, with each molecule containing 6.7% magnesium it plays an important role in activating enzymes involved in respiration, photosynthesis and nucleic acid synthesis. Magnesium facilitates translocation of carbohydrates (sugars and starches) and enhances the production of oils and fats.

#### **Symptoms of magnesium deficiency:-**

Magnesium is highly mobile in the plant and deficiency symptoms first appear on the lower leaves. Symptoms are more severe on the lower leaves because magnesium is moved to the new growth. Deficiency symptoms consist of interveinal chlorosis (leaf veins stay green while the regions between them turn yellow).

#### **Experimental section for Magnesium (Mg): -**

We tested the soil samples with the help of complexometric titration with EDTA. Then we find out that some soil samples were having deficiency of magnesium. We suggested farmers to add Magnesium in the soil.

#### **How to add magnesium in soil:-**

The most common soluble sources of magnesium to use as fertilizers is magnesium sulphate (containing 10% Mg and 14% S, also known as Epsom salt), sulphate of potash magnesia (containing 11.2% Mg, 22% S, and 22% K<sub>2</sub>O, commercially sold as K-Mag), and magnesium oxide (containing 55% Mg, also known as magnesia).

#### **6. Calcium (Ca):-**

[107]

*Wesleyan Journal of Research, Vol. 14 No. 25 (September 2021)*

Calcium (Ca) plays an important role in producing plant tissues and help plants for their growth better. Calcium is responsible for holding together the cell walls of plants. It is also crucial in activating certain enzymes and to send signals that coordinate certain cellular activities. Calcium also increases resistance to outside attack. Calcium plays a vital role in plant growth, specifically cell wall formation, cell division and pollination. It also signals plants to

Respond to drought and heat stress, activates many plant enzyme systems and helps plants absorb other nutrients.

#### **Symptoms of calcium deficiency:-**

Calcium deficiency symptoms appear initially as localized tissue necrosis leading to stunted plant growth, necrotic leaf margins on young leaves or curling of the leaves, and eventual death of terminal buds and root tips. Generally, the new growth and rapidly growing tissues of the plant are affected first.

#### **Experimental section for Calcium (Ca):-**

We tested soil samples with the help of Complexometric titration with EDTA for the analysis of Calcium (Ca) level in soil. In which we find out that some soil samples were having deficiency of Calcium (Ca). Then we suggested farmers to add Calcium (Ca) in the soil.

#### **How to add calcium in soil:-**

Adding lime to the soil in autumn increases Ca. Adding Eggshells in compost will also add calcium to soil.

#### **Result and Discussion: -**

Various Soil samples were taken during various crop seasons for testing in which many of the soil samples were having deficiency of various important elements that are required for proper growth of crop and maintaining the quality of crops. Finding out the decency of various elements and fertilizers we recommend various methods to farmers for adding the particular fertilizer to Sod. Which helped the farmers to take the better yield of crop with its best quality ever; hence detection of fertilizers and their proper management accordingly helped the farmer to control the expenses on fertilizers and also with the further degradation of soil due to excess use of fertilizers which the farmers previously were using without management.

*Wesleyan Journal of Research, Vol 14 No 23 (September 2021)*

Our main aim was to give the required amount of fertilizers management that is necessary for soil and crops. Any soil samples are not always fully available with all the nutrients. Less or more amount of nutrients is present in the soil samples. Therefore it is very important to study them and then use specific amount of respected fertilizers. The Nutrients like Nitrogen (N), Potassium (K), Phosphorus (P), Sulphur (S), Magnesium (Mg), and Calcium (Ca) were present in fewer amounts in all samples clearly. Hence crop rotation, soil testing, fertilizers management is very important for crop production.

While with Nitrogen (N) deficiency present in the soil we advised farmers that they must add Manure Crop, Plant Nitrogen-Fixing Plants, Mex Coffee Grounds in the Soil, Use Fish Emulsion, Spread Grass Clippings As Mulch, Use an Actual Plant Fertilizer. Having Phosphorus (P) deficiency in the soil we recommend farmers that they must add Bone meal, Rock phosphate, phosphorus fertilizers, organic compost, manure, clay soil for increase phosphorus level of soil. When having Potassium (K) deficiency in the soil. We advised farmers that they must add Banana peels, commercial fertilizers, compost made primarily from food by-products, also use kelp (or seaweed), wood Ash, compost to increase

potassium levels. When Sulphur (S) deficiency in the soil then we recommended farmers that they must add plants and animals manure. It is excellent source of Sulphur (S). When Magnesium (Mg) is deficient in the soil farmers must add soluble sources of magnesium to use as fertilizer mainly magnesium sulphate (containing 10% Mg and 14% S, also known as Epsom salt), sulphate of potash magnesia (containing 11.2% Mg, 22% S, and 22% K<sub>2</sub>O, commercially sold as K-Mag), and magnesium oxide (containing 55% Mg, also known as magnesite). When Calcium (Ca) deficiency was detected in the soil with the help of complexometric titration with EDTA we advised farmers that they must add lime, Eggshells & compost in order to increase the Calcium level.

#### **Conclusion:-**

Soil testing is important for farmers in order to better understand their soil types and deficiency of various nutrients in their soil which will help them to maximize the quality of crops, and make adequate use of different types of fertilizers, it become cost benefit to farmers as it avoids excess use of fertilizers. It also increases the crop productivity giving a better yield of crop. Our main aim is to give the required amount of fertilizer which is necessary for soil in better crop production. Hence we have to analyses the soil for its nutrient content and then properly manage the use of fertilizers. Before taking the crop soil testing should be necessarily done as it will save money as well as the time of farmer, and give better yield of high quality of crop. Also it will save the further degradation of soil due to excess fertilizers. Excess fertilizers can change the soil health and lead to unfi crop quality. Hence it is recommended to first analyses the soil and properly manages the fertilizers in respective crop seasons.

#### **References:-**

1. Sumner, Malcolm E. (1999-08-31). *Soil Science*. ISBN 9780849311367. Retrieved 2012-11-08.
2. "Soil Sampling for Precision Agriculture". *CropWatch*. 2015-09-17. Retrieved 2019-05-22.
3. "Using precision agriculture to improve soil fertility management and on-farm research Integrated Crop Management". *crops extension iastate.edu*. Retrieved 2019-05-22.
4. Jordan-Meslie, L., Rubæk, G. H., Ehlers, P. A. J., Gimot, V., Hofmann, G., Goulding, K., Recknagel, J.

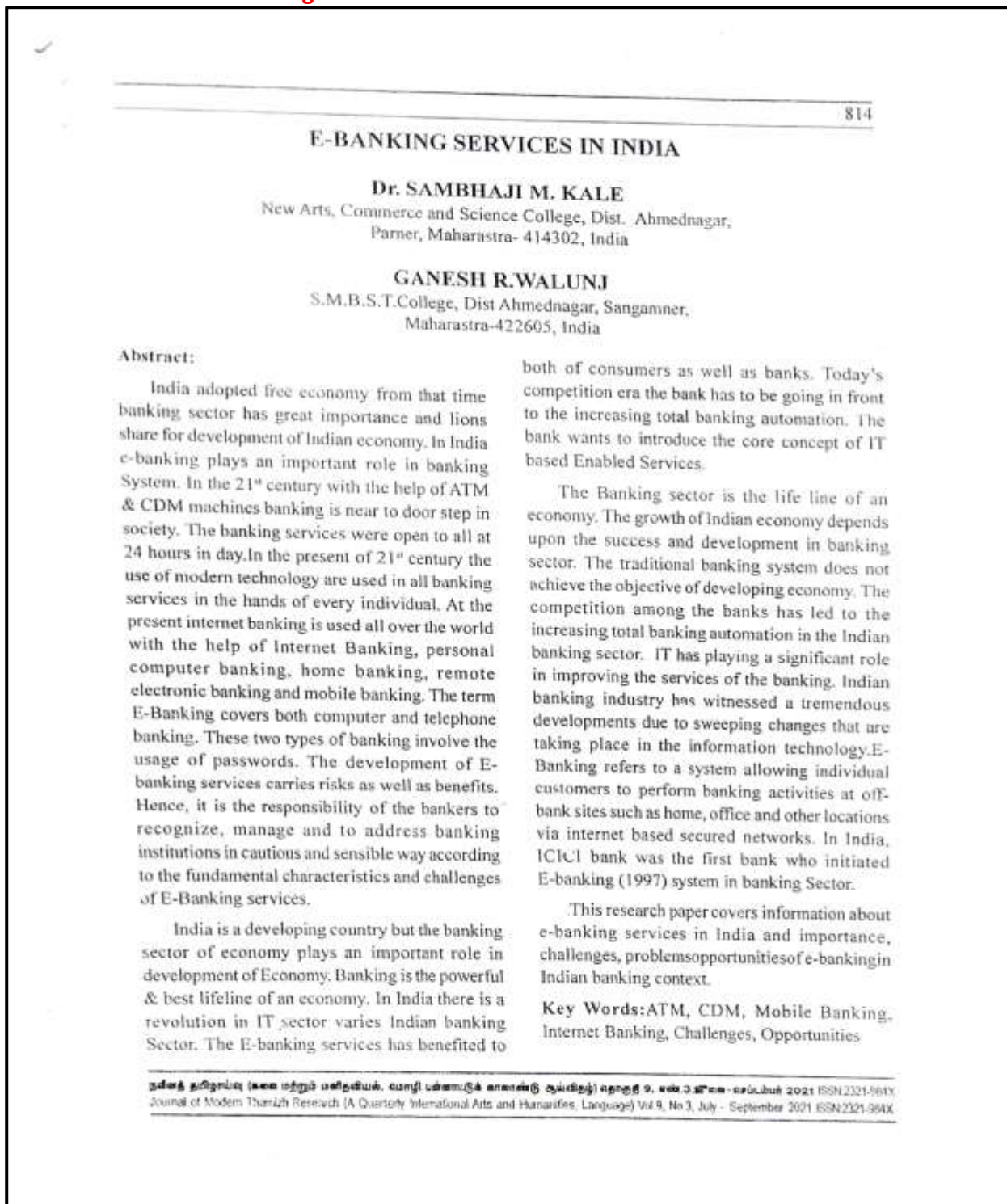


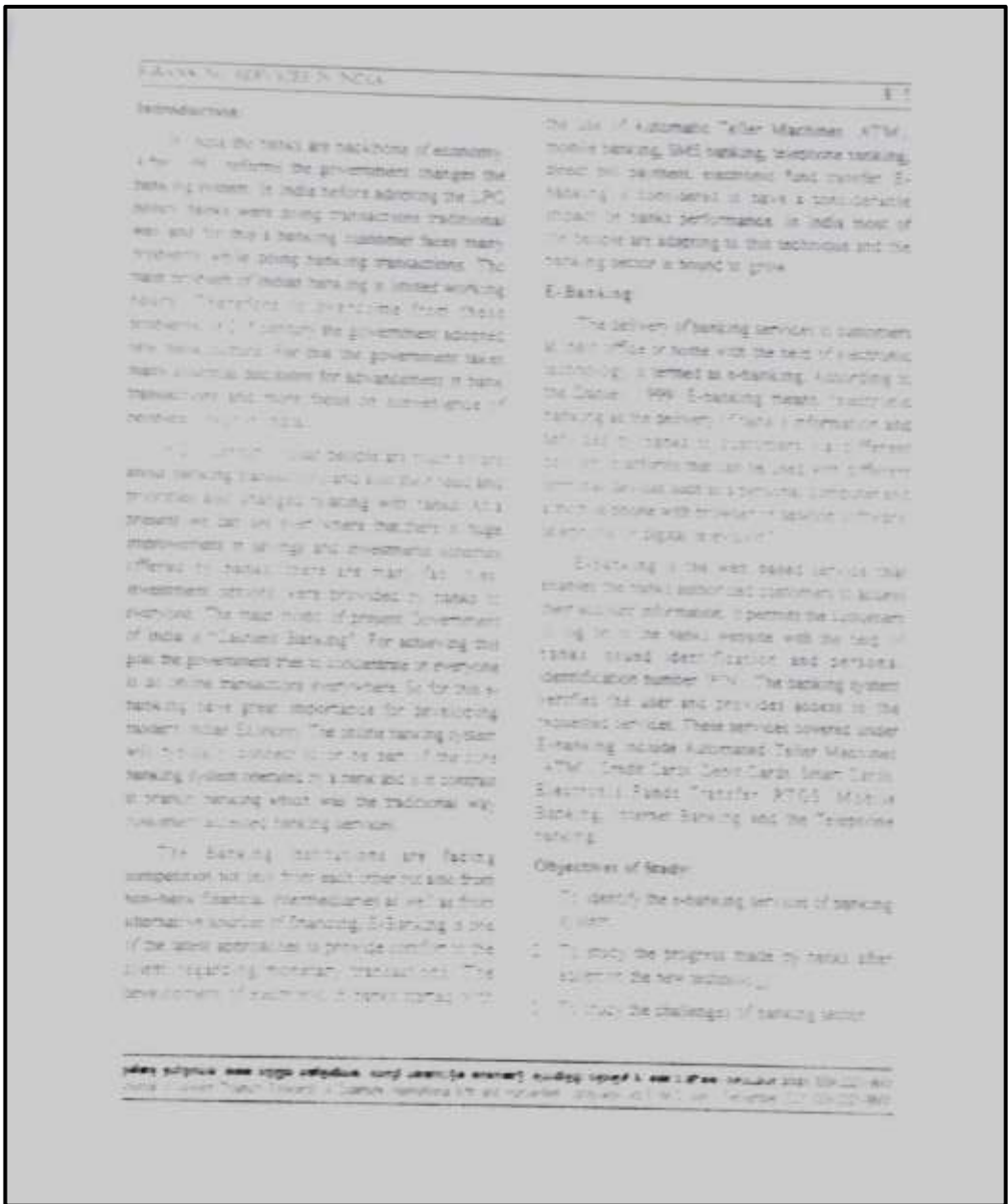
*Wiley Journal of Research, Vol.14 No.25 (September 2011)*

1. Provolo, G., Barracough, P. (2012-12-01). "An overview of fertilizerP recommendations in Europe: soil testing, calibration and fertilizer recommendations". *Soil use and management*, 28 (4): 419-435. doi:10.1111/j.1475-2743.2012.00453.x. ISSN:1475-2743.
2. On-the-spot, real-time and affordable soil testing technology is enhancing the agricultural value chain in Uganda.
3. On-the-spot, easy and affordable soil testing for Kenyan smallholder farmers.
4. "w-labs.com" w-labs.com. Retrieved 2012-11-08.
5. Carl J. Rosen. "Lead in the Home Garden and Urban Soil Environment". Extension.umn.edu. Retrieved 2012-11-08.
6. Vogel elementary practical organic chem. part III Log Longmans,1969. Vogel a text book of quantitative inorganic analysis ELBS,1969.

[110]

**44. E-Banking Services in India**





**Evolution of E-banking in India**

In India e-banking is of fairly recent origin. The traditional model for banking has been through branch banking. Only in the early 1990 there has been start of non-branch banking services. The good old manual systems on which Indian Banking depended upon for years seem to have no place today. The credit of launching internet banking in India goes to ICICI Bank, Citibank and HDFC Banks followed with internet banking services in 1999. Several initiatives have been taken by the Government of India as well as the Reserve Bank to facilitate the development of e-banking in India. The Government of India enacted the IT Act, 2008 with effect from October 17, 2009 which provided legal recognition to electronic transactions and other means of electronic commerce. The Reserve Bank is continuously monitoring and reviewing the legal and other requirements of e-banking on a continuous basis to ensure that e-banking would develop on sound lines and e-banking related challenges would not pose a threat to financial stability.

The Indian banks offer the following services to their customers

1. Automated Teller Machines (ATMs)
2. Cash Deposit Machine (CDM)
3. Internet Banking
4. Mobile Banking
5. Phone Banking
6. Tele-banking
7. Electronic Clearing Services
8. Electronic Clearing Cards
9. Easy Step Banking
10. Electronic Fund Transfer

**Role of E-Banking in varies banking services:**

The Indian banks offer to their customers following e-banking services-

**A) Automated Teller Machines (ATM):**

ATM is a computer driven system which is user friendly and operates 24 hours a day and 7 days a week. It is totally menu driven which displays step by step instructions for the customer. ATM can be accessed by a customer by using his ATM card to gain entry into the ATM room and the pin for desired transactions. ATMs are installed at banking premises for which no license is required from RBI. In case of branch ATMs at public places the banks have to obtain license. In India most of the banks have moved off-site ATM like airports, railway stations, petrol pumps, etcetera.

**Advantages of ATM:**

1. We can withdraw cash at any time
2. The customer can choose his own time for banking services at any time of the day
3. The ATMs are faster than going to the banking there is no long lines
4. They offer quick and efficient service
5. The ATM card is protected by pin number which keeping your money safe
6. There is no scope for discourtesy or subjective behavior as happens with interaction at a bank's counter.
7. Don't need to fill out withdrawal and deposit slips as is required at the bank.
8. ATMs offer the convenience of multiple locations.

**Dis-advantages of ATM:**

1. Cash withdrawals are restricted to certain deposits held by the bank and notified.

पुस्तकें, अध्यापन, वेब, एप्लिकेशन, एंड (अन्य) कक्षाओं में प्रयोग के लिए उपयुक्त है। संपर्क: 020-2511321, 099-2030114।  
 Journal of Modern Trends Research: A Quarterly International Journal and Research, Bangalore, 09, No. 7, 2018, September, 2018, 816-819

E-BANKING SERVICES IN INDIA

817

2. ATM may be off-line (system down).
3. Risk of robbery when you leave the ATM.
4. Cash dispensation is restricted to certain denomination of currency notes- usually
5. You may forget your PIN number.
6. Fees charged to use ATMs of other banks can become expensive.
7. The ATM can break down or run out of cash.

**B) Mobile Banking :**

The Mobile banking is the name indicates in contrast to the traditional brick and mortar banking which is done from a fixed branch premises where the customers have to go for transacting the desired banking transactions. Mobile banking tries to reach the customer to enable the transact banking. Mobile banking is used in two different senses. Banking through a mobile van or without computerized banking system, which moves from one place to other on designated routes at designated hours and the customers can transact their routine banking like cash deposit and withdrawals, draft issue, cheque collection, cheque book issue, pass book update etc.

**Mobile Banking Services:**

The Banks offering mobile access are mostly supporting some of the following services-

1. Account Balance Enquiry.
2. Account Statement Enquiries.
3. Cheque Status Enquiry.
4. Cheque Book Requests.
5. Fund Transfer between Accounts.
6. Credit/Debit Alerts.
7. Minimum Balance Alerts.
8. Bill Payment Alerts.

9. Bill Payment.
10. Recent Transaction History Requests.
11. Information Requests like Interest Rates/ Exchange Rates.

**Advantages of Mobile Banking:**

1. In Mobile banking, the user can transfer funds from your bank account to another bank account with a Smartphone just with the help of the internet, from anywhere to everywhere.
2. It is available for 24 hours and easy and convenient mode for many Mobile users in the rural areas.
3. Mobile Banking is said to be more secure and risk-free than online Internet Banking
4. With the help of Mobile, Banking user can transfer funds, and pay bills, checking account balance, study your recent transaction, block your ATM card, etc.
5. Mobile Banking is cost-effective, and Banks offer this service at less cost to the customers.
6. You can transfer money instantly to another account in the same bank using mobile banking
7. The service provided by bank is free of charge, there is no limit for number of times you can access your account

**Disadvantages of Mobile Banking-**

1. Mobile Banking is not available on all mobile phone.
2. It requires you to install apps on your phone to use the Mobile Banking feature which is available on the high-end Smartphone.
3. If the customer does not have a Smartphone than the use of Mobile Banking becomes limited.

<p><b>1. A low awareness about Internet Banking</b></p> <p>Most of a nation's people did not have full knowledge of online banking. They didn't get the proper knowledge and proper information about online banking.</p> <p><b>2. Absence of trust</b></p> <p>All internet users don't have online method of administration, particularly for bank related activities. They also are not prepared to share sensitive information with banks. They have questions with respect to the security of the exchange done by banks in the web. A high degree of security is required to exchange sensitive information.</p> <p><b>3. Impersonal</b></p> <p>A lack of physical and personal experience makes it extremely difficult. A high degree of security is required to exchange sensitive information. A high degree of security is required to exchange sensitive information.</p> <p><b>4. Difficult for first time users</b></p> <p>For the majority of people in a computer made of services as customer face a computer interface. They are not used to a computer interface. They are not used to a computer interface. They are not used to a computer interface.</p>	<p><b>5. Security concerns</b></p> <p>People for the very first time in online financial services are not very much aware of the security of the services. They are not very much aware of the security of the services. They are not very much aware of the security of the services.</p> <p><b>6. Lower internet speed and rates</b></p> <p>In the rural areas of the very remote areas, the internet speed is very low. The internet speed is very low. The internet speed is very low.</p> <p><b>7. Customer care services</b></p> <p>At the time of using internet services, the customer may face some problems. They may face some problems. They may face some problems.</p> <p><b>8. Importance of Banking in Business</b></p> <p>Businesses are using internet banking services. They are using internet banking services. They are using internet banking services.</p>
<p><b>1. A low awareness about Internet Banking</b></p> <p>Most of a nation's people did not have full knowledge of online banking. They didn't get the proper knowledge and proper information about online banking.</p> <p><b>2. Absence of trust</b></p> <p>All internet users don't have online method of administration, particularly for bank related activities. They also are not prepared to share sensitive information with banks. They have questions with respect to the security of the exchange done by banks in the web. A high degree of security is required to exchange sensitive information.</p> <p><b>3. Impersonal</b></p> <p>A lack of physical and personal experience makes it extremely difficult. A high degree of security is required to exchange sensitive information. A high degree of security is required to exchange sensitive information.</p> <p><b>4. Difficult for first time users</b></p> <p>For the majority of people in a computer made of services as customer face a computer interface. They are not used to a computer interface. They are not used to a computer interface.</p>	<p><b>5. Security concerns</b></p> <p>People for the very first time in online financial services are not very much aware of the security of the services. They are not very much aware of the security of the services. They are not very much aware of the security of the services.</p> <p><b>6. Lower internet speed and rates</b></p> <p>In the rural areas of the very remote areas, the internet speed is very low. The internet speed is very low. The internet speed is very low.</p> <p><b>7. Customer care services</b></p> <p>At the time of using internet services, the customer may face some problems. They may face some problems. They may face some problems.</p> <p><b>8. Importance of Banking in Business</b></p> <p>Businesses are using internet banking services. They are using internet banking services. They are using internet banking services.</p>

Dr. SAMBHAJI M. KALE, Dr. GANESHJI W. WILINJ

829

**Advantages of E-banking:**

1. For business transactions bank offer e-banking facilities. E-banking services are available 24 hours a day and 365 days around the year. Where internet is unavailable services are provided by smartphones or mobile phone.
2. You can use online banking to pay your bills. This will remove the need for stamps and prevent you from the check being lost in the mail.
3. At the touch of a button, actual time account balances and information are available.
4. It also acts as a great medium for the banks to promote their products and services. The services include loans, investment options and many others.
5. Online banking allows you to access your account history and transactions from anywhere.
6. It is fast and efficient. Funds get transferred from one account to the other account very fast.
7. It is available all the time, you can perform your task from anywhere and at any time, even at night when the bank is closed or on holidays. The only thing you need to have is an active internet connection.
8. E-banking allows for easier updating and maintaining of direct accounts. The time for changing mailing address is greatly reduced. Ordering of additional checks is easier and involves no actual time interest rates.
9. E-banking allows automatic funding of accounts from long established bank account via electronic fund transfer.
10. Online account is simple to open and easy to operate.

11. The speed of transaction is the faster relative to use of ATM or customary banking. Internet banking has several over traditional one which makes operating an account simple and convenient.

**Challenges of E-banking:**

The challenges of E-banking are as follows-

**A) Security Risk**

The problem related to the security has become one of the major concerns for banks. A large group of consumers refuses to opt for e-banking because of their fear to uncertainty and security concerns. According to the IAMAI Report (2006), 47% of internet users are not using internet banking because of security concerns. It is a big challenge for marketers and banks to convey a message regarding their security concerns which may further increase the online banking use.

**B) The Trust Factor**

Trust is not as the biggest hurdle to online banking for most of the consumers. Conventional banking is preferred by the consumers because of lack of trust on the online security. They have a perception that online transaction is risky due to which they do not take place. While using e-banking facilities lot of questions arises in the mind of consumers such as "Did transaction go through?", "Did I pay for my mobile phone or not?", "Is it actually the sufficient factors which influence the consumers to engage in a transaction with the merchant".

**C) Customer Awareness**

The awareness among consumers about the e-banking facilities and procedures is still at lower level in Indian scenario. Banks are not able to disseminate proper information about the use.

**संबंधित लेख: ऑनलाइन बँकिंगचा विकास आणि त्याचे आव्हाने**  
 Journal of Maharashtra Sahitya Akademi, Volume 10, No. 1, 2011, pp. 101-105

benefits and facility of internet banking. Less awareness of new technologies and their benefits is among one of the most ranked barrier in the development of e-banking.

**D) Privacy risk:**

The risk of disclosing private information & fear of identity theft is one of the major factors that inhibit the consumers while opting for internet banking services. Most of the consumers believe that using online banking services make them vulnerable to identity theft. According to the study consumers worry about their privacy and feel that bank may invade their privacy by utilizing their information for marketing and other secondary purposes without consent of consumers.

The most serious threat faced by e-banking is that it is not safe and secures all the time. There may be loss of data due to technical defaults. E-banks are facing business challenges for the transactions made through internet; the service charges are very low. Unless a large number of transactions are routed over the Web the E-banks cannot think of profit. There is lack of preparedness both on part of banks and customers in the adoption of new technological changes.

The Indian banking sector is faced with multiple and concurrent challenges such as increased competition, rising customer expectations, and diminishing customer loyalty. The banking industry is also changing at a phenomenal speed. While at the one end, we have millions of savers and investors who still do not use a bank, another segment continues to bank with a physical branch and at the other end of the spectrum, the customers are becoming familiar with ATMs, e-banking, and cashless economy. This shows the immense potential for market expansion. The exponential growth for the industry comes from being able to handle as wide

a range of this spectrum as possible. In this complex and fast changing environment, the only sustainable competitive advantage is to give the customer an optimum blend of technology and traditional service.

**Opportunities in E-Banking:**

**1. Untapped Rural Markets:**

The Contributing to 70% of the total population in India is a largely untapped market for banking sector. In all urban areas banking services entered but only few big villages have the banks entered.

**2. Multiple Channels:**

The Banks can offer so many channels to access their banking and other services such as ATM, Local branches, Telephone mobile banking, video banking etc. to increase the banking business.

**3. Worthy Customer Service:**

The Worthy customer services are the best brand ambassador for any bank for growing its business. Every engagement with customer is an opportunity to develop a customer faith in the bank. While increasing competition customer services has become the backbone for judging the performance of banks.

**4. Internet Banking:**

It is clear that online finance will pickup and there will be increasing convergence in terms of product offerings banking services, share trading, insurance, loans, based on the data warehousing and data mining technologies. Anytime anywhere banking will become common and will have to upscale, such up scaling could include banks launching separate internet banking services apart from traditional banking services.

நவீனத் தமிழ்நாடு (New Arts, Commerce & Science College, Parner) ஆய்விதழ் (அகத்துறை 3, எண் 3) ஜூன் - செப்டம்பர் 2021 ISSN:2321-894X  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.9, No 3, July - September 2021 ISSN:2321-894X



Dr. SAMBHAJI M. KALE & GANESH R. WALUNJ

822

**5. Retail Lending:**

In India recently the banks have adopted customer segmentation which has helped in customizing their product folios well. Thus retail lending has become a focus area particularly in respect of financing of consumer durables, housing, automobiles etc., Retail lending has also helped in risks dispersal and in enhancing the earnings of banks with better recovery rates.

**6. Increasing Internet Users & Computer Literacy:**

To use internet banking it is very important or initial requirement that people should have knowledge about internet technology so that they can easily adopt the internet banking services. The fast increasing internet users in India can be a very big opportunity and banking should Ancash this opportunity to attract more internet users to adopt internet banking services.

**Recommendations:**

E-banks should create awareness among people about e-banking products and Services. Customers should be made literate about the use of e-banking products and services. Employees of banks should be given special technical training for the use of E-banking so that they can further encourage customers to use the same. Seminars and workshops should be organized on the healthy usage of e-banking especially for those who are ATM or computer illiterate. E-banking services should be customized on basis of age, gender, occupation etc. so that needs and requirements of people are met accordingly.

**Conclusion:**

E-Banking provides 24 hour services as per our time. In India after demonetization of currency in 2016 E-banking use is rapidly growing.

However it is continuous challenges for financial security and personal privacy. Rapid growth of net banking use create security problem. E-Banking offers a more elevated amount of accommodation for overseeing one's accounts even from one's room. In any case, it keeps on introducing difficulties to the money related security and it is also necessary to understand the rights and responsibilities as a customer in order to make a difference to one's own financial well-being. To create Awareness of the risks and problems among the customer enables him to take precautions for a more secured online banking experience

The Customers are increasingly moving away from the confines of traditional banking and are seeking the convenience of remote electronic banking services. The role of technology is increasing day by day. The digital banking denotes the provision of banking and related services through extensive use of information technology. The various sectors of India are growing at much faster rate with the help of technology. The origin of virtual banking in the developed countries can be traced back to the 1970 with the installations of Automated Teller Machines. In addition to the ATM the Mobile banking is also a big platform of new technology which promotes the banking functions in the mobile. The Mobile banking also helps the banks to increase their customers. Today everyone has a mobile phone in his hands. The increasing frequency of mobile internet users gives the boost energy to the mobile banking. This paper explores the importance of Internet banking, mobile banking, SMS banking, ECS in the new era of technology which helps the banking sector to grow at higher speed. They are trying to utilize the information technology for banking and provide technology based banking products and services to their customers.

நவீனத் தமிழியல் (கலை மற்றும் மனிதவியல், மொழி பங்களிப்புக் களத்தில் ஆய்வித்து) தொகுதி 3, 2021 ஜூன்-செப்டம்பர் 2021 ISSN 2251-8944  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol 3, No 3, July - September 2021 ISSN 2251-8944

E-BANKING SERVICES IN INDIA

823

References:

1. Mr.Yogeshl .Patinge (2013), A Study of electronic banking in India-"Problem & Prospectus
2. Ruby Shukla&PankajShukla (2011), E-Banking : Problems and Prospects
3. Dr.K.RatnaManikyam, "Indian Banking Sector – Challenges and Opportunities", IOSR Journal of Business and Management, Volume 16, Issue 2, Ver. 1 (Feb, 2014), PP 52-61
4. www.banknetindia.com/banking/boverview
5. www.rbi.org.in
6. Ingie A and Pardeshi R, "Internet Banking in India: Challenges and Opportunities" IBMRD's Journal of Management and Research, Vol. 1,(2012): pp. 13-18
7. E-Banking in India: Challenges and Opportunities: Rimpilatana :2007

82

Journal of Modern Trends in Research & Studies International (JMTRSI) - Volume 1, Issue 1, Part 1, 2021, pp. 823-824

**45. Geomorphic assessment of the dev river basin in parner tehsil dist. Ahmednagar, Maharashtra: using geographical information system**



Wesleyan Journal of Research, Vol.14 No.27 (September 2021)

ISSN – 0975-1386  
Research article: (Science)

**“GEOMORPHIC ASSESSMENT OF THE DEV RIVER BASIN IN PARNER TEHSIL DIST. AHMEDNAGAR, MAHARASHTRA: USING GEOGRAPHICAL INFORMATION SYSTEM”**

**Dr. Nilesh S. Padalkar**

C.T.Bora College, Shirur, Pune.

**Dr. Sambhaji M. Kale**

Department Of Chemistry and Research Centre, New Arts Commerce and Science College, Parner, Dist. Ahmednagar. Email: [sambhajikale@gmail.com](mailto:sambhajikale@gmail.com)

**Dr. K.C. Mohite**

Principal, C. T.Bora College, Shirur, Pune.

**Mr. Jivan B. Kolpe**

C. T. Bora College Shirur, Pune (Research Student)

**Abstract:**

Drainage basins, catchments and sub catchments are the fundamental units for the management of land and water resources (Moore, et.al., 1994). The drainage basin is the fundamental unit for collection and distribution of water, solutes, and sediment in fluvial landscape (Ritter al. 1995), Horton. R. E. (1945), the first proposed a quantitative description of the drainage network and basin characteristics. The total length of Dev river channel is 26.3432 kms from its origin to confluence. The total area of the basin is 110.0245 Sq. km, and it falls in the Survey of India (SOI) Toposheet No, (47I/8, 47 J/5) for watershed boundary.

**Keywords: Physiography, Morphometry, GIS.**

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dr. Sambhaji M. Kale

**1. Introduction:**

Major part of Maharashtra consists from lava, in other words entire region rests on a basaltic base. The Balaghat plateau covers Parner tehsil (Ahmednagar district) in the west and Ambejogai in the east from the catchments area for a number of Plateau Rivers. The Kukadi is one of the main sub-streams of the Ghod River. Dev River is major sub-tributary of Kukadi River. The Dev river basin is one of the south flowing river and left bank tributary of Kukadi River.

**2. Study Area:**

[47]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

The study area includes the plateau region of the central part of Deccan plateau in Parner Tehsil. Study area is located at a latitudinal extent between  $18^{\circ} 56' 58''\text{N}$  to  $19^{\circ} 6' 53''\text{N}$  and a longitudinal extent between  $74^{\circ} 15' 4''\text{E}$  to  $74^{\circ} 24' 42''\text{E}$ . Dev river is originated at 913 meters mean above the sea level (ASL) near Vadagaon Darya village. Dev is a major left bank tributary of Kukadi River. The total length of Dev river channel is 26.3432 kms from its origin to confluence. The total area of the basin is 110.0245 Sq. km.



Fig.1. Location Map

### 3. Aim and objective:

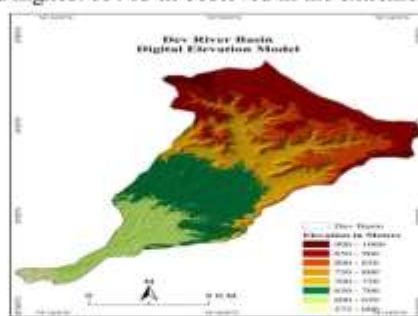
To analyze the physiographic and quantitative morphometric parameters (Linear, Areal, Relief aspects).

### 4. Data base and Methodology:

The present study is based on the survey of India Topo-sheets (47 I/8, 47J/5) at 1: 50000 scale map. It was scanned and georeferenced with appropriate projection parameters (Universal Transverse Mercator Projection, UTM, Zone 43 N and Datum GCS.WGS.1984). The survey of Indian Toposheet at the digitization work has been carried out for the entire analysis of the basin using GIS Software (ArcGIS 10.1). Stream, contour line, power line, road, forest, settlement, and well are digitized in Arc GIS (10.1) software and preparation of the physiographic map, DEM, contour map, slope map, aspect map. Contour interval of the Toposheet is 20 meters.

### 5. Physiography:

The topography of this region is rugged and highly dissected. Its altitude varies from the lowest height at 595 mts observed in confluence and highest of 913 m observed in the extreme northern part of the area.



[48]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

**Fig.2. Physiographic Map**

*(Source: Based on Survey of India Toposheet)*

**6. Geology:-**

Geologically the entire area is covered by basaltic lava flows which is commonly referred to as the Deccan traps (Geological survey of India, 1970). Dev River is a part of Maharashtra Deccan Basaltic plateau with an average height of 913 meters above the sea level (ASL). The Basaltic lava of the Deccan traps is the only major geological formation here.

**7. Drainage:**

Dev River is the sub-stream of the Kukadi River, from the point of view of peninsular drainage. The Dev River originates at vadagaon Darya 913 m from (ASL) and confluence to Kukadi near Devanwadi. The river basin comes in the rain shadow areas. The pattern of Dev River basin is tree shape drainage Patten.



**Fig.3. Drainage Network**

*(Source: Based on Survey of India Toposheet)*

**8. Morphometry:**

The quantitative expressions of various properties of the basin have been attempted by Horton's as well as Strahler method of stream ordering has been widely accepted:

1. The linear aspects w
2. ere studied by using the methods of Horton (1945), Strahler (1953), Chorley (1957), (Schumm1956).
3. The areal aspects were studied using the methods of Schumm (1956), Strahler (1956, 1968), Miller (1953) Chorley (1957), and Horton (1932).
4. The relief aspects were studied using the methods of Horton (1945), Broscoe (1959), Melton (1957), Schumm (1945), Strahler (1952) and Pareta (2004).

**8.1. Linear Aspects:**

The network analysis is the most important basin parameter for changing the geomorphic environment of the region.

**8.1.1. Stream ordering (Su):**

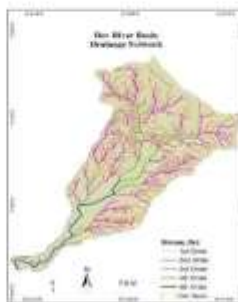
*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

The present drainage network of the Dev river basin is classified into stream order as followed by Strahler (1952) stream ordering system.

The total numbers of streams (423) were identified in the present drainage basin, which are first, second, third, fourth, fifth order streams.

**8.1.2. Stream Number (Nu) :**

“The order wise total number of stream segments is known as the stream number”. The total number of the stream identified in this river basin is 423 out of which 326 in first order, 73 in second order, 18 in third order, 5 in fourth order.



**Fig. 4. Stream Orders of Dev River Basin**

**8.1.3. Bifurcation Ratio : (Rb):-**

The bifurcation ratio (Rb) is the ratio of number of stream segment of the given order 'Nu' to the number of the stream in the next higher order (Schumm, 1957).

Mathematical Formula:-

$$Rb = Nu / N(N+1)$$

Where,

Rb= Bifurcation Ratio

Nu=Number of the stream order in given order

Nu+1=Number of streams segment of the next higher order

The mean bifurcation ratio of the Dev River basin is 4.27 which indicates that bifurcation is normal in region. This is because of uniform climate, rock types and uniform history of geological development.

**8.1.4. Stream Length (Lu):**

The number of streams of various orders in sub watershed was counted and their lengths were measured with the help of GIS Software.

**Table No. 1.**  
**Stream Order, Number of Stream, Stream Length, Percentage of stream Length.**

Su	Nu	Lu (Kms)	Lu (%)
----	----	----------	--------

[50]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

1	326	166.7101	<b>54.9445</b>
2	73	53.1178	<b>17.5066</b>
3	18	45.1028	<b>14.8650</b>
4	5	24.6253	<b>8.1160</b>
5	1	13.8592	<b>4.5677</b>

**Source:** Computed by Researcher.

#### 8.1.6 Mean stream length (Lum):

Mean stream length mean is the total length of stream of order divided by total numbers of segment in the order.

Mathematical Formula:

$$\text{Lum} = \text{Lu} / \text{Nu}$$

Where,

Lum=Mean stream Length.

Lu=Total stream length of order 'u',

Nu=Total number of stream segment of order 'u',

**Table No. 2.**

Su	Nu	Lu(kms)	Lum (kms)
1	326	166.7101	<b>0.5113</b>
2	73	53.1178	<b>0.7276</b>
3	18	45.1028	<b>2.5057</b>
4	5	24.6253	<b>4.9250</b>
5	1	13.8592	<b>13.8592</b>

**Source:** Computed By Researcher.

Where, Su-Stream Order, Nu-Number of Stream, Lu= Stream Length , Lum=Mean Stream Length. The positive relationship between the stream order and mean stream length as order increases the mean stream length also increase.

#### 8.1.6. Stream Length Ratio: (Lur):-

Horton's (1945) states that the stream length ratio is the ratio of mean (Lu) of segment of order (su) to mean length of segment of the next lower order (Lu-1) which trends to be constant throughout the successive order of a basin.

**Table No: 3**

[51]

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

Su	Nu	Lu(Kms)	Lum	Lur	Lurm
1	326	166.7101	0.5113	-	2.41
2	73	53.1178	0.7276	1.4230	
3	18	45.1028	2.5057	3.4437	
4	5	24.6253	4.9250	1.9655	
5	1	13.8592	13.8592	2.8140	

**Source:** Computed by Researcher.

Where, Su-Stream Order, Nu-Number of Stream, Lu = Stream Length, Lum = Mean Stream Length, Lur = Stream length ratio, Lurm = Mean stream length ratio.

The mean stream length ratio is 2.41 and comparing with the first, second and fourth order is observed to be indicating that water flow in the source region is limited. Stream length ratio of the 3<sup>rd</sup> and 5<sup>th</sup> order stream is 3.4437 and 2.8140 which indicated moderate surface flow.

#### 8. 1. 7. Length of main channel (C1):

Main channel length is computed by using ArcGIS software 10.1 versions is 26.3432 Kms.

#### 8. 1. 8 Length of overland flow (Lg):

According to the Chorley (1969) the length of overland flow is considered as dominant hydrological and morphometric factor and is the mean horizontal length of flow path from the divided path to the stream in a first order basin.

Mathematical Formula:

$$LG=A/2Lu$$

Where,

Lg=Length of the overland flow in Km.

A= Area of the basin in sq.km.

Lu= Total Length of stream in Km.

The value of length of over land flow of Dev River is **0.1813 km** which represents the moderate relief in the basin.

#### 8. 2. Areal aspects:

**8. 2. 1. Basin Perimeter (P):**The basin perimeter (p) is the total length of the drainage basin boundary enclosing its area. The basin perimeter of the Dev basin is 60.1306 km measured by the topographical map.

**8. 2. 2. Stream Frequency (Fs):**Horton (1932), Stream Frequency or channel frequency (Fs) is the total number of stream segments of all order per unit area.

Mathematical Formula:

$$Fs=Nu/A$$

Where,

Fs= Stream Frequency.

Nu= Number of stream Segment.



*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

A=Area of basin in sq.km. The stream frequency of Dev River basin is 3.84 Sq. Km. The value of stream frequency indicates a moderate relief and less run off basin.

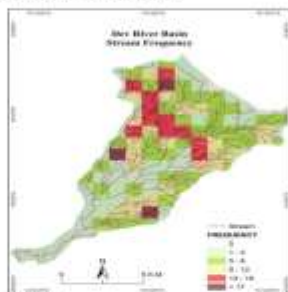


Fig. 4. Stream frequency Map

**8.2.3. Drainage Density (Dd):**According to Horton (1932) drainage density gives mean length of stream within a basin per unit area and it is obtained by dividing the total stream length (L) by the total basin area (A).

Mathematical Formula: Drainage Density (Dd)

$$Dd = Lu/A$$

Where,

Dd= Drainage Density in Km /km<sup>2</sup>

Lu= the total length cumulated for each stream order in km,

A= The total area of the basin in sq. km.

The drainage density of Dev river basin is 2.7577 Km/Km<sup>2</sup> which indicates a low numbers of streams per unit area, dense vegetation, high soil infiltration and permeability.

**8. 2. 4. Length of the basin (Lb):**-According to Schumm (1956) the basin length (Lb) is defined as the longest dimension of the basin parallel to the principal drainage line. The length of the basin is 19. 6642 kms of the Dev basin from source to mouth.

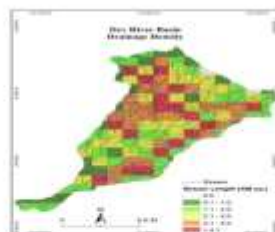


Fig. 6 Drainage Density Map

**8.2.5. Area of basin (A):**The drainage basin is one of the important parameter like stream number, length of stream etc. the drainage basin is computed with the help of ArcGIS 10.1 software is 110.0245 sq.km

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

**8.2.6. Form Factor (Rf):** According to Horton (1945) is the ratio between the basin area and square of the basin length form factor represents the erosional potential of the catchment area.

Mathematical Formula:

Where,

$$Rf = A / Lb^2$$

Rf = Form factor

A = Area of the drainage basin in sq.km

Lb = length of basin in km.

The form factor value of Dev river basin is .2845 which indicated the drainage basin less elongated shape.

**8.2.7. Circulatory Ratio (Rc):** Circulatory ratio is defined by Miller (1953), the ratio of the area of a basin to the area of a circle having the same circumference as the perimeter of the basin. The sub watersheds have an index of less than 0.50 indicating that the basin is more elongated shape.

Mathematical Formula:-

$$Rc = 4IIA/P^2$$

Where,

Rc = Circulatory Ratio.

A = Area of the basin in sq.km.

P = perimeter of the basin in km.

II = 3.14

The circulatory ratio of Dev river basin is 0.3820

**8.2.8. Infiltration Number (If):** Infiltration ratio (If) of watershed is defined as the product of drainage density and stream frequency. It is given as idea about the infiltration characteristics of the watershed. The higher infiltration number (If) the lower will be the infiltration and higher the run-off of the basin. The lower the infiltration number (If) the higher will be infiltration and lower the runoff of the basin.

Mathematical Formula: (Faniran, 1968)

$$If = Fs * Dd$$

Where,

If = Infiltration Number.

Fs = Stream Frequency.

Dd = Drainage Density.

Infiltration Number of Dev river basin is = 10.6019

### 8.3. Relief Aspects:

**8.3.1. Relative Relief (Rhp)** "The relative relief has shown the difference between the maximum elevation and minimum elevation of the area".

Mathematical Formula:

$$(Rhp) = Z - z$$

Where,

Z= Highest Elevation in the Basin.

z= Lowest Elevation in the Basin.

Rhp= 913m -595m

The relative relief of Dev river basin is 318 m which indicated as the moderate relative relief.

**8. 3. 2. Absolute Relief:** Absolute relief means the highest point on the basin mean above the sea level (MSL). The absolute relief of Dev river basin is 913 m in height.

**8. 3. 3. Ruggedness Number (Rn):**Ruggedness number is the product of the basin relief and the drainage density and usefully combines slope steepness with its length (Strahler, 1968).

Mathematical Formula,

$$Rn= H *Dd$$

Where,

Rn = Ruggedness Number.

H = Total Basin Relief.

Dd= Drainage Density

The Ruggedness Number of Dev River Basin is = 876.9486 which is indicated the relief and drainage density is low.

**8. 3. 5. Slope analysis :-**The contributions made by Rich (1916),Wentworth (1930),Robinson (1948), Miller (1960), Pity (1969), Smith (1939), Elves (1965) have a remarkable impact on slope geomorphology and various methods of representing the slope.

The present study based on the Wentworth (1930) method to analyse slope geomorphology of Dev River Basin.



Fig. 7. Slope Map

**8. 3. 6. Drainage pattern (D<sub>p</sub>):**Drainage pattern means the 'Form' (Geometrical Forms) of the drainage systems and the spatial arrangement of streams in a particular locality or region. The Drainage Patterns of Dev basins are

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

included in fifth order stream. The dendritic pattern of drainage in general is typical of homogeneous crystalline rocks.

**8. 3. 8 Dissection Index (Dis)** Dissection Index (Dis) is a parameter implying the degree of dissection or vertical erosion and expounds the stage of terrain or landscape development in any given physiographic region or watershed (Singh and Dubey 1994).

Mathematical Formula,

$$Di = \frac{H}{Ra}$$

Where,

Di= Dissection Index

H = Relative Relief.

Ra= Absolut Relief.

The Dissection Index value of Dev river basin is 0.34 which indicates that the watershed is moderately dissected.

**Result and Discussion: -**

The total length of Dev river channel is 26.3432 kms from its origin to confluence. The total area of the basin is 110.0245 Sq. km. and it falls in the Survey of India (SOI) Toposheet No, (47I/8, 47 J/5) for watershed boundary. The total numbers of streams (423) were identified in the present drainage basin, which are first, second, third, fourth, fifth order streams. The mean bifurcation ratio of the Dev River basin is 4.27 which indicates that bifurcation is normal in region. The drainage density of Dev river basin is 2.7577 Km/Km<sup>2</sup> which indicates a low numbers of streams per unit area, dense vegetation, high soil infiltration and permeability. The relative relief of Dev river basin is 318 m which indicated as the moderate relative relief.

**Conclusion:**

The present paper attempt the geomorphic assessment of dev river basin using geographical information system. The study area includes the plateau region of the central part of the Deccan plateau in parner tehsil. The geologically the entire area is covered by basaltic lava flows which is commonly referred as the Deccan traps. The dev river is the sub-stream of the kukadi river. The quantitative morphometric analysis of dev river basin. In dev river basin characterized uniform climate, rock types, and uniform history of geological development. The geomorphic analysis of dev river using GIS Technique.

**Reference:**

1. **Arupita, Pankaj., Pankaj Kumar., (2009)**, "GIS based Morphometric Analysis of Five major Sub-Watersheds of Song River, Dehradun district and Utrkhand with Special Referances to Landslide Incidences". Indian society Remote Sensing, Dehradun.
2. **Biswas, S., Sudhakar, S., Dasai, V.R., (1999)**, "Prioritisation of Sub Watershed based on Morphometric Analysis of Drainage Basin: A Remote Sensing and GIS Approach". Journal of Indian Society of Remote Sensing, Vol, 27, No.3, Pp. 155-166.

*Wesleyan Journal of Research, Vol.14 No.27 (September 2021)*

3. **Deosthali, V. (1977)**, "Rainfall Characteristics over Pune". An Unpublished Ph.D. Thesis Submitted to Department of Geography, University of Pune.
4. **Geena, G.B., Ballukraya, P.N. (2011)**, "Morphometric Analysis of Korattalaiyar River basin, Tamil Nadu, India: A GIS Approach". International Journal of Geomatics and Geosciences, Vol. 2, No. 2.Pp. 383-391.
5. **Javed, Akram-MohdYousufKhanday –Rizwan Ahmed., (2010)**, "Prioritization of Sub-Watersheds based on Morphometric and Land Use Analysis using Remote Sensing and GIS Techniques". Research Article, Indian Society of Remote Sensing, Vol. 37, Pp.261-274.
6. **Kale, V. S., Rajaguru, S.N., (1985)**, "Alluvial and Sub Alluvial Western Land River of Maharashtra, (India)," Journal Annals of the National Association of Geographers, Vol.V, No. II. India.
7. **Koshak, N., Dawod, G., (2011)**, "A GIS Morphometric Analysis of Hydrological Catchments within Makkah Metropolitan area, Saudi Arabia". International Journal of Geomatics and Geosciences, Vol. 2, No. 2, Pp. 544-554.
8. **Krishana, M., (2010)**, "Morphometric Analysis of Gostani River Basin in Andhra Pradesh State, India Using Spatial Information Technology", International Journal Of Geomatics and Geosciences, Vol.I. (2).
9. **Lakshamma., Nagaraju, D, D., Mahadevaswamy. G ., Siddalingamurthy, S., Manjunatha, S., (2011)**, "Morphometric Analysis of Gundal Watershed, Gundlupet Taluk, Chamarajanagar District, Karnataka , India", in International Journal of Geomatics and Ge Lacey, G.L., (1930), "Stable Channels in Alluvium". Institution of Civil Engineers Proceedings, Pp. 229,259-384.
10. **Malik, M. L., Bhat, M. S., Kuchay, N.A., (2011)**, "Watershed Based Drainage Morphometric Analysis of Lidder Catchment in Kashmir Valley Using Geographical Information System". Resent Research in Science and Technology, Vol.3, No.4, Pp.118-126.
11. **Nageswara Rao, K., Swarna Latha. P., Arun Kumar, P., Hari Krishna, R., (2010)**, "Morphometric Analysis of Gostani river basin in Andhra Pradesh State, India using Spatial Information System". International Journal of Geomatics and Geoscience, Vol. 1, No. 2, Pp.179-187.
12. **Padalkar, Nilesh S., (2014)**, "Application of Geoinformatics for morphometric analysis of Venna River Basin Satara (Maharashtra)", Unpublished Ph. D Thesis submitted to Department of Geography, Shivaji University, Kolhapur.
13. **Rao Liaqat A. K., Ansari Ziaur Rehman., Yusuf Alia., (2011)**, "Morphometric Analysis of Drainage Basin using Remote Sensing and GIS Techniques: A case study of Etmadpur Tehsil, Agra District, U. P." International Journal of Research in Chemistry and Environment Vol.1, No. 2, Pp.36-45.
14. **Singh, Surajit., Thakur B. R., (2011)**, "Morphometric Analysis of Kaushalaya River Watershed Using GIS and Remote Sensing Techniques". International Geographical Journal, Vol. 49, No. 1, Pp. 1-7.
15. **Singh, S., (1998)**, "Physical Geography", PrayagPustak Bhawan, Allahabad, India.

**46. Human Right and Health Policy**

**HUMAN RIGHTS AND HEALTH POLICY**

**Dr. SAMBHAJIM KALE,**

New Arts, Commerce and Science College, Dist. Ahmednagar,  
Parner, Maharashtra -414007, India

**SURESH B. SHINDE**

Assistant Professor, C. I. Bora College, Shirur,  
Pune District, Maharashtra -412210, India

**Abstract**

The right to health is a fundamental part of our human rights and of our understanding of a life in dignity. The right to health is the economic, social and cultural right to a universal minimum standard of health to which all individuals are entitled. The two decades witnessed the end of the 20th century promising to some the end of the world and human life, or at the least a massive collapse of electronic communication networks, while foretelling to others a 21st century and a new millennium of peace, security, justice and equitable global economic opportunities. The right to health, i.e. the right to the highest attainable standard of health, makes governments responsible for prevention, treatment and control of diseases and the creation of conditions to ensure access to health facilities, goods and services required to be healthy. Primarily located within legal frameworks that focus on civil and political rights, to right to health is more frequently being used to challenge abuses of health by invoking social and internationally accepted as civil and political right. Understanding health as a human right creates a legal obligation on states to ensure access to timely, acceptable, and affordable health care of appropriate quality as well as to providing for the underlying determinants of health, such as safe and potable water, sanitation, food, housing, health-related information and education, and gender equality.

**Keywords:** Human Rights, Global Economic opportunities, Civil and Political Rights

**Introduction**

Human right refers to internationally recognized norms applying equally to all people everywhere in the world. International human rights law is a set of legal standards to which governments have agreed with the purpose of promoting and protecting these rights. International treaties not only prohibit direct violations of human rights but also hold governments responsible for progressively ensuring conditions enabling individuals to realize their rights as fully as possible. Every country is now party to at least one treaty encompassing health-related rights and is therefore responsible for reporting periodically to an international monitoring body on its compliance.

All human rights economic, social, cultural, civil and political are considered interdependent and indivisible, governments are accountable for progressively correcting conditions that may impede the realization of the "right to health", as well as related rights to education, information, privacy, decent living and working conditions, participation, and freedom from discrimination. Systematic attention to this range of rights by the health sector can provide a coherent framework for a focus on conditions that may limit people's ability to achieve optimal health and to receive health services.

Dr. Sambhajim Kale and Suresh B. Shinde, Journal of Modern Management Research (A Quarterly International Arts and Humanities, Language) Vol. 9, No. 3, July - September 2021, pp. 404-407

The human right discourse and practice the right to health has been and continues to be a contentious arena. A right to health is one of a range of socio-economic rights for which many states have accepted an obligation under international law. However, in practice socio-economic rights are rarely given the same status as civil and political right. Access to health means that all people, regardless of differences in race, sex, language, religion or social origin should have physical access to health facilities goods and services. However, in practice access to health is not universally applied: all of the above are frequent barriers to securing adequate redress of health problems.

**Definition-**

The preamble of the 1946 World Health Organization Constitution defines health broadly as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The Constitution defines the right to health as "the enjoyment of the highest attainable standard of health," and enumerates some principles of this right as healthy child development; equitable dissemination of medical knowledge and its benefits; and government-provided social measures to ensure adequate health.

The WHO definition also highlights the importance of health promotion, defined as the process of enabling people to increase control over, and to improve, their health. To do so, an individual or group must be able to identify and realize aspirations, to satisfy needs, and to change or cope with the environment.

The positive and negative effects on health of promotion, neglect, or violation of human rights; the effect of health on the delivery of human

rights; and the effects of public health policies and programmes on human rights.<sup>19</sup> Despite the advances in the study and advocacy of health and human rights we still do not fully understand the nature of these relationships, how they interact, or their value to medicine and public health practice. In this chapter we address the public health aspects of these relations, and highlight where further research and action are needed.

**Universal Declaration of Human Rights**

Article 25 of the United Nations' Universal Declaration of Human Rights 1948 states that "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services." The Universal Declaration makes additional accommodations for security in case of physical debilitation or disability, and makes special mention of care given to those in motherhood or childhood.

The modern idea of human rights is similarly vibrant, hopeful, ambitious and complex. While there is a long history to human rights thinking, agreement was reached that all people are "born free and equal in dignity and rights" when the promotion of human rights was identified as a principal purpose of the United Nations in 1945. Then, in 1948, the Universal Declaration of Human Rights was adopted as a universal or common standard of achievement for all peoples and all nations.

**Constitution of the World Health Organization**

The states parties to this constitution declare, in conformity with the charter of the United Nations, that the following principles are basic to the happiness, harmonious relations and security of all peoples:

ಜನಕ ಪದವಿಯು ಹೊಸ ತಂತ್ರ ಸಾಧನಗಳು, ಸಂಶೋಧನೆ ಮತ್ತು ಅನ್ವಯಗಳನ್ನು ಉತ್ತರಿಸುತ್ತಿರುವುದು ಮತ್ತು ಸಂಶೋಧನೆ ಮತ್ತು ಅನ್ವಯಗಳನ್ನು ಉತ್ತರಿಸುತ್ತಿರುವುದು.  
 Journal of Modern Health Research (A Quarterly International Arts and Humanities, Life, and Social Sci. J. Vol. 1, No. 3, 2021) October 2021, pp. 417-424.

- Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
- The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.
- The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest cooperation of individuals and states.
- The achievement of any state in the promotion and protection of health is of value to all.
- Unequal development in different countries in the promotion of health and control of disease, especially communicable disease, is a common danger.
- Healthy development of the child is of basic importance; the ability to live harmoniously in a changing total environment is essential to such development.
- The extension to all peoples of the benefits of medical, psychological and related knowledge is essential to the fullest attainment of health.
- Informed opinion and active co-operation on the part of the public are of the utmost importance in the improvement of the health of the people.
- Governments have a responsibility for the health of their peoples, which can be fulfilled only by the provision of adequate health and social measures.

**Human Rights and Health**

The links between human rights and health are best understood by referring to the preface to the WHO constitution, which states that health is

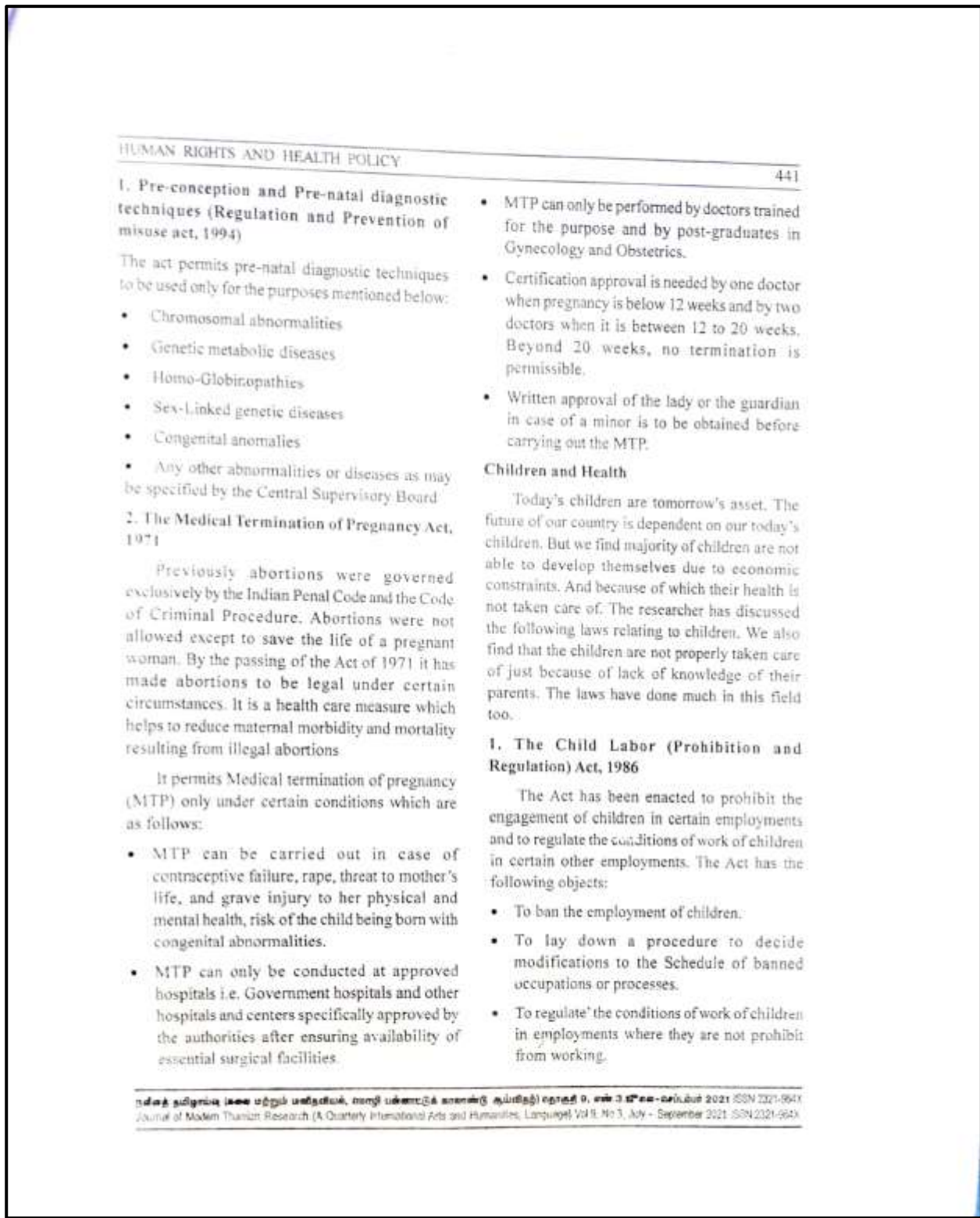
the "state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity" and "the highest attainable level of health is the fundamental right of every human being." Governments are therefore responsible for enabling their populations to achieve better health through respecting, protecting, and fulfilling rights. This responsibility extends beyond the provision of essential health services to tackling the determinants of health such as, provision of adequate education, housing, food, and favorable working conditions.

Economic, social, and cultural rights, such as education and food, are relevant to health, as are such civil and political rights as those relating to life, autonomy, information, free movement, association, equality, and participation. Recognition of the legal and political obligations that connect economic, social, and cultural rights, as well as civil and political rights, continues to grow. The right to the highest attainable standard of health therefore builds on, but is by no means limited to, Article 12 of the UN International Covenant on Economic, Social, and Cultural Rights. It transcends almost every other right. The legal obligation of states to respect health-related rights is only one part of the picture, because rights are also used to guide policies and programs for health and wellbeing. They enable a broad response to health and development by national and international stakeholders with responsibilities that reach beyond the health sector.

**Women and Health laws**

Women have always obtained an inferior status in our society. They are often ignored and are considered to be as child producing machines. In such situation there is no one to take care of women who besides homely duties do a much more to help the economic condition of the family. The legislators have done a great task by enforcing laws protecting health of women.





**Supply and Distribution) Act, 1992**

In fact breastfeeding has been our culture since ancient time. But in modern times our babies were deprived this gift of God due aggressive promotion of infant formulae and packaged cereal foods, which resulted in increased infant morbidity, malnutrition and mortality.

Recognizing this as a major public health problem, the Government of India had enacted the above legislation to prevent such improper practices. India became one of the few countries in Asia to fully implement the International Code of Marketing of Breast milk Substitutes with the enactment of the Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Act, 1992.

**3. The Juvenile Justice (Care and Protection) Act, 2000**

The object of the Act is to consolidate and amend the law relating to juveniles in conflict with law and children in need of care and protection, by providing for proper care, protection and treatment by catering their developmental needs, and by adopting a child-friendly approach in the adjudication and disposition of matters in the best interest of children and for their ultimate rehabilitation through various institutions established under the act.

**Convention on the Rights of the Child**

Health is mentioned on several instances in the Convention on the Rights of the Child. Parties

To diminish infant and child mortality. To ensure the provision of necessary medical assistance and health care to all children with emphasis on the development of primary health care, combat disease and malnutrition, including within the framework of primary health care, through, inter alia, the application of readily available technology and through the provision of adequate nutritious foods and clean drinking-water, taking into consideration the dangers and risks of environmental pollution. To ensure appropriate pre-natal and post-natal health care for mothers. To ensure that all segments of society, in particular parents and children, are informed, in particular parents and children, are informed, have access to education and are supported in the use of basic knowledge of child health and nutrition, the advantages of breastfeeding, hygiene and environmental sanitation and the prevention of accidents. To develop preventive health care, guidance for parents and family planning education and services.

**Globalization and Health Development**

Globalization and the direct and indirect impacts of intensifying global flows of money, trade, information, culture and people on health and related aspects of human development have brought out a new set of human rights issues (Brundtland 2000). These issues need particular attention, as they have largely been ignored up to now. The process of globalization has proceeded at a much faster pace than the development of policies aimed at maximizing its benefits to human

ಇದರಲ್ಲಿ ಸೂಚಿಸಲಾದ ಮಾಹಿತಿಗಳನ್ನು ಪರಿಶೀಲಿಸಿ, ನಿಮ್ಮ ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಸೂಕ್ತವಾಗಿ ಬಳಸಿ. ಇದು ಮಾಹಿತಿ-ಸಂಪನ್ಮೂಲವಾಗಿದೆ. ISSN: 2321-994X  
 Journal of Modern Therapist Research : A Quarterly International Arts and Humanities Language Vol. 5, No. 3, July - September 2021. ISSN: 2321-994X

HUMAN RIGHTS AND HEALTH POLICY

development and preventing or mitigating its harmful effects.

A universal need to reinforce the commitment and capacity of governments to ensure that actions taken by the private sector and other actors in civil society relevant to health and other aspects of human development, both within and outside the boundaries of nation-states, are informed by and comply with human rights principles. Current structures are generally insufficient for NGOs or governments to effectively monitor and hold corporations operating on a national 18 scale accountable.

Conclusions

The challenges posed in linking health with human rights are immense. There is, however, increasing evidence that public health efforts that respect, protect and fulfill human rights are more likely to succeed in public health terms than those that neglect or violate rights. National and international policy and decision makers, health professionals and the public at large all, to varying degrees, understand the fundamental linkages between health and human rights, and the way in which those linkages can provide new ways to analyze and conceive responses to health issues. To move the work of health and human rights forward will require building and strengthening the information and education available about human rights concepts and procedures. It will also require information exchange and stronger cooperation between those working on health and those working on human rights. When people are sufficiently knowledgeable about human rights, they will be able to identify the issues for which the synergy of human rights and health is critical, and to act accordingly. Human rights and health are progressing, in parallel, towards a common goal that will never be fully realized. Yet, together, they project a vision and an approach that may

fundamentally and positively improve the lives of people everywhere in the world.

Health has to be promoted from the human rights perspective and the same has to be borne in the minds of each and every individual involved in the health care sector. This is only possible when the legislations are made with a view to promote and protect health from a human right perspective. We find that the legislations in India fail to focus and promote health from human rights approach.

References:-

1. AratiDhar; Women and health, Yojana, 2012.
2. Anita Panot; Globalization and its impact on health, Perspective of social work, college of social work, Mumbai, 2002.
3. Grad, Frank P. (Jan 2002). "The Preamble of the Constitution of the World Health Organization" (PDF). *Bulletin of the World Health Organization* 80 (12): .
4. Cook, R.J. (1995). Gender, health and human rights. *Health and Human Rights* 1(4).
5. Mann, J.M., Gostin, L., Gruskin, S., Brennan, T., Lazzarini, Z., Fineberg, H. (1994). Health and human rights. *Health and Human Rights*, 1(1).
6. AAshokan (2009); "Perspective of health economics" Serial Publication, New Delhi.
7. www.nhp.gov.in
8. www.who.in.

cs

മലയാളം പഠനത്തിന് അനുകൂലമായ പരിസ്ഥിതി സൃഷ്ടിക്കാനും, അതിന് അനുയോജ്യമായ പരിഷ്കാരങ്ങൾ ഉൾക്കൊള്ളുന്നതിനും 9. 2021 ജൂലൈ - സെപ്റ്റംബർ 2021 ISSN 2321-884X  
Journal of Modern Thanzhi Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN 2321-884X

**47. Nutrient Analysis of Soil Samples in Parner Tahsil from Various Zones**

Wesleyan Journal of Research, Vol.14 No.26 (September 2021)

ISSN – 0975-1386  
Research article: (Botany)

**NUTRIENT ANALYSIS OF SOIL SAMPLES IN PARNER TAHSIL FROM VARIOUS ZONES**

**Dr. Sambhaji. M. Kale**

Dept. of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner, Dist.-  
Ahmednagar(MS). Email: [sambhajikale@gmail.com](mailto:sambhajikale@gmail.com).

**Mr. Akshay K. Meher**

New arts Commerce and science College, Parner, Dist. - Ahmednagar(MS).

**Abstract**

Analysis of nutrient or elements in soil samples provides all necessary information that is required in order to set target of nutrient application. It also allows the detection and monitoring of the changes in the parameters of soil. In this, the soil samples collected from different agriculture plots, lakeside area and mountain area, drought and irrigated area of Parner Tahsil are analysis for estimation of total Nitrogen, phosphorus, potassium, calcium and magnesium the method used are Kjeldahl method flame photometric method and EDTA titration method. It also measure pH, EC, moisture content of soil samples. Proper methods and timing of soil sampling help ensure reliability of test results for making informed decisions related to soil inputs such as fertilizer and lime. Our aim is to decrease the use of fertilizers and increase the crop productivity.

Use the proper amount of organic, inorganic fertilizers. Also decrease the money of farmers, decrease time. By testing soil samples before the crop taking we have predicting the accurate amount of fertilizers which is need to the specific crop which helps to increase the crop production.

**Keyword:** - Nutrient testing kit, pH meter, Conductometer, Oven, kjeldahl method, topsoil, fertilizer, flame photometric method, EDTA, Extractant and soil sampling.

**Article History**

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dr. Sambhaji. M. Kale

**Introduction**

As 58% of Indian population is depend on the agriculture field which contributes up to 20% of the GDP of our country. Soil is an important part of agriculture system, so soil testing and soil analysis becomes important for good crop productivity and also for the better quality of crop. Also within it 70% of Indian agriculture depends upon monsoon and alternately having year drought is a serious problem to consider for Indian agriculture, because

Weslyan Journal of Research, Vol. 14 No. 26 (September 2021)

absorb soil water available in the form of moisture in the soil. Soil moisture conditions can have a significant effect on pest resistance. Soil moisture is measured by the simple gravimetric technique.

**Experimental Section:**

**C. Collection of sample**

Soil samples taken for study were collected from different villages of Parner Taluka. Agricultural plots, lakeside areas, mountain areas, drought and irrigated areas of Parner Taluka.

**Soil Sampling**

Soil samples were taken from 0-10 cm depth at four equidistant positions in each plot. When the sampling was done, the surface of soil in all plots was dry.

**Procedure for Nutrient Detection: (N, P, K, Ca and Mg)**

Open the soil DROPTOR capsules carefully. Put the chemical inside the test tube and transfer 4-9 ml clear soil extract with dropper. And compare this solution with given chart.

**Nitrogen (N):**

Nitrogen is a part of chlorophyll molecule, which gives plants their green color and is involved in creating food for the plant through photosynthesis process. Nitrogen is a very important and much needed for plant growth. It is found in healthy soil and provides plant with the energy to grow and ability to produce fruits or vegetables. Nitrogen is actually considered the most important component for supporting plant growth. Lack of nitrogen is indicated by general yellowing (chlorosis) of the plant.

**How to maintain the level of Nitrogen in the Soil:**

Adding composted manure to the soil. Planting a green manure crops, planting nitrogen fixing plants like peas or beans, Adding organic & inorganic fertilizers.

**Phosphorus (P):**

Phosphorus plays an important role in the growth of plant including the Stimulated root development. It also results in increased stalk and stem strength with improved flower formation and seed production. It also helps to increase the nitrogen fixing capacity of legumes. Phosphorus is also helpful in improving the crop quality leading to increased resistance towards plant diseases. Basically, it supports overall development of plant upto it's full growth.

**How to Maintain the phosphorus levels:**

[24]

Weslyan Journal of Research, Vol. 14 No. 26 (September 2021)

of which management of soil, irrigation, proper doses of fertilizer become so important. In this project, I have studied soil of drought prone Parner Taluka. Nitrogen (N), Potassium (K), and Phosphorus (P) are the most important nutrients required for plant growth and development. Nitrogen and Phosphorus are not readily available for plants and deficiency of these elements may lead to deprived quality of plants.

**Content of Soil Samples Testing-**

**pH**

Soil pH is an excellent indicator of the suitability of a soil for plant growth. Soil pH can regulate and control many chemical and biochemical reactions within the soil. It is measured by using pH meter.

**How to maintain pH levels:-**

- 1. Use of lime. 2. Use of organic & inorganic fertilizers.

**Electrical Conductivity (EC)**

It is used to check the salinity of soil. Soil EC is done to measure the amount of salts present in soil. It is an important indicator of soil health. Excess of salts can adversely affect the plant growth. How to maintain EC:-

Adding organic matter such as manure & compost

Chart For pH and EC

Soil pH	Nature	EC Range (mmhos/cm)	Rating
<6	Acidic	<1	Good soil
6-8.5	Normal	1-2	Poor Seed Emit germs
8.5-9	Tending to become Alkaline	2-3	Harmful for many crops
>9	Alkaline soil harmful for crops	>3	Harmful for most of the crops

**Moisture Content:-**

Soil moisture level affects the air content, salinity, and presence of toxic substances. The moisture content of soil in the quantity of water present in the soil. Water content has an important role in greenhouse technique agriculture and soil chemistry. If the moisture content of soil is favourable for plant growth, plants can readily

[25]

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

Adding organic and inorganic phosphorus fertilizers

**Potassium (K):-**

Potassium is the second most important nutrient for plant. The role of potassium in crops is to increase the growth of roots and improve drought resistance and maintain turgor Pressure. It also helps to reduce the water loss and wilting of crops. It also helps in photosynthesis process and food formation. It reduces respiration, prevent energy losses. It also enhances the translocation of sugars and starch, and Produces grain which is rich in starch and helps to increase the plants' protein content. It also helps to build cellulose and Helps prevent crop diseases.

**How to maintain the Potassium level:-**

Adding organic matter such as manure & compost

**Calcium (Ca) :-**

Calcium is the most important element which helps in the growth and development of plants. It is an important factor for cell wall and membrane stability, and also serves as a second messenger in many developmental and physiological processes. It is responsible for maintaining intracellular  $Ca^{2+}$  homeostasis which is crucial for the ability to generate the signal. It acts as a plant nutrient on the same level as N, P and Mg and also as a pH regulator. It is determined by using EDTA Titration.

**How to maintain Calcium level:-**

Adding lime to the soil in autumn to increase Ca. Add Eggshells in your compost which will add calcium to soil

**Magnesium (Mg) –**

It helps to capture the sun's energy for growth and production of the plant through photosynthesis. Magnesium plays an important role in activating the enzymes involved in respiration, photosynthesis and nucleic acid synthesis. Mg helps in translocation of carbohydrates (sugars and starches) and increases the production of fats and oils.

It is determined by using EDTA Titration.

**How to maintain magnesium level: -**

Use dolomitic lime when lime is needed and Soluble sources of magnesium when lime is not needed. Use organic compost.

[25]

Nutrients Test

**SOIL DOCTOR PLUS**  
Soil NPK & pH Health Indicator Kit  
40 Test Capsule  
Product Code HC-106-NPK & pH

**SOIL DOCTOR PLUS**  
Agrinex Corporation  
40 Test Capsules

**NOT FOR HUMAN CONSUMPTION**

**TEST YOUR SOIL HEALTH WITHIN 20 MINUTES.**

**SOIL TESTING KIT, SIMPLE, ACCURATE, ECONOMICAL**

**SIMPLE**

**ACCURATE**

**ECONOMICAL**

[26]

Phosphorous Nitrogen Potassium Capsules used for Nutrients Analysis  
Nutrients Testing Kit

**Results and Discussions**

Sr. no	Village name	pH	EC (micro S/cm)	Moisture content	N (Kg/ha)	P (Kg/ha)	K (Kg/ha)	Ca (%)	Mg (%)
1	Padali daraya	6.77	0.49	10%	37	28	40	45	59
2	Nighoj	7.52	0.80	6.6%	20	36	50	62	71
3	Bhalavni	7.79	0.16	7%	40	25	100	75	63
4	Kanhur Pathar	7.37	0.70	7.2%	40	45	20	39	49

[27]



*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

7	Wadzire	6.44	0.21	3%	26	35	25	68	53
6	Kalewadi	6.80	0.55	6.6%	20	10	35	72	65
9	Lonimavla	6.43	0.63	8%	27	45	19	57	77

There are 25 samples collected from various areas of Parner Tahsil for testing, among which 7 tested sample results are given above:-

Samples collected from various areas like Padali daraya, Nighoj, Bhalavni, Kanhur Pathar, Wadzire, Kalewadi, Lonimavla

The average parameters found were as follows:

- pH was observed between 6.0 to 7.0
- Electrical conductivity EC was observed between 0.49 to 0.90 Mmhos/cm
- Moisture Content was observed between 10% to 50% by gravimetrically
- Nitrogen (N) was observed between 20 to 90 Kg / acr.
- Phosphorous (P) was observed between 20 to 90 Kg / acr.
- Potassium (K) was observed between 20 to 90 Kg / acr.
- Calcium (Ca) was observed between 40 % to 80 %
- Magnesium (Mg) was observed between 30% to 80 %

**Conclusion: -**

Soil test is important for several reasons. To optimize crop production; to protect the environment from contamination by excess of fertilizers & diagnosis of plant culture problems, to improve the nutritional balance of the growing media and to save money, save time, and conserve energy by applying only the amount of fertilizer needed. Pre- plant media analyses provides an indication of potential nutrient deficiencies, pH imbalance or excess soluble salts. The nutrient analysis of soil guides with the important information to use the target of nutrient application. Also it helps to use specific manure fertilizer and the results of test helps to maintain the pH level, EC Electrical Conductivity (salinity), nutrients, with accurate level.

*Wesleyan Journal of Research, Vol.14 No.26 (September 2021)*

**References: -**

1. Sumner, Malcolm E. (1999-08-31). Soil Science. ISBN 9780849331367. Retrieved 2012-11-08.
2. "Soil Sampling for Precision Agriculture". CropWatch. 2015-09-17. Retrieved 2019-05-22.
3. "Using precision agriculture to improve soil fertility management and on-farm research Integrated Crop Management". crops.extension.iastate.edu. Retrieved 2019-05-22.
4. Jordan-Meille, L.; Rubæk, G. H.; Ehlert, P. a. I.; Genot, V.; Hofman, G.; Goulding, K.; Recknagel, J.; Provololo, G.; Barraclough, P. (2012-12-01). "An overview of fertilizer-P recommendations in Europe: soil testing, calibration and fertilizer recommendations". Soil Use and Management. 28 (4): 419-435. doi:10.1111/j.1475-2743.2012.00453.x. ISSN 1475-2743.
5. On-the-spot, real-time and affordable soil testing technology is enhancing the agricultural value chain in Uganda.
6. On-the-spot, easy and affordable soil testing for Kenyan smallholder farmers
7. "Wlabs.com". Wlabs.com. Retrieved 2012-11-08.
8. Carl J. Rosen. "Lead in the Home Garden and Urban Soil Environment". Extension.umn.edu. Retrieved 2012-11-08.
9. Vogel elementary practical organic Chem ,part III Log Longmans,1969
10. Vogel Text book of quantitative inorganic analysis ELBS, 1969

## 48. Eco-Friendly Approach To Synthesis Of 2, 3-Diphenyl Quinoxaline Using Lignin@So3h As A Novel, Efficient And Reusable Heterogeneous Catalyst



Wesleyan Journal of Research, Vol.14 No.25 (September 2021)

ISSN – 0975-1386  
Research article: (Chemistry)

### ECO-FRIENDLY APPROACH TO SYNTHESIS OF 2, 3-DIPHENYL QUINOXALINE USING LIGNIN@SO<sub>3</sub>H AS A NOVEL, EFFICIENT AND REUSABLE HETEROGENEOUS CATALYST

**B. S. Narsale**

Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, 414302, India

**A. G. Gadhawe**

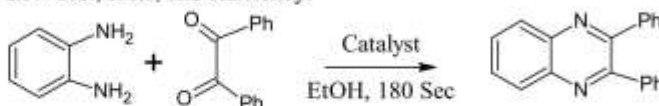
Department of Chemistry, Research Center, P.V.P. College, Pravaranagar, 413713, India

**D. R. Thube**

Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, 414302, India, drthube@rediffmail.com

#### Abstract

Quinoxaline compounds are well known in the pharmaceutical industry have a broad spectrum of biological activities. A condensation of aryl 1, 2-diamines with b-diketones or  $\alpha$ -hydroxyketones in the presence of a different catalyst, method, and the solvent is a green, highly efficient, and simple procedure. Generally, an acid catalyst with mild acidity is used in multicomponent reactions due to acid accelerate the reactions between nucleophilic components with electrophilic sites. Over the past decade, biopolymer has given great attention to a green catalyst for synthesis, especially inactive lignin obtains from biomass. Catalyst derived by physical and chemical activation of Lignin is efficient for various green transformations. As part of current studies, we here report an efficient practical technique of stirring & grinding. The overall progress of the reaction was monitored by TLC and characterized physical constant and IR spectroscopic technique. These methods are more convenient and reactions can be carried out in higher yield (92-97 %), shorter reaction time (2-3min), and milder conditions, without generation of waste and safer to an analyst. Synthesis of other quinoxaline derivatives from these features present methods can be correlated for Low cost, safer, and efficiency.



**Keywords:** 1, 2 diphenyl quinoxaline, Green Chemistry, Heterogeneous Catalyst, Lignin.

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Dilip. R. Thube

### 1. Introduction

In the last decade appreciably, attention has been devoted to the development of sustainable and efficient methods for the synthesis of quinoxalines derivatives. Quinoxaline is a nitrogen-containing heterocyclic compound also called a benzopyrazine, is a heterocyclic compound containing a ring complex made up of a benzene ring and a pyrazine. Quinoxaline skeleton is a building block attracted considerable attention over the decade owing to their very interesting pharmaceutical and biological properties such as antimicrobial [1], antibacterial [2], insecticidal [3], antitumor [4], antiviral [5], anti-inflammatory activity [6] and technology application like fluorescent dyeing agents, electroluminescent materials, chemical switches, cavitands, and semiconductors, etc. Over the years, several synthetic strategies have been reported in the literature for the preparation of substituted quinoxalines compounds, use of iodine, phenyl, potassium permanganate, copper sulphate [7], by biocompatible deep eluent solvent [8], Recyclable Alumina-Supported Heteropolyoxometalates [9], the oxidative cyclization of  $\alpha$ -hydroxyketones with *o*-phenylenediamines [10], the reaction of aryl- 1,2-diamines and diethyl bromomalonate [11], Furthermore, quinoxaline and its derivatives can also be successfully synthesized from the direct condensation of aryl 1,2-diamines and 1,2-dicarbonyl compounds. Currently, the synthesis of quinoxaline derivatives is usually carried out in the presence of a variety of catalysts, nanostructured pyrophosphate Na<sub>2</sub>PdP<sub>2</sub>O<sub>7</sub> [12], terminal alkynes and *o*-phenylenediamines by using copper alumina catalyst [13], polymer-supported sulphanilic acid [14], Ga(ClO<sub>4</sub>)<sub>3</sub> [15], etc.

Lignin is a premier biopolymer that is abundant in the cell walls of some specific cells. The biological functions such as water transport, mechanical support, resistance to various stresses, and many more. Over the past decade, lignin biomass has received great attention on a catalyst for green synthesis, especially inactive lignin obtains from pulp industry black liquor. Lignin-derived catalyst by physical and chemical activation is efficient for various green transformations [16]. Raw lignin consisting of the presence of impurities, poor surface-to-volume ratio, and limited catalytic active sites in the structure of lignin shows almost no reactivity [17]. Modification of lignin technology is an effective way. The lignin transformation into a catalyst involves acid treatment, thermal treatment, and surface modification [18]. Biochar-based solid acid catalysts can be synthesized directly from biomass sulfonation or pyrolysis/hydrothermal treatment combined with subsequent sulfonation, which refers to the one-pot and post-synthetic sulfonation methods [19]. In recent decades, the excessive consumption of fossil resources increases environmental pollution, climate change, resource, and energy crisis around the world. The attention to practical transformation and utilization of cheap and renewable biomass majority of the polysaccharides, e. g. cellulose, lignin, alginic acid, agar, chitin, and dextrin, are naturally occurring molecules and could have numerous applications. The renewable nature of polysaccharides has been exploited in diverse areas, e. g. agriculture, biomedical applications, water treatment, and cosmetics, among others [20]. Biomass-derived carbon-based sulfonated catalysts recently have been studied in biodiesel production, hydrolysis of cellulose, and some other applications. The catalyst is that the raw material (biomass) is abundant, widely existent, and renewable can be prepared by sulfonation of a carbon-based precursor with concentrated H<sub>2</sub>SO<sub>4</sub>. The precursor obtained from biomass includes carbonization methods, pyrolysis, gasification, hydrothermal carbonization, and flash carbonization [21]. Lignin-derived catalysts are low cost, environmental friendliness, high thermo-stability, and catalytic activity, an ideal alternative for some traditional catalysts. The

applications of lignin-derived catalyst functionalized with various active species for various green transformations [22]. Alternative like biomaterial, biofuels, and fine chemicals decrease the crisis of oil requirements due to the growing world population and the depletion of the reserve. Lignocellulosic biomass is recognized as a renewable feedstock of great value to produce value-added platform chemicals [23]. The catalytic reaction systems suffer from many drawbacks, mainly, the drastic reaction conditions such as high reaction temperature, high catalyst amount, prolonged reaction time even under microwave or ultrasound irradiation, contamination of the product even after purification, and it is impossible to regain the costly catalyst for reuse, as well as the environmental pollution caused by the use of a considerable amount of toxic solvents, thus making the process more complicated, expensive, and environmentally unfriendly. Hence, the development of sustainable protocols has attracted tremendous interest to design cleaner processes that possess reusable and efficient heterogeneous catalytic systems.

## **2. Material and Method**

### **2.1 Material**

The Corn stalk was collected from the local region in January at Parner, India. The Sodium Hydroxide (99%), chlorosulphonic acid (99%), Sodium Chloride (98%), were purchased from Sigma Aldrich, Sodium Bicarbonate, Benzil, and o-phenelene diamine from SD fine. No further purification is carried out on the chemicals.

### **2.2 Methods**

#### **a. Preparation of Lignin@SO<sub>3</sub>H**

The biomass was cut into small pieces. Then put them into Oven at 110°C for 4 hours to dry the moisture present in them. Followed by the carbonization is done in the air atmosphere with a temperature increment 50C per min. The black solid obtained were grinding into a particle size of 60-80 mesh. The carbonation is carried out at 2500C and 4000C for a period of 120 and 90 min respectively. The synthesis of CSC-250 and CSC-400 is

#### **a.1 Synthesis of CSC- 250**

The biomass obtains after 250 °C carbonizations were taken in an R.B flask containing 15 ml DCM. Added 10 ml chlorosulphonic acid dropwise for an hour. Reflux the mixture for 5 hours. The excess chlorosulphonic acid is removed by bubbling alcohol. Filter and wash with 10 ml DCM. the residue of the black solid was kept in the oven at 1100C for 1 hour.

#### **a.2 Synthesis of CSC-400**

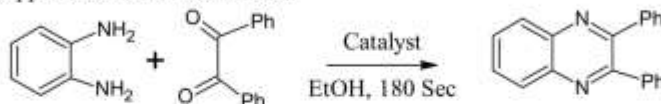
The biomass obtains after 400 °C carbonizations in two neck RB flask containing a 15 ml DCM. Added 4 ml chlorosulphonic acid drop by drop with the help of dropping funnel and kept solution for overnight. Reflux the mixture for 4 hours at 110 °C in DCM. The excess chlorosulphonic acid is removed by bubbling alcohol. Filter and wash with 10 ml DCM. Dry in oven for 3 hr at 110 °C the black colour powder formed.

#### **b. Synthesis of 2,3 diphenyl quinoxaline**

Benzil (1.0 mmol) and o-phenelene diamine (1.0 mmol) are added with specified catalyst (Table2) to the different solvents and continue stirring with a specified time. After completion of the reaction (Check by TLC). The solid material is filtered off. The brown solid was washed with hot water and further purification is done by

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

recrystallizing with 50 % water + alcohol to offer a pure product. The melting point 122-1240C using Analab thermocal melting point apparatus and is uncorrected.



## 2.3 Characterization

### a. Spectroscopic Technique

The characterization of a catalyst is done by using an IR spectroscopic technique. The German-made Brucker Alpha Eco-ATR. The CSC 250 and CSC 400 showing at 1017  $\text{cm}^{-1}$  indicate the formation of the S-O bond indicate the adsorption of chlorosulphonic acid over lignin biomass.

The synthesized 2,3 diphenyl quinoxaline shows IR ( $\nu_{\text{max}} \text{cm}^{-1}$ ) at 1551 (aromatic C=C Stretching), 1449 (Aromatic C=N stretching),

### b. Determination of Acid density

The ion exchange method is used for titration having calculation of acid density 6.6 and 7.92  $\text{mmol g}^{-1}$  for CSC-250 and CSC-400 respectively. The calculation of the density of a different functional group of synthesized catalyst was investigated using the titration method as

#### i) Measurement of total functional group (-SO<sub>3</sub>H, -COOH, and -OH groups)

A 30 ml 0.05 molL<sup>-1</sup> NaOH has added to the catalyst 50 mg. The mixture was stirred for 30 min at room temperature under ultrasonic vibrations. After centrifugal separation, the supernatant solution was titrated with 0.05 mol L<sup>-1</sup> HCl using a phenolphthalein indicator.

#### ii) Measurement of -SO<sub>3</sub>H, and -COOH functional group

A 30 ml 0.05 molL<sup>-1</sup> NaHCO<sub>3</sub> has added to the catalyst 50 mg. The mixture was stirred for 30 min at room temperature under ultrasonic vibrations. After centrifugal separation, the supernatant solution was titrated with 0.05 mol L<sup>-1</sup> HCl using a phenolphthalein indicator.

#### iii) Measurement of -SO<sub>3</sub>H functional group

A 30 ml 0.01 molL<sup>-1</sup> NaCl has added to the catalyst 50 mg. The mixture was stirred for 30 min at room temperature under ultrasonic vibrations. After centrifugal separation, the supernatant solution was titrated with 0.01 mol L<sup>-1</sup> NaOH using a phenolphthalein indicator.

## 3. Result and discussion

For optimization of reaction conditions, we investigated the influence of different reaction parameters, such as carbonation temperature, different catalysts, solvents, and the amount of the catalyst employed. The catalytic activity is influenced by carbonation temperature, low carbonation temperature has a less porous nature, adsorb minimum amount of acid shows less acid density (Table1). A very small amount of catalyst is sufficient for synthesis. Catalyst is regenerated and reused for up to three cycles without losing much catalytic activity. In the minimum amount of solvent better yield observe. To ascertain the purity and homogeneity of the synthesized compounds the thin layer chromatography was carried out. The solution of the compound was prepared in ethanol (1 mg/1 ml) E-Merck 0.25 mm silica plate used as an adsorbent. The most suitable solvent system used, is given below in Table 2. The spots were located by using a UV chamber. Rf value for each compound was

[37]

calculated. The model reaction was carried out in various solvents (Table 3). Thus, data revealed the Ethanol condition as the best reaction condition in terms of time and yield compare to water and n-hexane. The stirring method is superior to grinding (Table 4).

#### 4. Conclusion

In conclusion, we have developed a convenient, efficient, and environmentally benign protocol for the synthesis of 2,3 diphenyl quinoxaline using CSC as a heterogeneous catalyst. The catalyst is easily preparable, stable (up to 500 °C), and can be recycled for three runs without any loss of its catalytic activity. The significant advantages of this clean methodology are the excellent yield of the products, shorter reaction time, simple work-up procedure, and mild reactions conditions.

#### 5. References:

1. Vieira M., Pinheiro C., Fernandes R., Noronha J., Prudêncio C., (2014), Antimicrobial activity of quinoxaline 1,4-dioxide with 2- and 3-substituted derivatives, *Microbiological Research*, 169(4),287-293.
2. Xu F., Cheng G., Hao H., Wang Y., Wang X., Chen D., Peng D., Liu Z., Yuan Z., Dai, M., (2016), Mechanisms of Antibacterial Action of Quinoxaline 1,4-di-N-oxides against *Clostridium perfringens* and *Brachyspira hyodysenteriae*, *Frontiers in Microbiology*, 7.
3. Liu X.H., Yu W., Min L.J., Wedge D. E., Tan C.-X., Weng J. Q., Wu H. K., Cantrell C. L., Hischel J. B., Hua X. W., Duke, S. O., (2020), Synthesis and Pesticidal Activities of New Quinoxalines, *Journal of Agricultural and Food Chemistry* 68 (28), 7324-7332
4. Montana M., Mathias F., Terme T., Vanelle P., (2018), Antitumoral activity of quinoxaline derivatives: A systematic review, *European Journal of Medicinal Chemistry* 163, 136-143.
5. Montana M., Montero V., Khoumeri O., & Vanelle P., (2020), Quinoxaline Derivatives as Antiviral Agents: A Systematic Review, *Molecules*, 25(12), 2784.
6. Karakavalasa P., Kotra V., Priyadarshini R. L., Pratap V., (2015) synthesis, characterization and anti-inflammatory activity of novel quinoxaline derived chalcones, *International Journal of Pharmacy and Pharmaceutical Sciences*, 7(1)
7. Srivastava S., Banerjee J., Sharma N., Shrestha N.,(2017) A Convenient Process of Preparing of 2,3 Diphenyl Quinoxaline Derivatives, *International Journal of Chemistry Papers*, 1,1-7.
8. Katariya S. B., (2016) Synthesis of 2,3-diphenyl quinoxaline using biocompatible deep eutectic solvent, *WJPLS*, 2( 3), 400-405.
9. Ruiz D. M., Autino J. C., Quaranta N., Vázquez P. G., Romanelli G. P., (2012), An Efficient Protocol for the Synthesis of Quinoxaline Derivatives at Room Temperature Using Recyclable Alumina-Supported Heteropolyoxometalates, *Scientific World Journal.*, 174784.
10. Robinson R. S., Taylor R. J. K., (2005), Quinoxaline synthesis from  $\alpha$ -hydroxy ketones via a tandem oxidation process using catalysed aerobic oxidation. *Synlett*, 6, 1003-1005.
11. Haldar P, Dutta B, Guin J, Ray J. K., (2007), Uncatalyzed condensation between aryl-1,2-diamines and diethyl bromomalonate: a one-pot access to substituted ethyl 3-hydroxyquinoxaline-2-carboxylates. *Tetrahedron Lett*, 48, 5855-5857.

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

12. Dánoun K., Essamlali Y., Amadine O., Mahi H. and Zahouily M.,(2020), Eco-friendly approach to access of quinoxaline derivatives using nanostructured pyrophosphate  $\text{Na}_2\text{PdP}_2\text{O}_7$  as a new, efficient and reusable heterogeneous catalyst, *BMC Chemistry*, 14,6.
13. Nakhate A. V., Rasal K. B., Deshmukh G. P., Gupta S. S., Mannepalli L. K., (2018), *Journal of Chemical Sciences* 129, 1761–1769.
14. Tarpada U. P., Thummar B. B., Raval D. K., (2017), A green protocol for the synthesis of quinoxaline derivatives catalyzed by polymer supported sulphanilic acid, *Arabian Journal of Chemistry*,10, S2902–S2907.
15. Pan Fan, Chen Tang-Ming, Cao Jia-Jia, Zou Jian-Ping, Zhang W. (2012),  $\text{Ga}(\text{ClO}_4)_3$ -catalyzed synthesis of quinoxalines by cycloaddition of  $\alpha$ -hydroxyketones and o-phenylenediamines, *Tetrahedron Letters*, 53 (20), 2508-2510.
16. Kan T., Strezov V., Evans T., He J., Kumar R., Lu Q., (2020), Lignocellulosic biomass pyrolysis: A review of product properties and effects of pyrolysis parameters, *Renewable and Sustainable Energy Reviews*, 134, 110305.
17. Zhu Y., Li Z. and Chen J., (2019), Applications of lignin-derived catalysts for green synthesis, *Green Energy & Environment*, 4, 210-244.
18. Tian Y., Zhang R., Zhao W., Wen S., Xiang Y., Liu X., (2020) A New Sulfonic Acid-Functionalized Organic Polymer Catalyst for the Synthesis of Biomass-Derived Alkyl Levulinates, *Catalysis Letters*, 150, 3553-3560.
19. Xie Q., Yang X. Xu K., Chen Z., Sarkar B., Dou X., (2020), Conversion of biochar to sulfonated solid acid catalysts for spiramycin hydrolysis: Insights into the sulfonation process, *Environmental Research*, 188, 109887.
20. Kim H., Yang S., Kim D. H., (2020), One-pot conversion of alginic acid into furfural using Amberlyst-15 as a solid acid catalyst in  $\gamma$ -butyrolactone/water co-solvent system., *Environmental Research*, 187, 109667.
21. Kang S., Ye J., Zhang Y., Chang J., (2013), Preparation of biomass hydrochar derived sulfonated catalysts and their catalytic effects for 5-hydroxymethylfurfural production, *RSC Adv.*, 3, 7360–7366.
22. Varma R. S., (2019), Biomass-Derived Renewable Carbonaceous Materials for Sustainable Chemical and Environmental Applications, *ACS Sustainable Chem. Eng.*, 7, 6458-6470.
23. Khalil K.; Al-Matar H.; Elnagdi M., (2010), Chitosan as an eco-friendly heterogeneous catalyst for Michael type addition reactions. A simple and efficient route to pyridones and phthalazines, *Eur. J. Chem.* 1, 252-258.



**Table**

Table 1. Effect of Carbonation temperature on Catalyst activity

Catalyst	Carbonation Temperature (°C)	Acid Density (mmolg <sup>-1</sup> )	Time (min)
CSC 250	250	6.6	07
CSC 400	400	7.92	03

OPD(1mmol), Benzil(1mmol), Solvent: EtOH (2ml), Catalyst Load: 50 mg, RT

Table 2. Effect of Catalyst loading on synthesis and Thin Layer Chromatography

Entry	Catalyst (mg)	Time (sec.)	Yield (%)	M. P (°C)	R.F. Value
1	0	24 hr	15	120-122	0.43
2	20	300	92	120-122	0.42
3	50	180	95	122-124	0.45
4	70	150	95	122-124	0.44
5	100	120	96	120-122	0.43

OPD(1mmol), Benzil(1mmol), Solvent: EtOH, RT, TLC Solvent: (80:20) n-hexane + Ethyl acetoacetate)

Table 3. Effect of Solvent

Entry level	Solvent	Time (min.)	Yield (%)
A1	Solent Free	90	82
A2	Water	10	88
A3	Ethanol	3	95
A4	n-Hexane	3	92

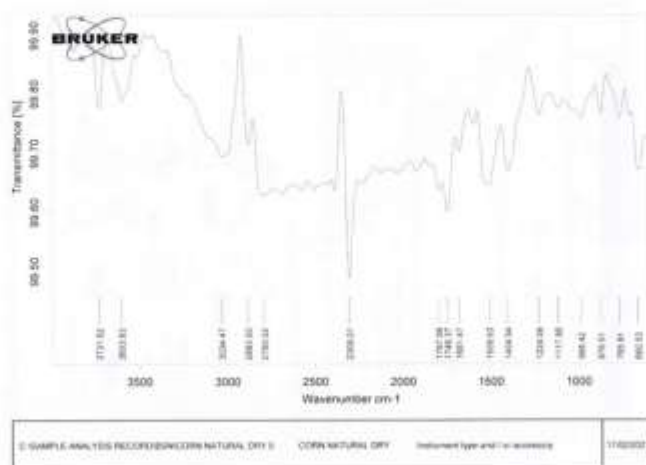
OPD(1mmol), Benzil(1mmol), Solvent: EtOH, Catalyst (50 mg), RT

Table 4. Effect of method

Method	Solvent	Time (min.)	Yield (%)
Grinding	Ethanol	15	72
Stirring	Ethanol	03	95
Grinding	-	240	48
Stirring	-	90	82

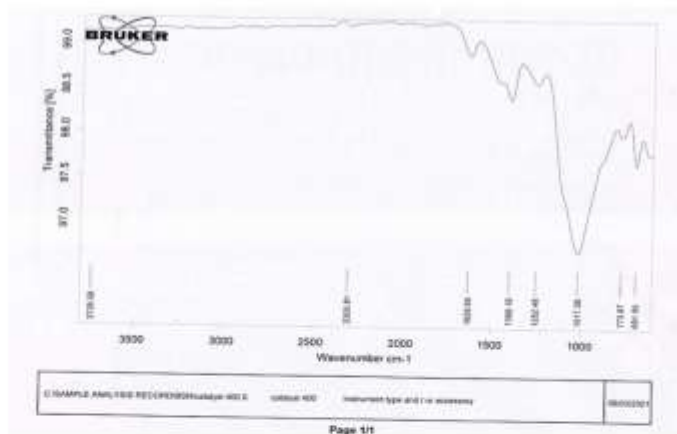
OPD(1mmol), Benzil(1mmol), Solvent: EtOH, Catalyst: CSC 400 (50 mg), RT

**IR Spectrum**  
**a. Dry Corn**



Page 1/1

**b. Catalyst CSC 400**

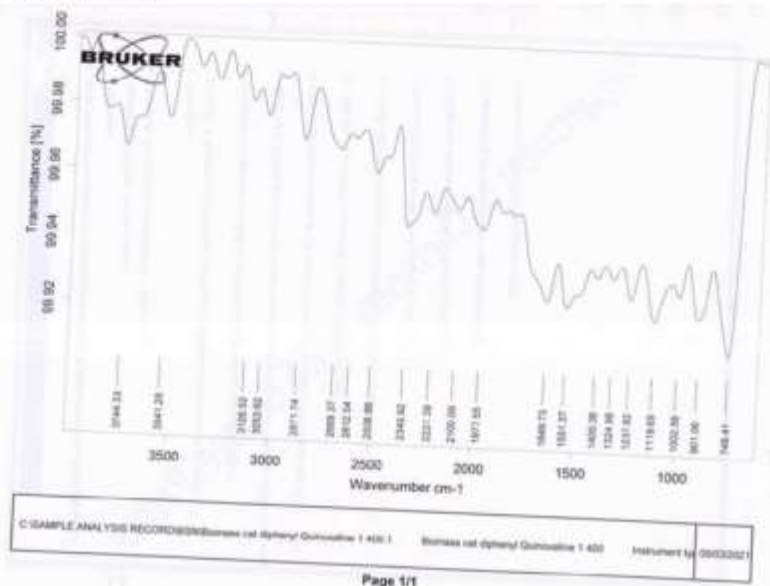


Page 1/1

[41]

*Wesleyan Journal of Research, Vol.14 No.25 (September 2021)*

**c. 2,3 diphenyl quinoxalines**



[42]

## 49. Green Approach Towards The Synthesis Of Novel Schiff's Bases



Wesleyan Journal of Research, Vol.14 No.24 (September 2021)

ISSN – 0975-1386  
Research article: (Commerce)**GREEN APPROACH TOWARDS THE SYNTHESIS OF NOVEL SCHIFF'S BASES****A.J. Dhole**

Department of Chemistry, New Arts, Commerce and Science College, Parner 414302 India

Corresponding Author: (D. R. Thube), email: drthube@rediffmail.com

**D. R. Thube**

Department of Chemistry, New Arts, Commerce and Science College, Parner 414302 India

Corresponding Author: (D. R. Thube), email: drthube@rediffmail.com

**Abstract**

Schiff's bases are a class of biologically important molecules. Synthesis of Schiff's bases by conventional methods requires more reaction time and use of organic solvents. We report a novel and eco-friendly method for the "green synthesis" of different Schiff's bases by reaction of ethylene diamine with various aryl aldehydes in solvent free as well as water as a solvent. This method is experimentally simple, green and easy to work up.

**Keywords:** Green synthesis, aqueous medium, Solvent free**Article History**

\* Received: 22/08/2021; Accepted: 09/09/2021

Corresponding author: A.J. Dhole

**Introduction:**

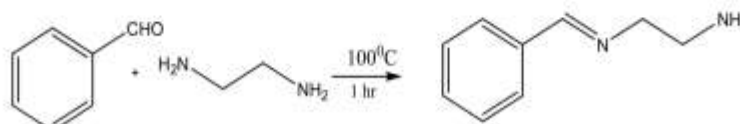
In recent years, environmentally benign synthetic methods have received considerable attention and a few solvent-free protocols are developed [1-2]. Schmeyers *et al* reported the solid-state synthesis of varied benzylidene aniline derivatives [3]. Varma *et al* reported the clay catalysed synthesis of imines and enamine under solvent-free conditions using microwave irradiation [4]. There has been an oversized emphasis on the event of environmentally benign solvents and reaction conditions. The normal solvents, like volatile organic solvents, results in number of environmental problems. Use of organic solvents like benzene and chlorinated hydrocarbons results damage to the environment due to their toxic and volatile nature [5, 6]. To scale back such disasters there is a necessity to use a safer reaction medium like water. Water is non-toxic, safe, cheap, and never results in menace to the environment. The employment of water as a solvent is undoubtedly the most effective alternative as there are generally no harsh reaction conditions and no need of vigorous drying of the solvents. Schiff's bases are employed in pharmaceuticals, rubber [7], as amino protective groups within the synthetic chemistry and

[30]

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

several other biologically active organic compounds [8-10]. The complexes of Schiff's base containing small organic molecules with metal cations have found broad applications within the field of interactions with biogenic macromolecules like DNA, RNA, and peptides [11-12]. Thanks to several applications of Schiff's bases in various fields of chemistry, there has been tremendous interest in developing efficient methods for the synthesis. Although different research groups have developed various methods. [13-18], these methods suffer from drawbacks like prolonged reaction times and low yields. In such consequences we have developed a brand new protocol for the preparation of Schiff's bases in aqueous media with short times and high yields. In the present work, we report our results for the preparation of Schiff's bases under solvent free and aqueous medium under the aspect of environmentally benign processes with high yields, which are superior to standard methods.

Overall green synthetic route of Schiff's bases.



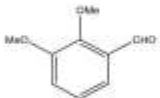

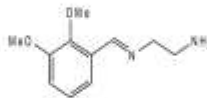
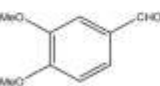
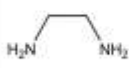
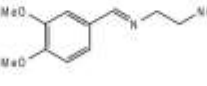
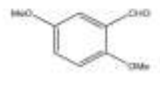

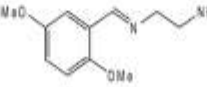
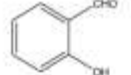
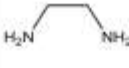
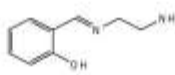
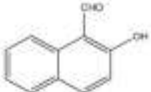

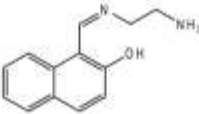
**Table 1. Schiff's bases under solvent free condition**

S.No.	Aldehyde	Amine	Product	Solvent	T <sup>o</sup> C	T Min	% yield	M.P °C.
1.				---	100	30	66	50-52
2.				---	100	30	70	140-142
3.				---	100	30	81	148-150
4.				---	100	30	65	120-122

**Table 2 Schiff's bases under aqueous medium**

[31]

Wesleyan Journal of Research, Vol.14 No.24 (September 2021)

S.No.	Aldehyde	Amine	Product	Solvent	T <sup>0</sup> C	T Min	% Yield	M.P.
5.				H <sub>2</sub> O	100	60	92	94-96
6.				H <sub>2</sub> O	100	60	90	100-102
7.				H <sub>2</sub> O	100	60	89	96-98
8.				H <sub>2</sub> O	100	60	66	118-120
9.				H <sub>2</sub> O	100	60	59	132-134

**Experimental:**

All chemicals were obtained from Sigma-Aldrich, Merck, used as such without further purification. Melting points were determined using a calibrated thermometer. IR Spectra were recorded in FT-IR spectrophotometer Bruker Made in Germany.

*Conventional method:* Taken 1 mmole of Aldehyde and 1 mmole ethylene diamine in 10 ml of ethanol, a some drops of 10% NaOH were added to regulate the pH and therefore the reaction mixture then refluxed with stirring for 2 hours and also the obtained precipitate was collected by filtration through Buchner funnel, recrystallized from ethanol, and dried at r.t. Temperature to afford yellow needles.

*Green route method Scheme 1* is completed using following procedure

Different aromatic aldehydes (1mmole) as shown in table 1 and ethylene diamine (1 mmole) is taken in R. B. Flask and heated the mixture at 100<sup>0</sup>C for 30 Min. without solvent then add 1 ml water and stirred for 15 min. to

*Wesleyan Journal of Research, Vol.14 No.24 (September 2021)*

complete the reaction monitored reaction using TLC. Cooled the reaction flask and filtered solid separated. Approximate yield obtained was 80 to 90 %

*Green route method: Scheme 2* is completed using following procedure

Different aromatic aldehydes (1mmole) as shown in table 2 and ethylene diamine (1 mmole) and water 5 ml is taken in R. B. Flask and heated the mixture at 100°C for 1 hr. under aqueous medium. Monitored reaction using TLC. Cooled the reaction flask and filtered solid separated. Approximate yield obtained was 80 to 90 %

### Results and discussion

Conventionally, Schiff's bases are often prepared by refluxing the amine and aldehyde in an organic solvent, for instance, ethanol or methanol, refluxing the mixture in heptane in presence of carboxylic acid, [19]. In the present method, we reported, efficient process for the condensation of aryl aldehydes and ethylene diamine in water. Using this system these reactions were completed in shorter reaction times about 30 to 60 min. with excellent yields (80-90%). It's noteworthy to say that the green route method requires simple work-up procedures, i.e. simple filtration. No further purification required reaction 1 to 4 did not require any solvent for completion they underwent without solvent with excellent yield. Entry 5 to 9 conducted in aqueous medium. Due to water as solvent and yield of products this process was selected as green, environmental benign, clean, and safe. At temperature of varied Schiff's bases

### Spectral data of compounds

1. (E)-N<sup>1</sup>-benzylideneethane-1,2-diamine  
IR- 746, 685 Aromatic (C=); 1626 (C=N); 1561 (C=C) 3250 (N-H)
2. (E)-N<sup>1</sup>-(4-chlorobenzylidene)ethane-1,2-diamine  
IR- 1631 (C=N); 1575 (C=C) 2847 (N-H); 3300 (N-H)  
(E)-N<sup>1</sup>-(4-nitrobenzylidene) ethane-1,2-diamine  
IR- 840 Ar (C=C); 1510 (C=C); 1328 (NO<sub>2</sub>); 3300 (N-H)  
(9E)-N<sup>1</sup>-((E)-3-phenylallylidene) ethane-1, 2-diamine  
IR- 684,741 ( Ar C=C); 1621 (C=N); 1565 (C=C); 3300 (N-H)
3. 2-((E)-(2-aminoethylimino)methyl)phenol  
IR-1574 (C=N); 1487 (C=C)
4. (E)-N<sup>1</sup>-(2,3-dimethoxybenzylidene)ethane-1,2-diamine  
IR- 3285 (N-H); 1631 (C=N); 1555 (C=C); 1210 ( C-O)
5. (E)-N<sup>1</sup>-(3,4-dimethoxybenzylidene)ethane-1,2-diamine  
IR- 1250 ( C-O); 1503 (C=C); 2950 (N-H)
6. (E)-N<sup>1</sup>-(2,5-dimethoxybenzylidene)ethane-1,2-diamine  
IR- 3351 (N-H) ; 1630 ( C=N ) ; 1482 ( C=C )
7. 1-((Z)-(2-aminoethylimino)methyl)naphthalen-2-ol  
IR- 741 ( Ar C=C); 1620 (C=N); 1538 (C = C) 2950 (N-H)

[33]

**Conclusion**

We developed a convenient, simple, efficient, and eco-friendly green procedure for the synthesis of Schiff's bases from various aldehydes and ethylene diamine under solvent free reaction conditions and in an aqueous medium. The most important advantages of this protocol are the ambient conditions, high yields, short reaction times, simple work-up procedure. To our knowledge this method represents the primary example of synthesis of Schiff's bases under solvent free and in aqueous medium.

**Acknowledgement**

The authors express their thanks to New Arts Commerce and Science College Parner for providing assistance for completion of this work.

1. Tanaka, K.; Toda, F. *Chem. Rev.* 2000, 100, 1025-1074.
2. Varma, R.S. *Green Chem.* 1999, 1, 43-55.
3. chmeyers, J.; Toda, F.; Boy, J.; Kaupp, G. *J. Chem. Soc. Perkin Trans.* 1, 1998, 2 989-993.
4. Varma, R.S.; Dahiya, R.; Kumar, S. *Tetrahed. Lett.* 1997, 38, 2039-2042.
5. Poliakoff, M., Fitzpatrick, J.M., Farren, T.R. and Anastas, P.T. 2002. *Science*, 297: 807-810.
6. Desimone, J.M. 2002. *Science*, 297: 799-803.
7. Kaboudin, B.; Saadati, F. *Tetrahed. Lett.* 2009, 50 13, 1450-1452.
8. Macho, V.; Kralik, M.; Hudec, J.; Cingelova, J. *J. Mol. Catal. A: Chem.* 2004, 209, 69-73.
9. Bey, P.; Vever, J.P. *Tetrahed. Lett.* 1977, 18, 1455-1458.
10. Lucas, R.A.; Dickel, D.F.; Dziemian, R.L.; Ceglowski, M.J.; Hensle, B.L.; MacPhillamy, H.B. *J. Am. Chem. Soc.* 1960, 82, 5688-5693.
11. Rouso, L., Friedman, N., Sheves, M. and Ottolenghi, M. 1995. *Biochem.*, 34: 12059-12065.
12. Bassov, T. and Sheves, M. 1986. *Biochem.*, 25: 5249-5258.
13. emeunynck, M., Bailly, C. and Wilson, W.D. 2002. *DNA and RNA Binders*, 126Wiley-VCH: Weinheim.
14. Cametti, M., Piantanida, I., Zinic, M., Cort, A.D., Mandolini, L., Marjanovic, M. and Kralj, M. 2007. *J. Iorg. Biochem.*, 101(8): 1129-1132. Singh, M.S., Singh, P., David Raju, M. and Singh, A.K. 2007. *Indian J. Chem. Sec. B.*, 46B(4): 694-697.
15. Zheglava, Kh.; Donka, V.; Anatolii, K.I. *J. Chem. Res.* 1995, 1, 32-33.
16. Wu, G., Wang, X., Li, J., Zhao, N., Wei, W. and Sun, Y. 2008. *Catal. Today*, 131(1-4): 402-407.
17. Mirkhani, V., Moghadam, M., Tangestaninejad, S., Bahramian, B. and Mallekpour-Shalamzari, A. 2007. *Appl. Catal. A. Gen.*, 321(1): 49-57.
18. El-ajaily, M., Abdseed, F.A. and Ben-gweirif, S. 2007. *E. J. Chem.*, 4: 461-466.
19. V. Koteswara Rao, S. Subba Reddy, B. Satish Krishna, K.Reddi Mohan Naidu, C. Naga Raju, S.K Ghosh 2010. *Green Chemistry Lett. & Review.* 217-223



**50. Analysis of calcium (Ca) in chocolates by volumetric and flame photometric methods***Wesleyan Journal of Research*, Vol.14 No.28 (September 2021)ISSN – 0975-1386  
Research article: (Science)**ANALYSIS OF CALCIUM (CA) IN CHOCOLATES BY VOLUMETRIC AND FLAME PHOTOMETRIC METHODS****Pravin N. Daule**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Sagar D. Mhaske**Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India, [sagarmhaske2000@gmail.com](mailto:sagarmhaske2000@gmail.com)**Puja P. Zaware**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Dilip R. Thube**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Bhausahab S. Narsale**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Sarita G. Kundlikar**

Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner-414302, India

**Santosh B. Katariya**

Department of Chemistry, SIES College, Sion, Mumbai 400 022, India

**Abstract**

All around the world Chocolates are used as flavours and taken as foodstuff like candies, cakes, bars, mousse, desserts, chocolate brownies, and chocolate chip cookies etc. Chocolates are made up from roasted and ground cacao pods of the Theobroma cacao, also called the cacao tree. Chocolate are used in cold and hot beverages and having different shapes, size. Chocolate contain Carbohydrates, Fat, Proteins, Vitamins, and Minerals. Minerals present in Chocolates are Calcium, Iron, Magnesium, Sodium, Potassium, Zinc etc. amount

[1]

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

of minerals are estimated by volumetric and instrumental methods. Estimation of Calcium is done by complexometric titration with Ethylenediaminetetraacetic Acid (EDTA) using Patton-Reeder indicator and flame photometric method. Volumetric observations are then subjected for stander deviation and Calibration Curve method for unknown sample. The Regression of the observations was done. The results of the complexometric titration and flame photometric method are in accordance to FSSI standards.

Keywords: Estimation of Calcium, Complexometric. Flame photometric, Regression,

#### Article History

\* Received: 24/08/2021; Accepted: 16/09/2021

Corresponding author: Sagar D. Mhaske

#### 1. Introduction

Among the most popular flavores in the world chocolates are the mostly preferred by all age groups people particular small children's. The history of chocolate began with the Maya, who were probably the first people in South America to cultivate the cocoa plant [1]. Maya used chocolate as a drink prepared with hot water and flavored with cinnamon and pepper. It was serve as food to the Emperor Moctezuma II by the Aztecs so called as "Food of the Gods" [1]. In Europe cocoa plant was unrecognized firstly as environment was unfavorable for growth. Coca plants grow well in relatively high temperature (maximum annual average of 30–32<sup>0</sup>C and minimum average of 18–21<sup>0</sup>C) and humidity conditions (during the day 100%, at night falling to 70–80%) [2]. Huge amount of Cocoa beans are produced world wild.

Cocoa beans undergo various processes of transformation to produce different types of chocolate with defined ingredients and characteristics in the food industry [1, 3–5]. Today chocolates are made available to us much guarded secret formula involving varying seeds, different ingredients, combinations of fermentation-roasting timings – temperature etc. Flavors such as mint, coffee, orange, strawberry etc. are some of the add ones. Also today the chocolates can contain ingredients as peanut, different types of walnuts, dry fruits, caramels, crisped rice etc. Chocolate consumption has recently increased around the world particular dark chocolate is the one which is more popular, as it has higher concentration of cocoa. Cocoa are beneficial effects on human health compared with normal or milk chocolate [6–9]. In addition, milk chocolate could be associated with adverse effects due to its sugar content. Cocoa contain minerals potassium, phosphorus, copper, iron, zinc, and magnesium along with proteins, lipids and carbohydrates [10]. The nutritional values of cocoa and two types of chocolate appear in Table 1 [11-13]

The amount of Calcium can be determined by Complexometric Titration Method and Flame Photometric Method at college level. [14]

#### 2. Material and Methods

[2]

### 2.1 Complexometric Titration Method (EDTA)

This Complexometric titration method is used to determine the calcium content of chocolate, milk, the 'hardness' of water and the amount of calcium carbonate in various solid materials. In this method Ethylenediamine Tetraacetic Acid commonly called as EDTA is used. The EDTA molecule forms a complex with calcium ions. Indicator used in this titration is Patton and Reeder's indicator (PR) called as a blue dye [15]. The blue dye also forms a complex with calcium ions, in this process colour change observe from blue to pink/red. The complex of metal ion-dye is less stable than the complex of metal ion-EDTA. As a result of this when calcium ion-blue dye complex is titrated with EDTA then calcium ion from a stable complex with EDTA. The Calcium-PR (Ca-PR) complex is formed first by adding the indicator to sample contain the Calcium ions and which forms Calcium-PR complex of pink/red colure. This is then titrated with EDTA. Titration endpoint is pink/red to blue. The blue color indicate the formation of Calcium ion-EDTA complex is formed. Blue color (endpoint) indicate the replacement of the calcium ion-PR complex by the calcium ion-EDTA complex. Blue color is of PR indicator.



#### 2.1.1 Experimental procedure

All the reagents are of analytical grade and prepared at the time of titration. All the glassware's were cleaned in alcohol, dried using hot air. The water used for analysis is distilled and deionized water. Sample preparation is done according to standard procedure.[16] The chocolates samples of different brands analyzed in this are purchased from supermarkets in Parner(Ahmednagar, MH, India). The literature reports methods for chocolate sample treatment involving microwave digestion, wet digestion, and dry ashing [17] . Calcium sample of chocolate is made by dissolving the 2.0g of chocolate into 20mL dilute Hydrochloric acid to allow for complete dissolution. To maintain the pH of the solution 7, solution was neutralized with dilute Sodium Hydroxide solution till all the unreacted acid is neutralized. This is done using pH paper. This solution was further diluted to 250mL. The EDTA solution was standardized according to the standard processes [16]. The EDTA was standardized with 0.01M CaCO<sub>3</sub> standard solution (Ca<sup>2+</sup> standard). The 10mL Ca<sup>2+</sup> solution was added with 40mL water and 8M Sodium Hydroxide solution. The indicator Patton-Reeder was added. This Ca<sup>2+</sup> solution was titrated with EDTA solution. The endpoint is notice by color change from Pink/Red to Blue. The standardization data is mention in table 2. The Chocolate sample solutions of different brands were analyze in similar way as above. The data of chocolate sample analysis is mention in table 3. The amount of Ca<sup>2+</sup> analyses for different chocolate sample is mention in table 4

[3]

## 2.2 Flame Photometric Method

The Systronics Flame Photometer, M128 used for analysis. In this analysis Calibration Curve method is used [18]. The instrument calibration done as per the SOP. The water used for analysis is distilled and deionized water. The solutions are prepared according to standard process. [16] The standard ppm solutions of  $\text{Ca}^{2+}$  and chocolate sample ppm solution finally diluted to 250mL and analyzed. The data of analysis of  $\text{Ca}^{2+}$  standard solution and chocolate sample is shown in table 5 and 6 respectively.

## 3. Results and Discussion

The amount of  $\text{Ca}^{2+}$  is in accordance with the Food Safety Standard Authority of India. [19] The complexometric method is more studious than flame photometric method. According to the standard deviation obtained for the complexometric titration and flame photometric method it is clear that, the value obtained for standard deviation for population mean for flame photometric method is low compare to that complexometric titration method. Therefore flame photometric method gives more accuracy and suitable for the estimation of calcium from chocolate. The graph and regression also shows the precision of experiment results Fig.1-2.

## 4. Conclusion

The analysis of the chocolate shown that the Calcium contain in chocolate is accordance with FSSAI [19] The flame photometric method is more accurate and hence recommended for Calcium analysis in chocolate than complexometric titration. The deficiency of Calcium in individual can be overcome eating adequate amount of chocolate [20-21]. Major health benefits can observe in individual taking chocolate.

## Acknowledgement

A deep sense of gratitude to respected principal Dr. R. K. Aher and Vice-principal Dr. D. R. Thube and Mr. P. N. Daule of New Arts, Commerce and Science college, Parner, Ahmednagar (MS) India for excellent guidance, stimulating discussion, continuous encouragement and perceptive criticism. Thank full to the all coauthors

## References

1. Verna, R. (2013) The history and science of chocolate. *Malays. J. Pathol.*, 35, 111–121.
2. International Cocoa Organization (ICCO). Available online: <https://www.icco.org/growing-cocoa/> (accessed on 07 Feb 2021)
3. Beckett, S.P.(2008) *The Science of Chocolate*, 2nd ed.; The Royal Society of Chemistry: Cambridge, UK.
4. Corti, R.; Perdrix, J.; Flammer, A.J.; Noll, G.(2010) Dark or white chocolate? Cocoa and cardiovascular health. *Rev. Med. Suisse*, 6, 499–504.
5. Petyaev, I.M.; Bashmakov, Y.K. (2017) Dark chocolate: Opportunity for an alliance between medical science and the food industry? *Front. Nutr.*, 4, 43.
6. Sumiyoshi, E.; Matsuzaki, K.; Sugimoto, N.; Tanabe, Y.; Hara, T.; Katakura, H.; Miyamoto, M.; Mishima, S.; Shido, O. (2019) Sub-Chronic Consumption of Dark Chocolate Enhances Cognitive

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

- Function and Releases Nerve Growth Factors: A Parallel-Group Randomized Trial. *Nutrients* 2019, 11, 2800.
7. Fox, M.; Meyer-Gerspach, A.C.; Wendebourg, M.J.; Gruber, M.; Heinrich, H.; Sauter, M.; Woelnerhanssen, B.; Koeberle, D.; Juengling, F.(2019) Effect of cocoa on the brain and gut in healthy subjects: A randomised controlled trial. *Br. J. Nutr.*, 121, 654–661.
  8. Pruijm, M.; Hofmann, L.; Charollais-Thoenig, J.; Forni, V.; Maillard, M.; Coristine, A.; Stuber, M.; Burnier, M.; Vogt, B.(2013) Effect of dark chocolate on renal tissue oxygenation as measured by BOLD-MRI in healthy volunteers. *Clin. Nephrol.*, 80, 211–217.
  9. Grassi, D.; Lippi, C.; Necozione, S.; Desideri, G.; Ferri, C.(2005) Short-term administration of dark chocolate is followed by a significant increase in insulin sensitivity and a decrease in blood pressure in healthy persons. *Am. J. Clin. Nutr.*, 81, 611–614.
  10. Latif, R. (2013) Chocolate/cocoa and human health: A review. *Neth. J. Med.*, 71, 63–68.
  11. Meng, C.C.; Jalil, A.M.; Ismail, A. (2009)Phenolic and theobromine contents of commercial dark, milk and white chocolates on the Malaysian market. *Molecules*, 14, 200–209.
  12. Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione (INRAN). Available online: [http://www.clitt.it/contents/scienze-files/6160\\_rodato\\_quaderno-files/6160\\_TabelleComposAlim](http://www.clitt.it/contents/scienze-files/6160_rodato_quaderno-files/6160_TabelleComposAlim). (accessed on 25 November2019).
  13. Urbańska, B.; Kowalska, J. (2019)Comparison of the Total Polyphenol Content and Antioxidant Activity of Chocolate Obtained from Roasted and Unroasted Cocoa Beans from Different Regions of the World. *Antioxidants*, 8, 283.
  14. Welz, B., & Sperling, M. (1999). *Atomic Absorption Spectrometry* (3rd ed.). Weinheim: Wiley-VCH.
  15. College of Science, University of Canterbury, Determination of Calcium Ion Concentration, <https://www.canterbury.ac.nz/media/documents/science-outreach/calcium>.
  16. Zhai, J., & Bakker, E. (2016). Complexometric titrations: new reagents and concepts to overcome old limitations. *The Analyst*, 141(14), 4252–4261.
  17. Metin Gültaş (2008) Comparison of digestion methods and trace elements determination in chocolates with pistachio using atomic absorption spectrometry, *Journal of Food and Nutrition Research* Vol. 47, No. 2, 92-99
  18. Mitra Azadeh, Boris Gorovits, John Kamerud, Stephen MacMannis, Afshin Safavi, Jeffrey Sailstad, and Perceval Sondag, (2018) Calibration Curves in Quantitative Ligand Binding Assays: Recommendations and Best Practices for Preparation, Design, and Editing of Calibration Curves, *The AAPS Journal* 20: 22 DOI: 10.1208/s12248-017-0159-4.
  19. Food Safety and Standards Authority of India, (2015) Manual For Analysis of Metals <https://fssai.gov.in/cms/manuals-of-methods-of-analysis-for-various-food-products>
  20. Gabriela Cormick and Jose M Belizán ,(2019) Review Calcium Intake and Health, *Nutrients*, 11, 1606.

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

---

21. Jonathan M Hodgson, Amanda Devine, Valerie Burke, Ian M Dick, and Richard L Prince (2008)  
Chocolate consumption and bone density in older women, American Society for Nutrition 87:175–80.

[6]

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

**22. Table-1:** Nutritional values per 100 g of cocoa and two types of chocolate.

Particulars	Cocoa	Dark Chocolate	Milk Chocolate
Water (g)	2.5	0.5	0.8
Protein (g)	20.4	6.6	7.3
Lipid (g)	25.6	33.6	36.3
Carbohydrate (g)	11.5	49.7	50.5
Sugar (g)	Traces	49.7	50.5
Total fiber (g)	-	8	3.2
Sodium (mg)	-	11	120
Potassium (mg)	-	300	420
Iron (mg)	14.3	5	3
Calcium (mg)	51	51	262
Phosphorus (mg)	685	186	207
Energy (kcal)	355	515	545

**Table-2:** Standardization data of EDTA solution

0.01 M CaCO <sub>3</sub> Solution (mL)	0.01 M EDTA Solution (approx.)(mL)	Constant Burette Reading (CBR)	Exact Molarity of EDTA Solution
10	16.1	16.1 mL	0.0062 M
10	16.1		
10	16.1		

**Table-3:** Titration data of 10mL Ca<sup>2+</sup> Chocolate samples

Sample	Brand Name	0.0062 M EDTA Solution (exact) (mL)			Constant Burette Reading (mL)
1.	Nestle milky bar	2.1	2.1	2.1	2.1
2.	Dairy milk	0.8	0.6	0.8	0.8
3.	5 Star Cadbury	0.7	0.7	0.7	0.7
4.	Cadbury fuse	0.6	0.6	0.7	0.6
5.	Kitkat	0.7	0.6	0.7	0.7
6.	Bakemate	0.9	0.8	0.8	0.8
7.	Kaprica Tuffle	1.1	1.1	1.0	1.1
8.	Lavian Chokita	0.8	0.8	0.8	0.8
9.	Delight	1.0	1.2	1.0	1.0
10.	Eclairs	0.7	0.8	0.7	0.7

[7]

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

**Table-4:** Ca<sup>2+</sup> Chocolate samples analysis data and % of Ca<sup>2+</sup>

Sample	Brand Name	CBR (mL)	Ca <sup>2+</sup> in 10 ml diluted (gm)	Ca <sup>2+</sup> in 2.0 gm	% of Ca <sup>2+</sup>
1.	Nestle milky bar	2.1	0.00052	0.01304	0.65216
2.	Dairy milk	0.8	0.00020	0.00497	0.24844
3.	5 Star Cadbury	0.7	0.00017	0.00435	0.21739
4.	Cadbury fuse	0.6	0.00015	0.00373	0.18633
5.	Kitkat	0.7	0.00017	0.00435	0.21739
6.	Bakemate	0.8	0.00022	0.00559	0.27950
7.	Kaprica Tuffle	1.1	0.00027	0.00683	0.34161
8.	Lavian Chokita	0.8	0.00020	0.00497	0.24844
9.	Delight	1.0	0.00035	0.00868	0.43400
10.	Eclairs	0.7	0.00030	0.00744	0.37200
<b>Standard Deviation (Calculated by using MS excel)</b>					<b>0.133155</b>

**Table-5:** Flame photometric analysis of Ca<sup>2+</sup> standard solution

Sample	Sample Name	Emission Intensity	K for Known = Emission Intensity/Conc.
1.	Standard 1 <b>20ppm</b>	20.5	1.02500
2.	Standard 2 <b>40ppm</b>	41.12	1.02800
3.	Standard 3 <b>60ppm</b>	65.23	1.08717
4.	Standard 4 <b>80ppm</b>	81.69	1.02113
5.	Standard 5 <b>100ppm</b>	100	1.00000
			<b>Mean K=1.03226</b>

**Table-6:** Flame photometric analysis of Ca<sup>2+</sup> chocolate sample

Sample	Sample Name	Emission Intensity	Unknown Conc. (ppm)	Ca <sup>2+</sup> in 2.0 gm	% of Ca <sup>2+</sup>
1.	Nestle milky bar	13.25	12.836	0.012836	0.641797
2.	Dairy milk	5.21	5.0472	0.005047	0.252359
3.	5 Star cadbury	4.21	4.0784	0.004078	0.203922
4.	Cadbury fuse	3.57	3.4584	0.003458	0.172922

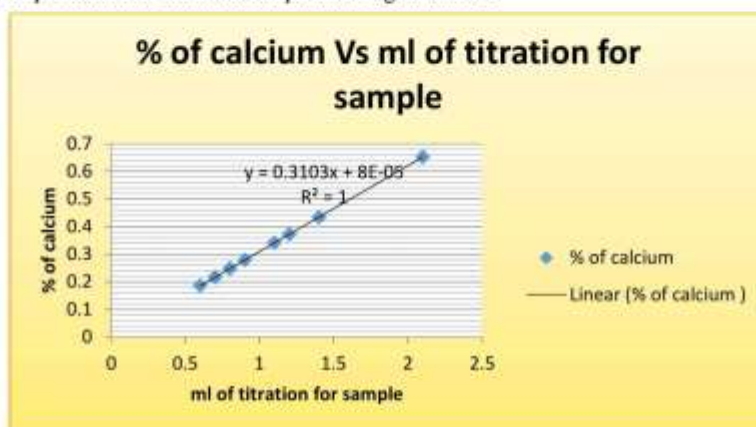
[8]



*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*

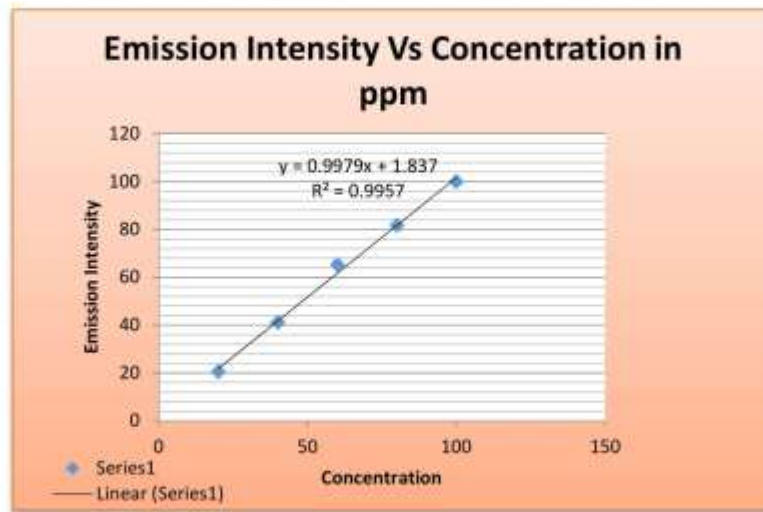
5.	Kitkat	4.74	4.5919	0.004592	0.229594
6.	Bakemate	6.25	6.0547	0.006055	0.302734
7.	Kaprica Tuffle	6.96	6.7425	0.006742	0.337125
8.	Lavian Chokita	4.65	4.5047	0.004505	0.225234
9.	Delight	3.95	3.82656	0.0038265	0.191328
10.	Eclairs	4.78	4.63062	0.0046306	0.231531
<b>Standard Deviation (Calculated by using MS excel)</b>					<b>0.129782</b>

**Fig.-1:** Complexometric Titration Graph and Regression 'R'



**Fig.-2:** Complexometric Titration Graph and Regression 'R'

*Wesleyan Journal of Research, Vol.14 No.28 (September 2021)*



[10]

### 51. One pot approach of novel xanthan perchloric acid catalyst in synthesis of bis(indolyl)methane derivatives via greener perspective



Polycyclic Aromatic Compounds



ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/gpol20>

## One Pot Approach of Novel Xanthan Perchloric Acid Catalyst in Synthesis of Bis(Indolyl)Methane Derivatives via Greener Perspective

Bhausahab S. Narsale, Anil G. Gadhave, Ketan S. Raut & Dilip R. Thube

To cite this article: Bhausahab S. Narsale, Anil G. Gadhave, Ketan S. Raut & Dilip R. Thube (2022): One Pot Approach of Novel Xanthan Perchloric Acid Catalyst in Synthesis of Bis(Indolyl)Methane Derivatives via Greener Perspective, Polycyclic Aromatic Compounds, DOI: 10.1080/10406638.2022.2108075

To link to this article: <https://doi.org/10.1080/10406638.2022.2108075>



Published online: 11 Aug 2022.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)

Full Terms & Conditions of access and use can be found at  
<https://www.tandfonline.com/action/journalInformation?journalCode=gppl20>

POLYCYCLIC AROMATIC COMPOUNDS  
<https://doi.org/10.1080/10406638.2022.2108075>



## One Pot Approach of Novel Xanthan Perchloric Acid Catalyst in Synthesis of Bis(Indolyl)Methane Derivatives via Greener Perspective

Bhauasheb S. Narsale<sup>a</sup> , Anil G. Gadhave<sup>b</sup> , Ketan S. Raut<sup>a</sup>, and Dilip R. Thube<sup>a</sup>

<sup>a</sup>Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, India;

<sup>b</sup>Department of Chemistry, Research Center, P.V.P. College, Pravaranagar, India

### ABSTRACT

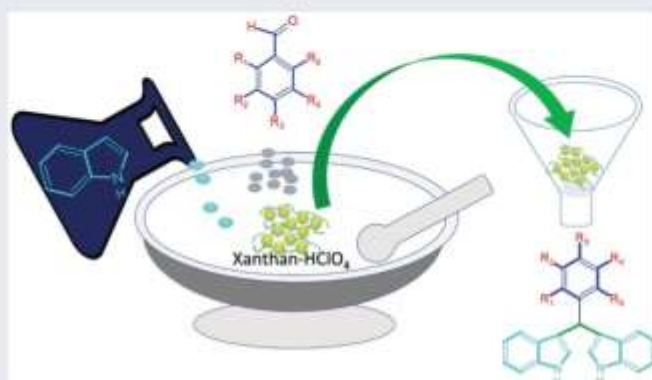
A convenient, eco-friendly electrophilic reaction of indole with substituted aromatic aldehydes to yield bis(indolyl)methane (BIM) derivatives. BIM derivatives are synthesized in one pot by employing a biopolymer-derived novel heterogeneous catalyst, Xanthan Perchloric Acid (XPA). The Catalyst XPA is prepared from biopolymer xanthan and treated with perchloric acid. XPA is thermally stable with sufficient acidic sites, mild, nontoxic, and reusable. The reaction proceeds smoothly at room temperature in the green context, shorter reaction time, and excellent yield under solvent-free conditions.

### ARTICLE HISTORY

Received 15 April 2022  
 Accepted 21 July 2022

### KEYWORDS

Biopolymer; green synthesis; bis(indolyl)-methane; xanthan perchloric acid



### Introduction

The multicomponent reactions (MCR) performed by green chemical methods in one-pot have more attention due to solventless synthesis, cost-effectiveness, environment feasibility, fewer hazards, waste, energy consumption reagents, and ecological reaction conditions. The MCRs like Strecker amino acid synthesis, Hydantoins by Bucherer Berg, Ugi, Mannich, Passerini, Hantzsch, Pauson Khand, and Petasis have a great importance in green synthesis. Bis(indolyl)methane (BIM) is a benign protocol for the most biologically active drugs. It exhibits a wide pharmacological activity like faspaplysin, a marine bisindole alkaloid as tranquilizer,<sup>1</sup> anticancer,<sup>2-4</sup>

CONTACT Dilip R. Thube drthube@rediffmail.com Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, Maharashtra 414302, India.

© 2022 Taylor & Francis Group, LLC

2  B. S. NARSALE ET AL.

antibacterial,<sup>5</sup> antioxidant,<sup>6</sup> analgesic,<sup>7</sup> antimicrobial,<sup>8</sup> antifungal,<sup>9</sup> anti-inflammatory,<sup>10</sup> anti-viral<sup>11</sup> properties. Also, there are several medicinal chemistry applications of BIMs such as treatment of breast cancer, curing carcinoma of epithelial cell and ovarian carcinoma,<sup>12-13</sup> applications in fluorescence chemosensors in the detection of Zn(II) and Cu(II),<sup>14</sup> molecular docking for targeting SARS CoV-2.<sup>6,15</sup>

Bis(indolyl)methane is synthesized by an electrophilic substitution reaction of indole and carbonyl compounds. A number of methods are reported in the literature catalyzed by Lewis acids such as *p*-toluene sulfonic acid,<sup>16</sup> H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub>,<sup>17</sup> Bu<sub>4</sub>NHSO<sub>4</sub>,<sup>18</sup> Thiamin Hydrochloride,<sup>19</sup> ionic solid NiI<sub>2</sub>,<sup>20</sup> and heteropoly acids such as Cellulose-HClO<sub>4</sub>,<sup>21</sup> PPh<sub>3</sub>-HClO<sub>4</sub>,<sup>22</sup> magnetically separable Fe<sub>3</sub>O<sub>4</sub>@Fe<sub>2</sub>O<sub>3</sub>-SO<sub>3</sub>H,<sup>23</sup> β-CD-Ti<sup>4+</sup>-Fe<sub>3</sub>O<sub>4</sub> and β-CD-Fe<sub>3</sub>O<sub>4</sub>-Ti<sup>4+</sup> composites,<sup>24</sup> Graphene oxide<sup>25</sup> found to promote the reactions. The use of resin catalyzed under microwave,<sup>26,27</sup> ultrasonic,<sup>28</sup> ultrasonic promoted pyruvic acid,<sup>29</sup> under visible light irradiation<sup>30</sup> promotions in BIM synthesis are reported. However, most of the methods are suffering from drawbacks such as the use of toxic chemicals, expensive, high catalyst loading, harsh condition, tedious workup procedures, volatile solvents, and recovery and reusability of catalyst. The solvent-free reactions are rapid and have excellent yields. In addition, the reusable heterogeneous catalyst is more attractive in the synthesis. In this context, we achieved the synthesis of BIM by a nontraditional method in solvent-free conditions at room temperature using a reusable catalyst.

In the conventional methods, the solubility of homogeneous catalyst in solvent encounters a problem in the synthesis. Thus, we moved to the replacement of a homogeneous catalyst with a solid Bronsted acid catalyst which is effective. In multicomponent reactions, practical transformation and exploitation of low-cost, renewable biomass polysaccharides derived catalyst is crucial. According to studies on the simulation of biocomposites of polymer matrices with natural materials produced from biomass and agricultural waste, cellulose, the biopolymer, is widely available around the globe.<sup>31</sup> The major applications of the biopolymer catalysts are organic synthesis reactions which successfully promote the transformations of organic compounds, carbon dioxide, biomass-based cellulose, saccharide, and vegetable oil into valuable chemicals and fuels.<sup>32</sup> Amorphous carbon-containing graphene sheets bearing high densities of -SO<sub>3</sub>H, -COOH, and -OH groups are demonstrated to be very active in the hydrolysis.<sup>33</sup>

Chitin is a second abundant natural polymer resembling cellulose. This biopolymer derived from nature can be directly used as a heterogeneous catalyst. The attractive features of the catalyst are hydrophilicity, biocompatibility, binding to a cellular system, and speeding up wound healing. Numerous applications have been reported for chitosan, which include Huisgen cycloaddition,<sup>34</sup> Michel addition,<sup>35</sup> Ullmann coupling,<sup>36</sup> Suzuki cross-coupling,<sup>37</sup> aldol, and Knoevenagel condensation.<sup>38,39</sup> Due to their renewable nature; they have been exploited in diverse areas, e. g. cosmetics, agriculture, biomedical applications, water treatment, and among others.<sup>40</sup> In this article, we have reported the synthesis of a novel, green and reusable solid catalyst Xanthan Perchloric Acid (XPA) as an efficient catalyst and one-pot synthesis of bioactive BIM derivatives.

## Result and discussion

### Characterization of XPA

The XPA is synthesized by chemisorption of perchloric acid on biopolymer xanthan (XG). The acid density of synthesized XPA is determined using acid-base titrations. The acid density of the catalyst is observed to be increased with the increasing amount of perchloric acid and decomposes after from 30 mmol of the acid (Figure 1).

The physical structure of the catalyst is evaluated by X-ray diffraction (XRD, Figure 2). The XRD plot clearly indicated the crystalline nature of the XPA. It is revealed from the 2θ angles at 19°–28° indicative of the crystallinity of catalyst and weak peak at 31°–41° for amorphous carbon

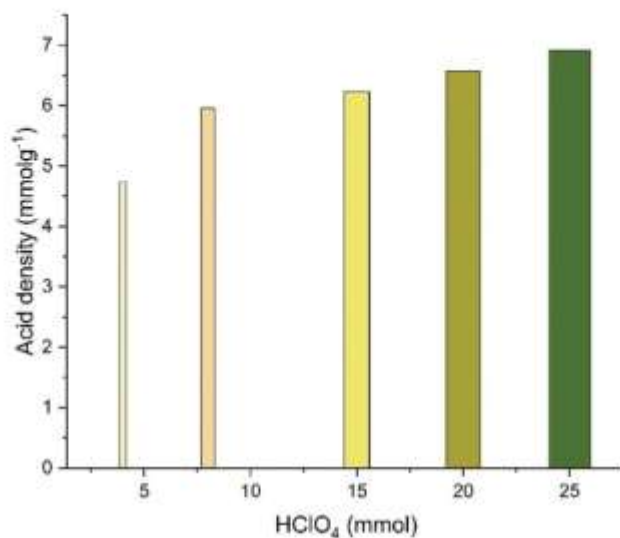


Figure 1. Acid density vs amount of perchloric acid.

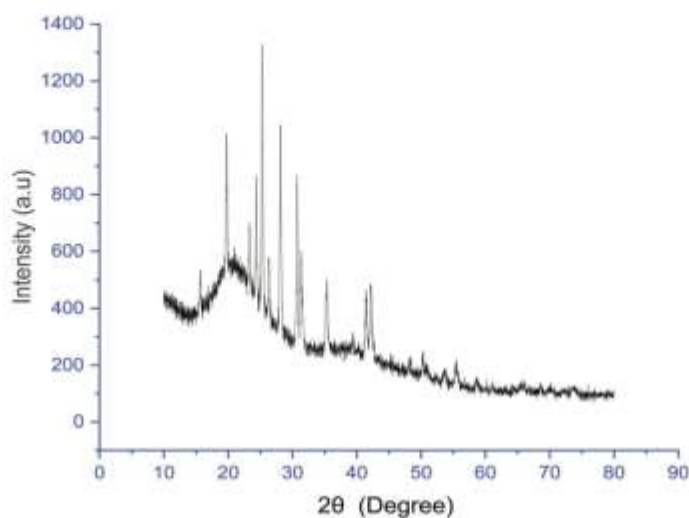


Figure 2. XRD of XPA.

composed of randomly organized polymeric XG. The crystallinity index (*CI*) is calculated using Scherer equation (Equation 1),

$$\text{Crystalline Index (CI)} = \frac{I_c}{I_m} \times 100 \quad (1)$$

where the maximum intensity at crystalline peak (*I<sub>c</sub>*) is 25.30° (*2θ*) and the intensity of amorphous region (*I<sub>m</sub>*) is calculated as minimum height of the crystalline peak 15.68° (*2θ*). The evaluated *CI* of XPA is 59.36%.

The FTIR optical absorption data gives precise information about the vibrational bands present in the XPA catalyst indicates the sum of the characteristic bands of the constituent material. The

4 B. S. NARSALE ET AL.

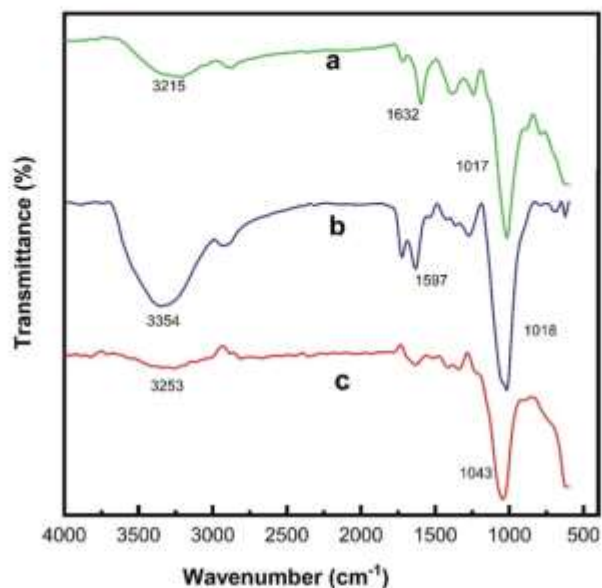


Figure 3. FTIR (a. Xanthan, b. XPA, and c. reused XPA).

spectrum is recorded in the range of  $4000\text{--}400\text{ cm}^{-1}$  for vibrational bands. The band at  $3354\text{ cm}^{-1}$  attributed for  $\text{-OH}$  stretching is shifted from  $3215\text{ cm}^{-1}$  of XG, the peak at  $2933\text{ cm}^{-1}$  is attributed for methylene  $\text{C-H}$  stretching,  $1724\text{ cm}^{-1}$  for  $\text{C=O}$  stretching vibrations of  $\text{COOH}$ ,  $1273\text{ cm}^{-1}$  for  $\text{C-H}$  and  $\text{C-O}$  bond stretching,  $1018\text{ cm}^{-1}$  for  $\text{C-O}$  alcoholic stretching, and the broad band at  $692\text{ cm}^{-1}$  due to  $\text{Cl-O}$  stretching, clearly indicates the chemisorption of perchloric acid over xanthan (Figure 3(b)).

The scanning electron microscopy (SEM) of XPA shows aggregates of fibrous morphology (Figure 4). The energy-dispersive X-ray analysis (EDAX) of XPA (Figure 5) shows that the surface of catalyst is mainly composed of C, O and Cl. The composition of Cl is 3.97% indicative of formation of XPA. The thermal behavior of the XPA and recycled XPA is examined by performing TGA under  $\text{N}_2$  atmosphere at  $30\text{--}500\text{ }^\circ\text{C}$  with a heating rate of  $10\text{ }^\circ\text{C}$  per minute. The weight loss measured is plotted as a function of temperature (Figure 6). The weight loss at about  $100\text{ }^\circ\text{C}$  is attributed to the dehydration of the material due to its hydrophilicity. The major weight loss observed in the range of  $230\text{--}350\text{ }^\circ\text{C}$  indicates removal of perchloric group from the surface of xanthan. This confers the thermal stability to catalyst up to  $230\text{ }^\circ\text{C}$ .

### Synthesis of BIMs

As a case study, a mixture of *p*-nitro benzaldehyde (1 mmol), indole (2 mmol) and XPA was ground at room temperature in neat condition, corresponding bis(indolyl)methane (Table 3, Entry 1a) was formed by electrophilic substitution in short reaction time monitored by TLC (Scheme 1). The results are compared with the methods reported in literature (Table 1). A series of reactions are carried out under different conditions (Table 2(a,b)). No catalyst is used in the control reaction, which is carried out neatly at room temperature (rt) without observing any changes in the reactant. The XPA is tested as a catalyst with catalytic load 20 and 50 mg grounded with indole and aldehyde for 20 min at rt and obtained 63% and 86% yields,

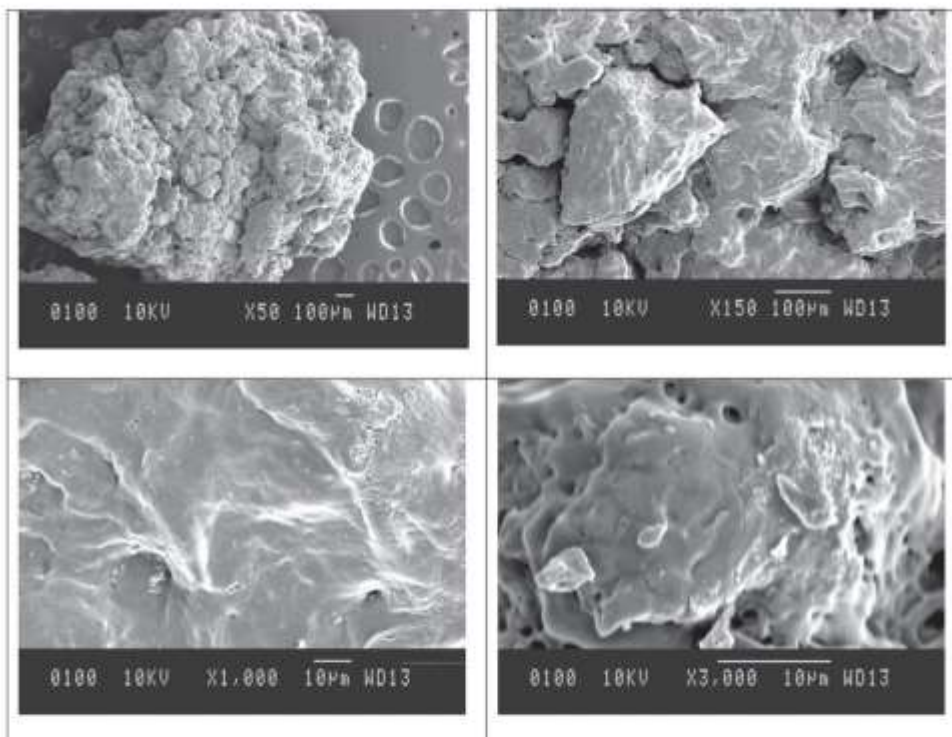


Figure 4. SEM image at different magnifications.

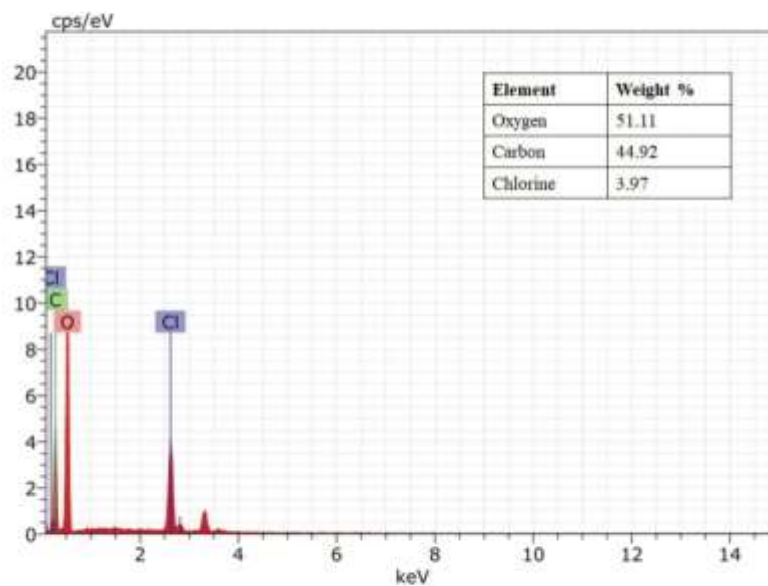


Figure 5. EDAX.



6 B. S. NARSALE ET AL.

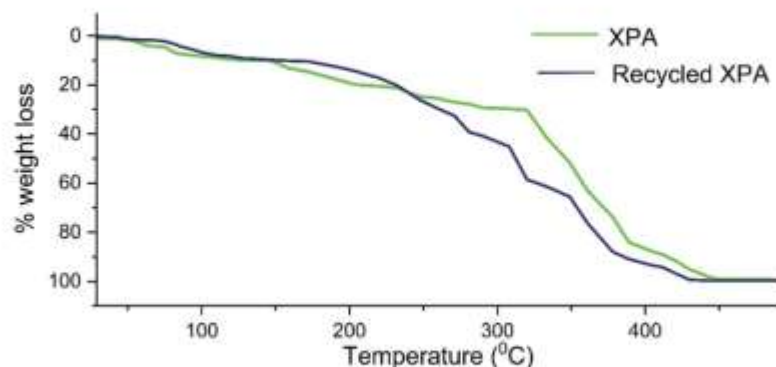
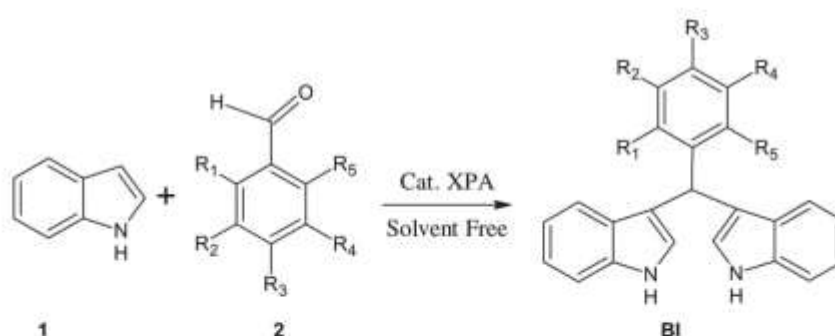


Figure 6. TGA plot of XPA and recycled XPA.



Scheme 1. Synthesis of BIMs under solvent free conditions.

Table 1. Comparison of the efficiency of XPA catalyst for synthesis of BIMs.

Catalyst	Catalyst loading (mg)	Time (min)	Solvent	Temperature (°C)	Yield (%)	Refs
Cellulose, HClO <sub>4</sub>	100	15	Neat	rt	88	21
Xanthan sulfuric acid	200	20	Methanol	rt	92	41
SiO <sub>2</sub> -H <sub>2</sub> SO <sub>4</sub>	100	15	Neat	rt	95	42
NaOH	400	120	EtOH-H <sub>2</sub> O	90	85	43
H <sub>2</sub> SO <sub>4</sub> -SiO <sub>2</sub> /I <sub>2</sub>	30	15	CH <sub>3</sub> CN	rt	98	44
PPy@CH <sub>2</sub> Br	10	300	Neat	60	96	45
XPA	70	10	Neat	rt	96	This work

Aldehyde (1 mmol), Indole (2 mmol).

respectively. The amount of XPA was increased to 70 mg in order to boost the product yield. This yield increases to 96% in 10 min and is monitored by TLC. The same yield was observed with increasing further amount of catalyst. Different solvents are used with stirring at rt to test the neat condition; this produces the same yields but a noticeably longer reaction time. Similar yield was obtained by carrying out the same reaction under reflux conditions at 100 °C.

In order to achieve the generality of protocol, biologically potent BIMs are synthesized in high yields (87–96%) using XPA under neat conditions. A variety of aromatic and aliphatic aldehydes are reacted with indole and the result obtained are summarized in Tables 3 and 4. The reactions of halogenated and aliphatic aldehydes are observed slower than the other aldehydes having electron donating and withdrawing abilities. The use of aromatic and aliphatic aldehydes does not

Table 2. Optimization of reaction condition for the synthesis of Bla.

## a. Effect of Catalyst loading on the synthesis

Entry	Catalyst (mg)	Time (min.)	Yield (%)	M.p (°C)
1	0	4 hr	–	–
2	20	20	63	232–234
3	50	20	86	232–234
4	70	10	96	232–234
5	100	10	96	233–235

## b. Effect of method and solvent

Method used	Solvent	Time (min) <sup>a</sup>	Temperature (°C)	Yield (%) <sup>b</sup>
Grinding	Neat	10	rt	96
Stirring	Ethanol	25	rt	95
Stirring	Water	25	rt	96
Stirring	Hexane	25	rt	94
Stirring	DMF	25	rt	92
Reflux	Ethanol	18	100	94
Reflux	Water	20	100	95
Reflux	Hexane	20	100	89
Reflux	DMF	20	100	90

4-Nitro-benzaldehyde (1 mmol), Indole (2 mmol), Solvent: NIL, rt. TLC Solvent: 70:30 (n-hexane + Ethyl acetoacetate). 4-nitro-benzaldehyde (1 mmol), Indole (2 mmol), Catalyst load: 70 mg

<sup>a</sup>Monitored by TLC with 3:1 (n-hexane + Ethyl acetoacetate) system. <sup>b</sup>Isolated yield.


Table 3. Synthesis of bis(indolyl)methane derivatives using aromatic aldehydes.

Entry	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Catalyst loading (mg)	Time (min)	Yield (%) <sup>a</sup>	M.P. (°C)	Rf
Bla	H	H	NO <sub>2</sub>	H	H	70	10	96	232–234	0.40
Bib	H	H	Cl	H	H	70	10	92	64–66	0.20
Bic	OH	H	H	H	H	70	10	92	193–195	0.50
Bid	H	H	OH	H	H	70	10	92	198–200	0.58
Bie	F	H	H	H	H	100	15	89	177–179	0.22
Bif	H	H	F	H	H	100	15	89	86–88	0.54
Big	H	NO <sub>2</sub>	H	H	H	70	10	95	110–112	0.27
Bih	H	H	Me	H	H	70	10	94	195–197	0.54
Bil	H	H	CH(Me) <sub>2</sub>	H	H	70	10	87	146–148	0.67
Bij	H	OMe	OMe	H	H	100	12	92	185–187	0.20
Bik	OH	Br	Cl	H	H	120	18	90	160–162	0.23
Bil	H	Br	OMe	H	H	100	15	92	94–96	0.40
Bim	OH	H	H	Br	H	100	12	92	84–86	0.59
Bin	OMe	H	CHO	OMe	H	120	15	85	152–154	0.25
Bio	OMe	H	OMe	H	H	100	10	94	164–166	0.31
Blp	H	H	H	H	H	70	10	93	110–112	0.35

Catalyst: XPA, rt, grinding.

<sup>a</sup>Isolated yields.

Table 4. Synthesis of bis(indolyl)methane derivatives using aliphatic aldehydes.

Entry	Aldehyde	Catalyst loading (mg)	Time (min)	Yield (%)	MP (°C)	Rf
Blq	HCHO	70	12	92	82–84	0.41
Blr		70	18	87	150–152	0.60

Catalyst: XPA, rt, grinding.

alter the reaction time (Table 3, entry Bla & Table 4, Entry Blq). All synthesized BIMs are confirmed by FTIR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectrometry. In FTIR spectrum, the peak of C=O stretching of aldehydes is disappeared confirming the formation of BIMs. In <sup>1</sup>H NMR spectra, the Ar-CH proton appeared as a singlet in the region  $\delta$  6.30–5.80 ppm. The signal of

8 B. S. NARSALE ET AL.

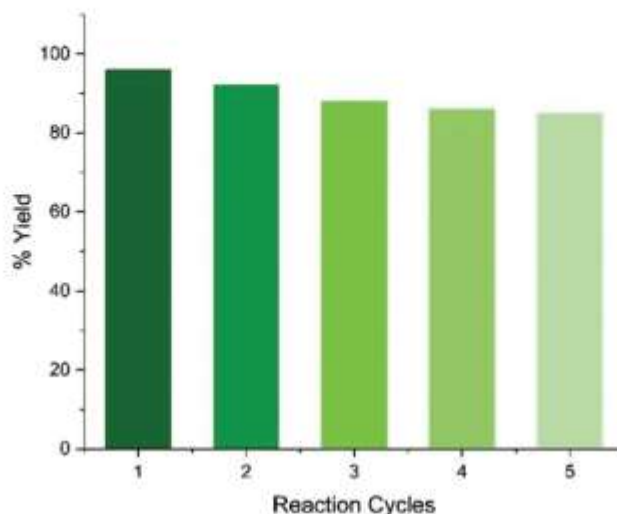


Figure 7. Reusability of the XPA catalyst in terms of the yield of compound Bla.

-NH protons appeared in the region  $\delta$  10.93–7.74 ppm. The remaining signals are appeared in the expected region confirming the formation of desired product.  $^{13}\text{C}$  NMR spectrum also confirms the Ar-CH peak in the region  $\delta$  41–38 ppm.

#### Catalyst reusability

The efficiency and reusability of the catalyst is a significant aspect needed to be considered. After the reaction, the catalyst was separated by simple and cost effective method of filtration of the reaction mixture. This catalyst is regenerated by washing with the mixture of acetone-alcohol and drying at 100 °C for 3 h prior to reuse in the next run. The cycle usage test of XPA is conducted and the results are presented in Figure 7. The catalytic activity of the catalyst for conversion into BIM derivatives show decrease in activity when reused for 5 rounds of reaction. First run showed 96% yield of bis(indolyl)methane while second and third run showed 92% and 88% yield of BIM respectively, indicating optimum efficiency and stability of the XPA catalyst. The decrease of catalytic activity is attributed to the accumulation of the reactants and products on the surface of the catalyst which blocks the active sites.

#### Conclusion

We have developed a novel heterogeneous, stable, and reusable Xanthan Perchloric acid (XPA) catalyst. It is synthesized from biopolymer xanthan by treatment of monoprotic perchloric acid. This XPA is characterized for its acid density, morphology, surface properties, chemical composition, and stability using titrimetric estimation, XRD, EDAX, SEM, TGA, and FTIR. The novel XPA catalyst is with sufficient acidic sites, nontoxic, reusable, and thermally stable up to 230 °C. It is therefore used for the synthesis of a variety of Bis(indolyl)methane derivatives in one pot under normal conditions. The BIM compounds presented in this article are obtained by simple grinding of reactant with excellent yield at rt and characterized using FTIR,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, and Mass spectrometry. This protocol offers advantages like environment friendly catalyst, low toxicity, reusability, and easy route for preparation under mild and clean reaction conditions. Thus, XPA is a potential catalyst for multicomponent reactions of aldehydes under mild conditions.

## Experimental section

### Material

The Indole (99.9%, Sigma Aldrich), Aldehydes and all solvents are obtained from commercial sources and were of analytically pure grade, used without further purification. The Xanthan, Perchloric Acid is purchased from Sigma Aldrich and used as received.

### Instrumentation and measurements

The melting points (M.P.) are recorded on digital apparatus Analab Scientific Instrument make and are uncorrected. The functional group of materials were detected with FTIR spectra recorded on Bruker EcoATR at rt. The samples were measured in the range of  $4000\text{--}400\text{ cm}^{-1}$ . The XRD patterns were recorded from  $2\theta$  values  $10^\circ\text{--}80^\circ$  to determine the crystallinity of the catalyst on Panalytical's X'Pert Pro diffractometer with Ni beta filtered Cu, K $\alpha$  radiations with wavelength of  $1.54\text{ \AA}$ . The morphology, size and microstructure of the product were investigated by SEM (H-7500, Hitachi) at different magnifications. The element carbon, chlorine and oxygen content were determined using EDX (JSM 6100, JEOL). Thermal stability of the catalyst was determined by using TGA in temperature range of  $10\text{--}500^\circ\text{C}$  at a heating rate of  $10^\circ\text{C min}^{-1}$  with continuous flow of nitrogen gas at  $50\text{ mL min}^{-1}$ . The acid densities were measured by acid-base titrations.  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were recorded with Bruker AVANCE NEO 500 MHz in  $\text{CDCl}_3$  and  $d_6\text{-DMSO}$  solvent. The chemical shift of protons was relative to TMS as internal standard. The data are presented in terms of chemical shift (ppm), spin multiplicity as s (singlet), bs (broad singlet), d (doublet), t (triplet), dd (doublet of doublet), dt (doublet of triplet), m (multiplet), and coupling constant J (Hz). The Mass spectra were performed on LC-MS Q-TOF Micromass.

### Synthesis of XPA

In a round bottom flask containing mixture of xanthan (1 g), and hexane (20 ml), perchloric acid (20 mmol) was added dropwise for 2 h on a magnetic stirrer. The stirring is continued further for next 2 h and worked up with suitable solvent. The white grey colored crystalline XPA is obtained and dried naturally (Figure 8). The acid catalyst, XPA is characterized by FTIR, XRD, EDAX, SEM, and TGA.

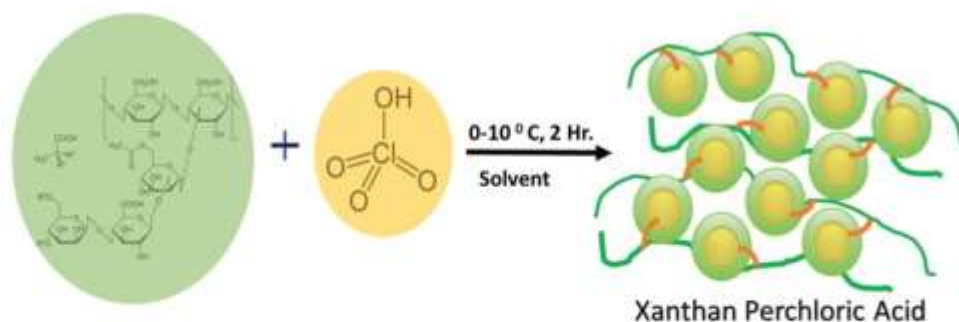


Figure 8. Synthesis of XPA.

10 B. S. NARSALE ET AL.

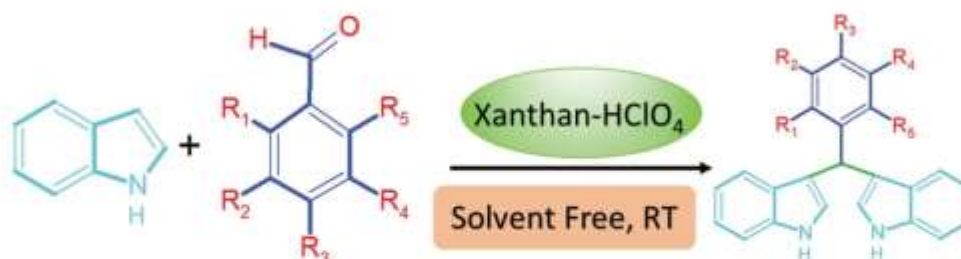


Figure 9. Synthesis of BIMs.

#### Determination of acid density of XPA

A 30 ml 0.01 mol L<sup>-1</sup> NaCl was added to the 50 mg XPA catalyst in an Erlenmeyer flask. The mixture was stirred for 30 min at room temperature under ultrasonic vibrations. After centrifugal separation, the supernatant solution was titrated with 0.01 mol L<sup>-1</sup> NaOH using a phenolphthalein indicator.

#### General procedure of synthesis of BIMs

In a mortar pestle 70 mg XPA was added to a mixture of indole (2 mmol) and aldehyde (1 mmol). The resulting mixture was grinded at room temperature until the completion of the reaction monitored by thin-layer chromatography (3:1, ethyl acetate: n-hexane). On the filtration the solvent was evaporated under reduced pressure, the solid substance recrystallizes from ethanol to get desired product (Figure 9). The catalyst residue was washed with acetone-alcohol and reused in next cycle. The products obtained were characterized by FTIR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectroscopy.

#### Spectroscopic data for selected compounds

**3,3'-[(4-Nitrophenyl)methanediyl]bis(1H-indole) (BIa).** Yellow solid; M.p. 232–234 °C, R<sub>f</sub> = 0.4 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3595, 3381, 3046, 1587, 1501, 1334, 1224, 1088, 738; <sup>1</sup>H NMR (500 MHz, DMSO) δ (ppm) 10.93 (bs, 2H, -NH), 8.16 (d, J = 7 Hz, 2H, Ar-H), 7.62 (d, J = 8.75 Hz, 2H, Ar-H), 7.38 (d, J = 8.15 Hz, 2H, Ar-H), 7.30 (d, J = 7.95 Hz, 2H, Ar-H), 7.06 (dt, J = 7.1 & 7.15 Hz, 2H, Ar-H), 6.91–6.88 (m, 4H, Ar-H), 6.04 (s, 1H, Ar-CH); <sup>13</sup>C NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 151, 146, 136, 129, 126, 123, 122, 120, 119, 118, 111, 40; ESI-MS m/z C<sub>23</sub>H<sub>17</sub>N<sub>3</sub>O<sub>2</sub> calcd. 367.4005, found 367.4458 [M]<sup>+</sup>, 366.4290 [M-1]<sup>+</sup>.

**3,3'-[(4-Chlorophenyl)methanediyl]bis(1H-indole) (BIb).** Red solid; M.p. 64–66 °C, R<sub>f</sub> = 0.20 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3330, 1687, 1597, 1422, 1340, 1214, 1085, 1008, 736; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ (ppm) 7.86 (bs, 2H, -NH), 7.33 (d, J = 7.85 Hz, 1H, Ar-H), 7.28 (d, J = 8.05 Hz, 2H, Ar-H), 7.22–7.18 (m, 4H, Ar-H), 7.14 (t, J = 7.65 & 7.3 Hz, 2H, Ar-H), 6.98 (t, J = 7.15 & 7.4 Hz, 2H, Ar-H), 6.35 (s, 2H, Ar-H), 5.81 (s, 1H, Ar-CH); <sup>13</sup>C NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 142, 136, 131, 129, 128, 126, 123, 121, 120, 119, 118, 111, 39; ESI-MS m/z C<sub>23</sub>H<sub>17</sub>N<sub>2</sub>Cl calcd. 356.8474, found 356.2936 [M]<sup>+</sup>, 355.3751 [M-1]<sup>+</sup>, 358.4198 [M+2]<sup>+</sup>.

**3,3'-[(2-Hydroxyphenyl)methanediyl]bis(1H-indole) (BIc).** Pink solid; M.p. 193–195 °C, R<sub>f</sub> = 0.50 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3409, 1593, 1443, 1330, 1197, 1082, 738; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 7.86 (bs, 2H, -NH), 7.37 (d, J = 7.95 Hz, 2H, Ar-H), 7.31 (d, J = 8.2 Hz, 2H, Ar-H), 7.23–7.14 (m, 4H, Ar-H), 7.01 (t, J = 7.45 & 7.4 Hz, 2H, Ar-H), 6.86–6.82

(*m*, 2H, Ar-H), 6.68(d, *J* = 1.55 Hz, 2H, Ar-H), 5.97(s, 1H, Ar-CH), 5.38 (bs, 1H, Ar-OH); ESI-MS *m/z* C<sub>23</sub>H<sub>18</sub>N<sub>2</sub>O calcd. 338.4018, found 338.3037 [M]<sup>+</sup>, 337.4178 [M-1]<sup>+</sup>.

3,3'-[(4-Hydroxyphenyl)methanediyl]bis(1H-indole) (*Blid*). Red Brown solid; M.p. 198–200 °C, R<sub>f</sub> = 0.58 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3448, 3400, 1600, 1505, 1416, 1337, 1173, 1083, 742; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 7.89 (bs, 2H, -NH), 7.38 (d, *J* = 8 Hz, 2H, Ar-H), 7.34 (d, *J* = 8.15 Hz, 2H, Ar-H), 7.19 (dd, *J* = 4.95 & 1.75 Hz, 2H, Ar-H), 7.16 (dt, *J* = 7.15 & 0.9 Hz, 2H, Ar-H), 6.99 (dt, *J* = 7.15, 7.05 & 0.8 Hz, 2H, Ar-H), 6.73(td, *J* = 4.55 & 2.0 Hz, 2H, Ar-H), 6.65 (d, *J* = 1.5 Hz, 2H, Ar-H), 5.82 (s, 1H, Ar-CH); ESI-MS *m/z* C<sub>23</sub>H<sub>18</sub>N<sub>2</sub>O calcd. 338.4018, found 338.2231 [M]<sup>+</sup>, 337.3911 [M-1]<sup>+</sup>.

3,3'-[(2-Fluorophenyl)methanediyl]bis(1H-indole) (*Bie*). Pink solid; M.p. 177–179 °C, R<sub>f</sub> = 0.22 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3380, 3050, 1607, 1452, 1337, 1215, 1086, 746; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ (ppm) 7.74 (bs, 2H, -NH), 7.38 (d, *J* = 7.95 Hz, 2H, Ar-H), 7.29 (d, *J* = 8.15 Hz, 2H, Ar-H), 7.21–7.13 (*m*, 4H, Ar-H), 7.05 (*t*, 1H, Ar-H), 7.00–6.95 (*m*, 3H, Ar-H), 6.61(d, *J* = 1.4 Hz, 2H, Ar-H), 6.20 (s, 1H, Ar-CH); ESI-MS *m/z* C<sub>23</sub>H<sub>17</sub>N<sub>2</sub>F calcd. 340.2928, found 340.3033 [M]<sup>+</sup>, 339.4148 [M-1]<sup>+</sup>.

3,3'-[(4-Methylphenyl)methanediyl]bis(1H-indole) (*Blh*). Red Brown solid; M.p. 195–197 °C, R<sub>f</sub> = 0.54 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3403, 3037, 1607, 1509, 1417, 1207, 1093, 742; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ (ppm) 7.79 (bs, 2H, -NH), 7.37 (d, *J* = 7.95 Hz, 2H, Ar-H), 7.30 (d, *J* = 8.15 Hz, 2H, Ar-H), 7.21 (*t*, *J* = 7.95 Hz, 2H, Ar-H), 7.13 (*t*, *J* = 7.5 & 7.45 Hz, 2H, Ar-H), 7.06 (d, *J* = 7.85 Hz, 2H, Ar-H), 6.99 (*t*, *J* = 7.45 & 7.4 Hz, 2H, Ar-H), 6.60 (d, *J* = 1.45 Hz, 2H, Ar-H), 5.82 (s, 1H, Ar-CH), 2.30(s, 3H, -CH<sub>3</sub>); ESI-MS *m/z* C<sub>24</sub>H<sub>20</sub>N<sub>2</sub> calcd. 336.4290, found 336.2297 [M]<sup>+</sup>, 335.4001 [M-1]<sup>+</sup>.

3,3'-[(3,4-Dimethoxyphenyl)methanediyl]bis(1H-indole) (*Blj*). Red Brown solid; M.p. 185–187 °C, R<sub>f</sub> = 0.20 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3383, 3034, 1597, 1502, 1440, 1229, 1128, 1014, 741; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ (ppm) 7.88 (bs, 2H, -NH), 7.38 (d, *J* = 7.8 Hz, 2H, Ar-H), 7.30 (d, *J* = 8.0 Hz, 2H, Ar-H), 7.13 (*t*, *J* = 7.55 & 7.15 Hz, 2H, Ar-H), 6.98 (*t*, *J* = 7.35 & 7.25 Hz, 2H, Ar-H), 6.90 (s, *J* = 1H, Ar-H), 6.80 (d, *J* = 7.85 Hz, 1H, Ar-H), 6.72 (d, *J* = 8.15 Hz, 1H, Ar-H), 6.58 (s, 2H, Ar-H), 5.80(s, 1H, Ar-CH), 3.81 (s, 3H), 3.71 (s, 3H); <sup>13</sup>C NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 148, 147, 136, 136, 127, 123, 121, 120, 119, 119, 119, 112, 111, 110, 56, 55, 39; ESI-MS *m/z* C<sub>25</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub> calcd. 382.4543, found 382.2581 [M]<sup>+</sup>, 381.3730[M-1]<sup>+</sup>.

3,3'-[(3-Bromo-4-chloro-2-hydroxy-phenyl)methanediyl]bis(1H-indole) (*Blk*). Pink solid; M.p. 160–162 °C, R<sub>f</sub> = 0.23 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3392, 1656, 1448, 1340, 1215, 1087, 741; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>): δ (ppm) 7.84 (bs, 2H, -NH), 7.39 (d, *J* = 7.9 Hz, 2H, Ar-H), 7.35 (d, *J* = 2.3 Hz, 1H, Ar-H), 7.32 (d, *J* = 8.1 Hz, 2H, Ar-H), 7.17 (*t*, *J* = 7.65 & 7.4 Hz, 2H, Ar-H), 7.06 (d, *J* = 2.25 Hz, 1H, Ar-H), 7.02 (*t*, *J* = 7.45 Hz, 2H, Ar-H), 6.62 (d, *J* = 1.2 Hz, 2H, Ar-H), 6.18 (s, 1H, Ar-CH), 5.76 (bs, 1H, -OH); ESI-MS *m/z* C<sub>23</sub>H<sub>16</sub>N<sub>2</sub>BrClO calcd. 451.7429, found 451.2634 [M]<sup>+</sup>, 449.2574[M-2]<sup>+</sup>, 455.3306[M+4]<sup>+</sup>.

3,3'-[(3,4-Dimethoxyphenyl)methanediyl]bis(1H-indole) (*Bllo*). Pink solid; M.p. 164–166 °C, R<sub>f</sub> = 0.31 (30% EtOAc/n-Hexane); IR ν(cm<sup>-1</sup>): 3418, 3341, 3036, 1599, 1490, 1339, 1210, 1028, 796, 729; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ (ppm) 7.79 (bs, 2H, -NH), 7.40 (d, *J* = 7.9 Hz, 2H, Ar-H), 7.28 (d, *J* = 8.15 Hz, 1H, Ar-H), 7.12 (*t*, *J* = 7.6 & 7.45 Hz, 2H, Ar-H), 6.97 (*t*, *J* = 7.45 Hz, 2H, Ar-H), 6.84 (d, *J* = 8.8 Hz, 1H, Ar-H), 6.74 (d, *J* = 3.05 Hz, 1H, Ar-H), 6.70 (dd, *J* = 5.65 & 3.1 Hz, 1H, Ar-H), 6.56 (d, *J* = 1.25 Hz, 2H, Ar-H), 6.30(s, 1H, Ar-CH), 3.74 (s, 3H), 3.61(s, 3H); ESI-MS *m/z* C<sub>25</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub> calcd. 382.4543, found 382.2581 [M]<sup>+</sup>, 381.3730[M-1]<sup>+</sup>.

12  B. S. NARSALE ET AL.

### Acknowledgements


The authors are supported by the office bearers of Ahmednagar Jilha Maratha Vidya Prasarak Samaj's Ahmednagar and New Arts, Commerce and Science College, Parner and Department of Science and Technology (DST), New Delhi for the research facilities. Thanks are due to SAIF, Punjab University, Chandigarh for providing some of the analytical facilities.


### Disclosure statement

The authors declare no conflict of interest, financial or otherwise.

### ORCID

Bhauasheb S. Narsale  <http://orcid.org/0000-0001-7565-5229>

Anil G. Gadhave  <http://orcid.org/0000-0002-1733-132X>

Dilip R. Thube  <http://orcid.org/0000-0003-4095-4899>

### Data availability statement

The data that support the findings of this study are openly available in "figshare" at <http://doi10.6084/m9.figshare.19575823>.

### References

1. S. Manda, S. Sharma, A. Wani, P. Joshi, V. Kumar, S. K. Guru, S. S. Bharate, S. Bhushan, R. A. Vishwakarma, A. Kumar, et al., "Discovery of a Marine-Derived Bis-Indole Alkaloid Fascaplysin, as a New Class of Potent P-Glycoprotein Inducer and Establishment of Its Structure-Activity Relationship," *European Journal of Medicinal Chemistry* 107 (2016): 1-11.
2. C. Grosso, A. L. Cardoso, A. Lemos, J. Varela, M. J. Rodrigues, L. Custódio, L. Barreira, e Melo. Pinho, and M. V. D. Teresa, "Novel Approach to Bis(Indolyl)Methanes: De Novo Synthesis of 1-Hydroxyiminomethyl Derivatives with Anti-Cancer Properties," *European Journal of Medicinal Chemistry* 93 (2015): 9-15. [PMC][10.1016/j.ejmech.2015.01.050] [25644672]
3. Andreani, S. Burnelli, M. Granaiola, A. Leoni, A. Locatelli, R. Morigi, M. Rambaldi, L. Varoli, L. Landi, C. Prata, M. V. Berridge, et al., "Antitumor Activity of Bis-Indole Derivatives," *Journal of Medicinal Chemistry* 51, no. 15 (2008): 4563-70.
4. Y. Zhang, and C. Hu, "Anticancer Activity of Bisindole Alkaloids Derived from Natural Sources and Synthetic Bisindole Hybrids," *Archiv Der Pharmazie* 353, no. 9 (2020): 2000092-15.
5. N. A. Khan, N. Kaur, P. Owens, O. P. Thomas, and A. Boyd, "Bis-Indole Alkaloids Isolated from the Sponge *Spongosorites Calcicola* Disrupt Cell Membranes of MRSA," *International Journal of Molecular Sciences* 23, no. 4 (2022): 1991.
6. S. Singhal, P. Khanna, and L. Khanna, "Synthesis, Comparative in Vitro Antibacterial, Antioxidant and UV Fluorescence Studies of Bis Indole Schiff Bases and Molecular Docking with ct-DNA and SARS-CoV-2 M<sup>pro</sup>," *Luminescence* 36, no. 6 (2021): 1531-43.
7. Sunil Kumar, "A Brief Review of the Biological Potential of Indole Derivatives," *Future Journal of Pharmaceutical Sciences* 6, no. 1 (2020): 1-19.
8. P. Choppara, M. S. Bethu, P. Y. Vara, J. Venkateswara Rao, T. J. Uday Ranjan, G. V. Siva Prasad, R. Doradla, and Y. L. N. Murthy, "Synthesis, Characterization and Cytotoxic Investigations of Novel Bis(Indole) Analogues besides Antimicrobial Study," *Arabian Journal of Chemistry* 12, no.8 (2019): 2721-2731.
9. Jae Sung Park, Eunji Cho, Ji-Yeon Hwang, Sung Chul Park, Beomkoo Chung, Oh-Seok Kwon, Chung J. Sim, Dong-Chan Oh, Ki-Bong Oh, and Jongheon Shin, "Bioactive Bis(Indole) Alkaloids from a *Spongosorites* sp. Sponge," *Marine Drugs* 19, no. 1suppl 3 (2020): 3-14.
10. S. Sarva, J. S. Harinath, S. P. Sthanikam, S. Ethiraj, M. Vaithiyalingam, and S. R. Cirandur, "Synthesis, Antibacterial and anti-Inflammatory Activity of Bis(Indolyl)Methanes," *Chinese Chemical Letters*. 27, no. 1 (2016): 16-20.
11. Ming-Zhi Zhang, Qiong Chen, and Guang-Fu Yang, "A Review on Recent Developments of Indole-Containing Antiviral Agents," *European Journal of Medicinal Chemistry* 89 (2015): 421-41.

12. W. M. Eldehna, G. S. Hassan, S. T. Al-Rashood, H. M. Alkahtani, A. A. Almezhia, and Al-G H. Ansary, "Marine-Inspired Bis-Indoles Possessing Antiproliferative Activity against Breast Cancer, Design, Synthesis, and Biological Evaluation," *Marine Drugs* 18, no. 4 (2020): 190.
13. E. Maestro, C. Martín-Encinas, E. Alonso, G. Martínez de Marigorta, J. Rubiales, Javier Vicario, and F. Palacios, "Synthesis of Novel Antiproliferative Hybrid Bis-(3-Indolyl)Methane Phosphonate Derivatives," *European Journal of Medicinal Chemistry* 158 (2018): 874–83. [PMC][10.1016/j.ejmech.2018.09.011][30253344]
14. Donghwan. Choe, Haeri. So, Soyoung. Park, Hangyul. Lee, Ju. Byeong Chae, Jiwon. Kim, Ki-Tae. Kim, and Cheal. Kim, "An Indole-Based Fluorescent Chemosensor for Detecting Zn<sup>2+</sup> in Aqueous Media and Zebrafish," *Sensors* 21, no. 16 (2021): 5591.
15. Barnali Deb, Sudhan Debnath, Ankita Chakraborty, and Swapan Majumdar, "Bis-Indoloylation of Aldehydes and Ketones Using Silica-Supported FeCl<sub>3</sub>: Molecular Docking Studies of Bisindoles by Targeting SARS-CoV-2 Main Protease Binding Sites," *RSC Advances* 11, no. 49 (2021): 30827–39.
16. Xiong-Wei. Liu, Zhi-Yong. Chen, Guan-Lian. Wang, Xi-Tao. Ma, Yi Gong, Xiong-Li. Liu, Ting-Ting. Feng, and Ying. Zhou, "Diversity-Oriented TsOH Catalysis-Enabled Construction of Tanshinone-Substituted Bis(Indolyl/Pyrrolyl)Methanes and Their Biological Evaluation for Anticancer Activities," *Synthetic Communications* 47, no. 24 (2017): 2378–86.
17. M. A. Amrollahi, and Z. Kheilkordi, "H<sub>2</sub>PW<sub>12</sub>O<sub>40</sub>-Catalyzed One-Pot Synthesis of Bis(Indole) Derivatives under Silent and Ultrasonic Irradiation Conditions in Aqueous Media," *Journal of the Iranian Chemical Society* 13, no. 5 (2016): 925–9.
18. S. H. Siadatifard, M. Abdoli-Senejani, M. A. Bodaghifard, and G. Weaver, "An Efficient Method for Synthesis of Bis(Indolyl)Methane and di-Bis(Indolyl)Methane Derivatives in Environmentally Benign Conditions Using TBAHS," *Cogent Chemistry* 2, no. 1 (2016): 1188435.
19. S. Mathavan, K. Kannan, and Y. B. R. D. Rajesh, "Thiamine Hydrochloride as a Recyclable Organocatalyst for the Synthesis of Bis(Indolyl)Methanes, Tris(Indolyl)Methanes, 3,3-di(Indol-3-yl)Indolin-2-Ones and Biscoumarins," *Organic & Biomolecular Chemistry* 17, no. 44 (2019): 9620–6.
20. S. Ramesh, and D. Sarvanan, "An Efficient Method for the Synthesis of Bis(Indolyl)Methane Catalyzed by Nickel (II) Iodide," *Organic Chem Curr Res* 8, no. 2 (2020): 199.
21. S. B. Gaikwad, S. B. Borul, and S. R. Bembalkar, "Synthesis of Bis 1h-Indole Methane Derivatives Using Cellulose Perchloric Acid under Solvent-Free Conditions," *IJCPS* 4, no. 6 (2015): 62–5.
22. N. G. Singh, C. Kathing, Jims W. S. Rani, and R. L. Nongkhaw, "Synthesis of Pharmacologically Active Bis(Indolyl) and Tris(Indolyl) Derivatives Using Chlorotrimethylsilane," *Journal of the Chinese Chemical Society* 61, no. 4 (2014): 442–6.
23. J. Kothandapani, A. Ganesan, and S. S. Ganesan, "Magnetically Separable Sulfonic Acid Catalysed One-Pot Synthesis of Diverse Indole Derivatives," *Tetrahedron Letters* 56, no. 41 (2015): 5568–72. [CrossRef][10.1016/j.tetlet.2015.08.043]
24. V. S. Mozafari, and A. M. Ali, "Preparation, Characterization and Comparison of  $\beta$ -CD-Ti<sup>4+</sup>-Fe<sub>3</sub>O<sub>4</sub> and  $\beta$ -CD-Fe<sub>3</sub>O<sub>4</sub>-Ti<sup>4+</sup> Composites as Efficient Magnetic Catalysts for the Synthesis of Bis(Indolyl)Methane and Benzo[a]Xanthen-11-One Derivatives," *Polycyclic Aromatic Compounds* (2021): 1–13. 10.1080/10406638.2021.2002374.
25. Y. Wang, R. Sang, Y. Zheng, L. Guo, M. Guan, and Y. Wu, "Graphene Oxide: An Efficient Recyclable Solid Acid for the Synthesis of Bis(Indolyl)Methanes from Aldehydes and Indoles in Water," *Catalysis Communications* 89 (2017): 138–42.
26. H. K. Indurthi, R. Viridi, P. Koli, D. Nageswara. Rao, and D. K. Sharma, "Seralite SRC-120 Resin Catalyzed Synthesis of Bis(Indolyl)Methanes Using Indoles and Low/High Boiling Point Carbonyl Compounds under Solvent Free Conditions," *Synthetic Communications* 51, no. 1 (2021): 139–50.
27. H. Halawa, A. H. Bedair, A. M. El-Agrody, E. M. Eliwa, M. Frese, N. Sewald, and M. Shaaban, "Synthesis and Biological Activities of New Bis-Indole Derivatives via Microwave Irradiation," *Zeitschrift Für Naturforschung B* 72, no. 9 (2017): 639–46.
28. S. Rahimi, M. A. Amrollahi, and Z. Kheilkordi, "An Efficient Ultrasound-Promoted Method for the Synthesis of Bis(Indole) Derivatives," *Comptes Rendus Chimie* 18, no. 5 (2015): 558–63.
29. S. R. Deshmukh, A. S. Nalkar, and S. R. Thopate, "Ultrasound-Promoted Pyruvic Acid Catalyzed Green Synthesis of Biologically Relevant Bis(Indolyl)Methanes Scaffold under Aqueous Condition," *Polycyclic Aromatic Compounds* (2021): 1–9. doi: 10.1080/10406638.2021.1984259
30. B. S. Hote, T. A. J. Siddiqui, P. M. Pisal, and G. G. Mandawad, "Green Approach of Solvent- and Catalyst Free Synthesis of Bis(Indolyl)Methanes under Visible Light Irradiation," *Polycyclic Aromatic Compounds* 42, no.4 (2020): 1761–1769.
31. R. S. Varma, "Biomass-Derived Renewable Carbonaceous Materials for Sustainable Chemical and Environmental Applications," *ACS Sustainable Chemistry & Engineering* 7, no. 7 (2019): 6458–70.



14 B. S. NARSALE ET AL.

32. Y. Zhu, Z. Li, and J. Chen, "Applications of Lignin-Derived Catalysts for Green Synthesis," *Green Energy & Environment* 4, no. 3 (2019): 210–44.
33. Qianqian. Xie, Xiao. Yang, Kangning. Xu, Zheng. Chen, Binoy. Sarkar, and Xiaomin. Dou, "Conversion Biochar to Sulfonated Solid Acid Catalysts for Spiramycin Hydrolyses: Insights into the Sulfonation Processes," *Environmental Research* 188 (2020): 109887.
34. D. J. Macquarrie, and Jeff J. E. Hardy, "Applications of Functionalized Chitosan in Catalysis," *Industrial & Engineering Chemistry Research* 44, no. 23 (2005): 8499–520.
35. M. Chtchigrovsky, A. Primo, P. Gonzalez, K. Molvinger, M. Robitzer, F. Quignard, and F. Taran, "Functionalized Chitosan as a Green, Recyclable, Biopolymer-Supported Catalyst for the [3 + 2] Huisgen Cycloaddition," *Angewandte Chemie (International ed. in English)* 48, no. 32 (2009): 5916–20.
36. Khaled Khalil, Hamad Al-Matar, and Mohamed Elnagdi, "Chitosan as an Eco-Friendly Heterogeneous Catalyst for Michael Type Addition Reactions. A Simple and Efficient Route to Pyridones and Phthalazines," *European Journal of Chemistry* 1, no. 4 (2010): 252–8.
37. Minfeng. Zeng, Yijun. Du, Linjun. Shao, Chenze. Qi, and Xian-Man. Zhang, "Palladium-Catalyzed Reductive Homocoupling of Aromatic Halides and Oxidation of Alcohols," *The Journal of Organic Chemistry* 75, no. 8 (2010): 2556–63.
38. M. Lee, Bo-Yen. Chen, and W. Den, "Chitosan as a Natural Polymer for Heterogeneous Catalysts Support: A Short Review on Its Applications," *Applied Sciences* 5, no. 4 (2015): 1272–83.
39. K. R. Reddy, K. Rajgopal, C. Uma. Maheswari, and K. M. Lakshmi, "Chitosan Hydrogel: A Green and Recyclable Biopolymer Catalyst for Aldol and Knoevenagel Reactions," *New Journal of Chemistry* 30, no. 11 (2006): 1549–52.
40. Y. Tian, R. Zhang, W. Zhao, S. Wen, Y. Xiang, and X. Liu, "A New Sulfonic Acid-Functionalized Organic Polymer Catalyst for the Synthesis of Biomass-Derived Alkyl Levulinates," *Catalysis Letters* 150, no. 12 (2020): 3553–60.
41. Zeba N. Siddiqui, and Saima. Tarannum, "Xanthan Sulfuric Acid: An Efficient and Biodegradable Solid Acid Catalyst for the Synthesis of Bis(Indolyl)Methanes under Solvent-Free Conditions," *Comptes Rendus Chimie* 16, no. 9 (2013): 829–37.
42. Yan. Zhang, Xiang. Chen, Jun. Liang, and Zhi-cai. Shang, "Room-Temperature Synthesis of Diindolylmethanes Using Silica-Supported Sulfuric Acid as a Reusable Catalyst under Solvent-Free Conditions," *Synthetic Communications* 41, no. 16 (2011): 2446–54.
43. Mohit L. Deb, B. Deka, P. J. Saikia, and P. K. Baruah, "Base-Promoted Three-Component Cascade Approach to Unsymmetrical Bis(Indolyl)Methanes," *Tetrahedron Letters* 58, no. 20 (2017): 1999–2003.
44. N. Saehlim, T. Kasemsuk, U. Sirion, and R. Saeeng, "One Pot Approach for the Synthesis of Bis-Indole-1,4-Disubstituted-1,2,3-Triazoles," *The Journal of Organic Chemistry* 83, no. 21 (2018): 13233–42.
45. R. M. N. Kalla, Sung Chul. Hong, and Il. Kim, "Synthesis of Bis(Indolyl)Methanes Using Hyper-Cross-Linked Polyaromatic Spheres Decorated with Bromomethyl Groups as Efficient and Recyclable Catalysts," *ACS Omega* 3, no. 2 (2018): 2242–53.

## 52. Estimation of particle size and micro strain in Eu doped Yttrium oxide nanoparticle synthesized by homogenous coprecipitation method

© 2022 JETIR August 2022, Volume 9, Issue 8

www.jetir.org (ISSN-2349-5162)

JETIR.ORG

ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

**JOURNAL OF EMERGING TECHNOLOGIES AND  
INNOVATIVE RESEARCH (JETIR)**

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# Estimation of particle size and micro strain in Europium doped Yttrium oxide nanoparticle synthesized by homogenous coprecipitation method

\*Sanjay R. Kale<sup>1</sup> and Dilip R. Thube<sup>2</sup><sup>1</sup>Department of Chemistry, Tuljaram Chaturchand College, Baramati (Pune) MS<sup>2</sup>Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, (Ahmednagar) MSE-mail: [kalesanjay29@gmail.com](mailto:kalesanjay29@gmail.com) (Corresponding Author)**Abstract:**

Europium (Eu) doped Yttrium Oxide ( $Y_2O_3$ ) nanoparticles were successfully synthesized by homogenous coprecipitation method (HCP) with Yttrium nitrate hexahydrate as inorganic precursor and Europium nitrate hexahydrate as dopant. Particle size was estimated by XRD analysis while microstrain by Williamson-Hall plotting method. The effect of doping on structural properties of  $Y_2O_3$  was reported in this study.

**Key words:** Particle size, Micro strain, Homogenous Coprecipitation method.

**Introduction:**

Nanotechnology is an excellent example of an emerging and newly developed technology, offering nanostructured fabricated materials with the great potential for producing various products with substantially improved performances.<sup>1,2</sup> Nanomaterials, an exciting class of materials have emerged in recent years which are in high demand due to variety of practical applications.<sup>3,4,5,6</sup> Currently, nanomaterials find employable roles in scratch-free and dust-free paints, cosmetics, surface coatings, sports equipment, electronics, sensors, energy-storage devices, environmental remediation and food industry.<sup>7,8</sup>

The fabrication of new nanomaterial with acceptable size, shape and surface morphology has been achieved by various physical, chemical and biological methods.<sup>9,10,11,12,13</sup> Among all these reported methods, the homogenous co-precipitation method (HCP) was well documented better approach for high yield production of spherical particles with controllable sizes.<sup>14</sup>

Out of different sesquioxides, the  $Y_2O_3$  has been attracted widely as the host material for rare earth ion doping because of its thermomechanical stability, wide-ranging optical transparency (0.2 to 8  $\mu\text{m}$ ), having a band gap of 5.6 eV, less annealing temperature (800°C), low maximum photon energy (380  $\text{cm}^{-1}$ ), high refractive index (~1.87) and thermodynamically stable crystal structures. The similarities in the physico-chemical properties,

JETIR2208037

Journal of Emerging Technologies and Innovative Research (JETIR) [www.jetir.org](http://www.jetir.org)

a269

crystalline structure, ionic radius and lattice constant of inner transition metal ions and  $Y_2O_3$  make it a promising candidate for host material. In recent years, the studies on incorporation of RE in a single host material has fascinated and being extensively investigated. Due to similarities in ionic radius of RE ( $Eu^{3+}=0.947 \text{ \AA}$ ), the cell parameter (A) of synthesized nanoparticle is found to be much similar to that of pure  $Y_2O_3$  ( $Y_2O_3: Eu = 10.659 \text{ \AA}$ ,  $Y_2O_3 = 10.616 \text{ \AA}$ ). Therefore, it can be considered as a new generation long-lasting luminescent nanomaterial.

In this study, the estimation on particle size and microstrain in crystal structure of pure and Eu doped  $Y_2O_3$  by XRD analysis and Williamson-Hall plotting method was reported. Also the effect of doping on cell parameter of  $Y_2O_3$  was discussed.

#### Experimental method:

Pure and Eu doped  $Y_2O_3$  crystallites were synthesized by homogenous coprecipitation method (HCP). The details about material used, experimental procedure was briefly discussed in our earlier report.<sup>15</sup> After calcinations at  $\sim 800^\circ\text{C}$ , the obtained white powder was analyzed for its crystalline size and microstrain in the lattice by XRD and Williamson-Hall plotting method. The effect of doping on crystalline size of  $Y_2O_3$  nanoparticle was estimated.

#### Result and discussion:

The XRD patterns for 1% to 4% Eu doped  $Y_2O_3$  nanoparticle were presented in figure 1 to 4.

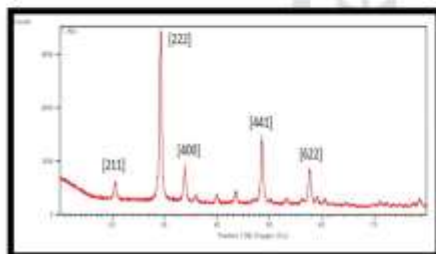


Fig. 1 XRD for 1 %  $Eu^{3+}$  doped  $Y_2O_3$  NPs

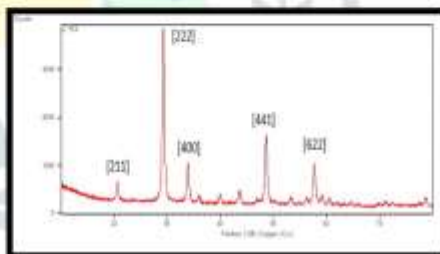


Fig. 2 XRD for 2 %  $Eu^{3+}$  doped  $Y_2O_3$  NPs

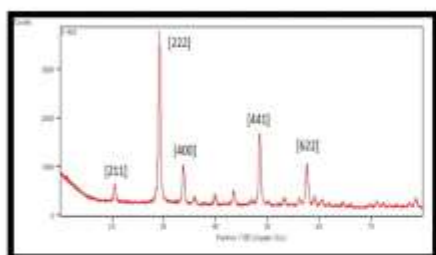


Fig. 3 XRD for 3 %  $Eu^{3+}$  doped  $Y_2O_3$  NPs

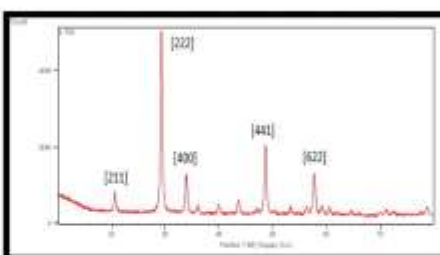


Fig. 4 XRD for 4 %  $Eu^{3+}$  doped  $Y_2O_3$  NPs

The XRD patterns show that the intensities of five basic peaks of the (211), (222), (400), (441), and (622) planes are more than that of other peaks. The observed intense peaks refer the excellent growth of crystal size

and assembly of larger clusters. The crystallite size (D) was calculated from the full width at half maximum (FWHM) of the strongest diffraction peak by using the Debye-Scherer formula<sup>16</sup>.

$$D = \frac{K \lambda}{\beta \cos \theta}$$

The following Table 1 shows the XRD parameters and crystalline size of pure and 1% to 4% Eu doped Y<sub>2</sub>O<sub>3</sub> NPs (222) plane orientation.

**Table 1: The XRD parameters and crystalline size of pure and 1% to 4% Eu doped Y<sub>2</sub>O<sub>3</sub> NPs**

Sample	2 θ (deg)	FWHM	d (obs) Å	D (nm)
Pure Y <sub>2</sub> O <sub>3</sub>	29.2615	0.4225	3.04962	32.42
1% Eu:Y <sub>2</sub> O <sub>3</sub>	29.1828	0.4499	3.05755	33.25
2% Eu:Y <sub>2</sub> O <sub>3</sub>	29.2148	0.4299	3.05438	34.81
3% Eu:Y <sub>2</sub> O <sub>3</sub>	29.1238	0.4065	3.06372	36.80
4% Eu:Y <sub>2</sub> O <sub>3</sub>	29.2107	0.3699	3.05481	40.45

The crystalline size of pure and 1 % to 5 % Eu<sup>3+</sup> doped Y<sub>2</sub>O<sub>3</sub> NPs is almost similar within the range of 32 to 40 nm. It indicates that there is no any major structural change or alteration in the crystal of Y<sub>2</sub>O<sub>3</sub> NPs due to incorporation of Eu<sup>3+</sup> ions. (as Eu<sub>2</sub>O<sub>3</sub>). The significance of broadening of peaks evidences grain refinement along with the large strain associated with the powder. The presence of impurities in crystal, changes the lattice energy and responsible to cause the excess strain in the lattice structure. The micro strain induced in powder due to crystal imperfection and distortion was calculated using Williamson-Hall equation<sup>17</sup>,

$$\beta \cos \theta = \frac{k \lambda}{D} + 4 \epsilon \sin \theta$$

Where ε is the strain and D is the mean size of the crystallite. The W-H plots for 1 % to 5 % Eu<sup>3+</sup> doped Y<sub>2</sub>O<sub>3</sub> NPs were represented in figure 5 to 8. From the linear fit to the data, the crystalline size was calculated from the y-intercepts, and the micro strain, from the slope of the W-H plot for all samples.

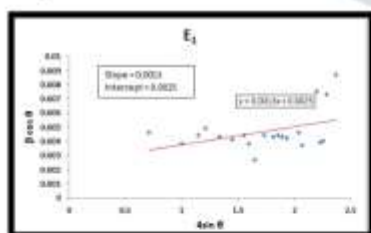


Fig. 5 The W-H plot for 1 % Eu: Y<sub>2</sub>O<sub>3</sub>

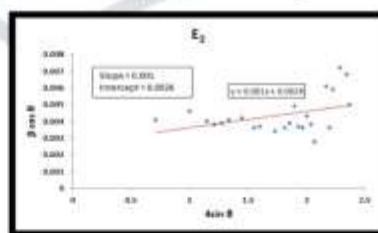


Fig. 6 The W-H plot for 2 % Eu: Y<sub>2</sub>O<sub>3</sub>

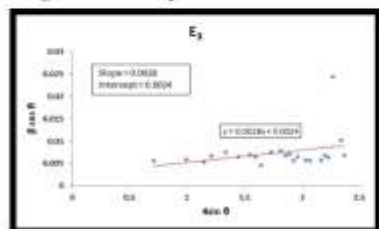


Fig. 7 The W-H plot for 3 % Eu: Y<sub>2</sub>O<sub>3</sub>

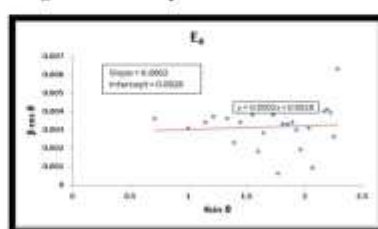


Fig. 8 The W-H plot for 4 % Eu: Y<sub>2</sub>O<sub>3</sub>

The crystallite size (D) determined from W-H plot, for pure and 1% to 5% Eu<sup>3+</sup> doped Y<sub>2</sub>O<sub>3</sub> NPs is represented in following Table 2. It was observed that the crystallite size (D) determined from W-H plot is more than that of obtained from Scherrer formula, indicating the micro strain has significant effect on the particle size of these samples.<sup>18</sup>

**Table 2: The crystalline size (D) and microstrain for Eu<sup>3+</sup> doped Y<sub>2</sub>O<sub>3</sub> from W-H analysis.**

Sample	Slope = Microstrain	Y- Intercept	D
Pure Y <sub>2</sub> O <sub>3</sub>	0.0008	0.0028	51.12
1% Eu:Y <sub>2</sub> O <sub>3</sub>	0.0013	0.0025	57.92
2% Eu:Y <sub>2</sub> O <sub>3</sub>	0.0010	0.0026	55.70
3% Eu:Y <sub>2</sub> O <sub>3</sub>	0.0028	0.0024	60.34
4% Eu:Y <sub>2</sub> O <sub>3</sub>	0.0002	0.0028	51.71

During doping, the d-spacing for a given (hkl) plane will change (i.e. peak shift) and induced lattice strain can be calculated. The peak broadening is either due to random microstrain induced by dislocation (strain broadening) or due to shrinkage of coherent scattering volume (size broadening). The observed broadening of peak is likely the combined results of both effects.<sup>19</sup> The low value of microstrain, shows almost absence of other impurity in the crystal lattice. The crystallite size calculated by using Scherrer's formula varies with the peak used. In comparison, the crystallite size determined from W-H plot, does not changes according to peak positions.

#### Conclusion:

The Eu doped Y<sub>2</sub>O<sub>3</sub> NPs were successfully synthesized by homogenous coprecipitation method. The XRD pattern confirms the cubic structure of Europium doped Y<sub>2</sub>O<sub>3</sub> and the crystalline size is found to be 32 to 40 nm while the crystalline size estimated by W-H analysis is within the range of 51 to 60 nm, indicating presence of microstrain due to incorporation of Eu<sup>3+</sup> ion substituted in place of Y<sup>3+</sup> ion at C<sub>2</sub> symmetry site of Y<sub>2</sub>O<sub>3</sub> NPs. Also the increase in crystalline size was observed due to incorporation of dopant Eu<sup>3+</sup> ion in Y<sub>2</sub>O<sub>3</sub> NPs. Scherrer's method gives average particle size of all crystallites present in the sample in a direction perpendicular to a particular (hkl) plane, but W-H method gives average particle size in all directions of all individual particles. As the crystalline size obtained is within the nanometer range, Eu doped Y<sub>2</sub>O<sub>3</sub> NPs can be considered as a best candidate luminescent nanomaterial for its employability in display devices and biomedical field.

#### Acknowledgement:

We thank CIAR, CFC, and Department of Chemistry, Tuljaram Chaturchand College, Baramati (Pune) and Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, (Ahmednagar) for providing necessary laboratory facilities.

**Conflict of interest:** The authors declare no conflict of interest.

**Reference:**

1. Asiyabola B, Soboyejo W., *J Surg Educ.* **2008**, 65(2), 155-61.
2. Yavuz, M., Irannejad, M., Brzezinski, et al. *Nanosci Technol.* **2014**,1(1), 2.
3. E. Roduner. *Chem Soc Rev.* **2006**, 35(7), 583-92.
4. Jeevanandam J, Barhoum A, Chan YS, *Beilstein J Nanotechnol.* **2018**,9(3), 1050-74.
5. Buzea C, Pacheco II, Robbie K. *Bio interphases.* **2007**, 2(4), MR17-71.
6. Nadeem Baig, Irshad Kammakakam, and Wail Falath, *Mater. Adv.* **2021**, 2, 1821-1871.
7. Ficzero, I, Zentai, A, Gál, V, et al. *Élelmezési Ipar.* **2009**, 63(3), 65-70.
8. Khan I, Saeed K, Khan I. *Arabian Journal of Chemistry.* **2019**,12(7), 908-931.
9. Das G. K. & Tan T. T. Y., *J Phys Chem*, **2008**, C 112, 11211-11217.
10. Qin X., Yokomori T. & Ju Y., *J Appl Phys Lett*, **2007**, 90, 073104.
11. Larimi Z. M. & Amirabadizadeh A., *Int conf chem & chemi proc*, **2011**, 10, 86-90.
12. Kanan S. K. & Sundrarajan M., *Bull Mater Sci*, 38 (4), **2015**, 945-950.
13. Hanadnch I. & Alhayek H., *Egypt J Chem*, **2019**, 62 (4), 573-581.
14. Fucushima S. & Furukawa T., *J Mater*, **2016**, 6 (3), 831-844.
15. Sanjay R. Kale and Dilip R. Thube, *Wesleyan J of Research*, 2021, 14 (26) 50-61.
16. Patterson A. L., *Physical Review*, **1939**. 56, (10), 978-982.
17. Williamson G. K. & Hall W. H., *Acta Metal*, **1953**, 1, 22-31.
18. Yamagata Shuichi, Yamamoto Takaaki, *Nano Biomedicine*, 9 (1), **2017**, 15-22.
19. Kalita A. K., Dr. Karmakar S., *Int. J Sci. Res.(IJSR)*, **2016**, 5(2), 654-655.

## 53. Design, Synthesis And Characterization Of Novel Fluorinated Styryl Chromones



Indian Journal of Chemistry  
Vol. 61, February 2022, pp. 225-228



### Design, synthesis and characterization of novel fluorinated styryl chromones

S G Kundlikar<sup>a\*</sup>, P J Jojar<sup>a</sup>, M S Tarade<sup>a</sup>, Y R Thorat<sup>a</sup>, D R Thube<sup>a</sup>, B K Karale<sup>b</sup>, H N Akolkar<sup>b</sup> & S D Mhaske<sup>c</sup>

<sup>a</sup>New Arts, Commerce and Science College Parner, Dist. Ahmednagar 414 302, India

<sup>b</sup>Radhabai Kale Mahila Mahavidyalaya, Dist. Ahmednagar 414 001, India

<sup>c</sup>Dalapatil Rajale Arts, Science and Commerce College, Pathardi, Dist. Ahmednagar 414 102, India

E-mail: saritakundlikar1@gmail.com

*Received 1 June 2020; accepted (revised) 8 November 2021*

(E)-3-(3-(Trifluoromethyl)-5-nitrophenyl)acrylic acid **1** when treated with substituted 2-hydroxyacetophenones **2** in dry pyridine and POCl<sub>3</sub> affords compound **3** which when reacted with pyridine/KOH by B. V. transformation gives **4**. Compound **4** on refluxing with acetic acid in HCl gives **5**. The structures of all synthesized compounds have been confirmed by spectroscopic techniques.

**Keywords:** Fluorine, diketone, styryl chromones

Substitution of hydrogen atom by fluorine into potentially active drug molecule alters lipophilic, electronic, steric parameters as well as pharmacokinetic and pharmacodynamic properties of drugs. Fluorine containing molecule is considered as an important tool in the design of new drugs<sup>1</sup>. Fluorine incorporated drugs are endowed with wide spectrum of biological activities such as insecticidal<sup>2</sup>, anticoagulant<sup>3</sup>, antimicrobial<sup>4</sup>, antitumor<sup>5</sup> and anticancer<sup>6</sup>.

β-Diketones are important intermediates in many drug syntheses<sup>7</sup>. The diketone derivatives are associated with broad spectrum of biological activities like corrosion inhibitor<sup>8</sup>, antimicrobial<sup>9</sup>, inhibition of amyloid α aggregation<sup>10</sup>, antiinflammatory<sup>11</sup>, etc.

Chromone moiety is a core fragment of different flavonoids like flavones, isoflavones and flavonols<sup>12</sup>. Large number of chromone derivatives are known for their pharmacological properties like such as anti-picomavirus capsid-binders<sup>13</sup>, antitumor<sup>14</sup>, anticancer<sup>15</sup>. Styryl chromones is one of the small family of chromone compounds exhibiting different biological activities like cytotoxicity<sup>16</sup>, antiproliferative<sup>17</sup>, monoamine oxidase inhibitors<sup>18</sup> and anti-noroviral agents<sup>19</sup>.

Based on this valuable literature observations associated with fluorine, diketone and chromones the present work describes an attempt towards synthesis of fluorine containing different diketones and chromones (Scheme I).

#### Experimental Section

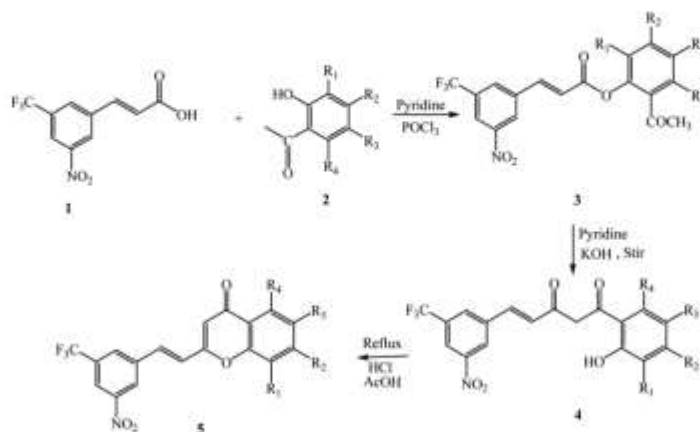
Melting points were determined in open capillaries in liquid paraffin bath and are uncorrected. Mass spectra were recorded on Waters Acquity TQD mass spectrometer. <sup>1</sup>H NMR spectra were recorded on Bruker Avance II 500 MHz NMR spectrometer in CDCl<sub>3</sub> as a solvent and TMS as an internal standard. Peak values are shown in δ (ppm). IR spectra were recorded on Shimadzu IR Affinity-1S spectrophotometer.

#### (E)-2-Acetylphenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, **3a-e**

Equimolar quantities of 2-(4-fluorophenyl)-5-phenylbenzofuran-3-carboxylic acid **1** (0.004M) and substituted 2-hydroxyacetophenone **2** (0.004M) was dissolved in pyridine (20 mL) maintained at about 0°C then POCl<sub>3</sub> (0.004 M) was slowly added maintaining the temperature below 4°C. After complete addition the reaction mixture was kept overnight. Resulting reaction mixture was poured over crushed ice, solid thus obtained was separated by filtration and crystallized from ethanol to afford **3**.

#### (E)-2-Acetylphenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)

**acrylate, 3a:** m.p. 68°C. Yield 90%. IR: 2929, 1690, 1521, 1351, 1154, 678 cm<sup>-1</sup>; <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.56 (s, 3H), 6.75 (d, *J* = 16 Hz, 1H), 7.19 (dd, *J* = 4.6 Hz, 1H), 7.29 (dd, *J* = 3 and 4.6 Hz, 1H), 7.54 (dd, *J* = 3 Hz, 1H), 7.58-7.79 (m, 4H), 7.93 (d, *J* = 16 Hz, 1H); MS:



Scheme I

$m/z$  (M+1), 380. Anal. Calcd: C, 57.00; H, 3.19. Found: C, 57.02; H, 3.22%.

**(E)-2-Acetyl-4-fluorophenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, 3b:** m.p. 83°C. Yield 73%. IR: 2923, 1688, 1519, 1348, 1150, 675  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.56 (s, 3H), 6.73 (d,  $J = 16$  Hz, 1H), 7.17 (dd,  $J = 4.6$  Hz, 1H), 7.26 (dd,  $J = 3$  and 4.6 Hz, 1H), 7.52 (dd,  $J = 3$  Hz, 1H), 7.56 (t,  $J = 7.8$  Hz, 1H), 7.69 (d,  $J = 7.8$  Hz, 1H), 7.77 (d,  $J = 7.8$  Hz, 1H), 7.91 (d,  $J = 16$  Hz, 1H); MS:  $m/z$  (M+1), 398. Anal. Calcd: C, 54.42; H, 2.79. Found: C, 54.43; H, 2.81%.

**(E)-2-Acetyl-4-chlorophenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, 3c:** m.p. 96°C. Yield 84%. IR: 2926, 1691, 1516, 1350, 1154, 1035, 678  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.54 (s, 3H), 6.70 (d,  $J = 16$  Hz, 1H), 7.08 (dd,  $J = 4.6$  Hz, 1H), 7.20 (dd,  $J = 3$  and 4.6 Hz, 1H), 7.50 (dd,  $J = 3$  Hz, 1H), 7.53 (d,  $J = 3$  Hz, 1H), 7.60 (d,  $J = 7.4$  Hz, 1H), 7.73 (dd,  $J = 7.4$  and 3 Hz, 1H), 7.91 (d,  $J = 16$  Hz, 1H); MS:  $m/z$  (M+1), 415. Anal. Calcd: C, 52.25; H, 2.68. Found: C, 52.29; H, 2.71%.

**(E)-2-Acetyl-4-methylphenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, 3d:** m.p. 76°C. Yield 74%. IR: 2920, 1682, 1515, 1351, 1152, 672  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.40 (s, 3H), 2.50 (s, 3H), 6.68 (d,  $J = 16$  Hz, 1H), 7.04 (dd,  $J = 4.6$  Hz, 1H), 7.16 (dd,  $J = 3$  and 4.6 Hz, 1H), 7.49 (dd,  $J = 3$  Hz, 1H), 7.52 (d,  $J = 3$  Hz, 1H), 7.58 (d,  $J = 7.4$  Hz, 1H), 7.70 (dd,  $J = 7.4$  and 3 Hz, 1H), 7.88 (d,  $J = 16$  Hz, 1H); MS:  $m/z$  (M+1),

394. Anal. Calcd: C, 58.02; H, 3.59. Found: C, 58.04; H, 3.62%.

**(E)-2-Acetyl-4,6-dimethylphenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, 3e:** m.p. 76°C. Yield 80%. IR: 2921, 1684, 1516, 1350, 1150, 670  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.36 (s, 3H), 2.39 (s, 3H), 2.49 (s, 3H), 6.66 (d,  $J = 16$  Hz, 1H), 7.02 (dd,  $J = 4.6$  Hz, 1H), 7.19 (dd,  $J = 3$  and 4.6 Hz, 1H), 7.49 (dd,  $J = 3$  Hz, 1H), 7.50 (d,  $J = 3$  Hz, 1H), 7.64 (d,  $J = 3$  Hz, 1H), 7.80 (d,  $J = 16$  Hz, 1H); MS:  $m/z$  (M+1), 408. Anal. Calcd: C, 58.97; H, 3.96. Found: C, 58.99; H, 3.99.

**(E)-2-Acetyl-4-chloro-5-methylphenyl 3-(3-(trifluoromethyl)-5-nitrophenyl)acrylate, 3f:** m.p. 84°C. Yield 78%. IR: 2920, 1686, 1514, 1347, 1151, 1030, 670  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.32 (s, 3H), 2.52 (s, 3H), 6.71 (d,  $J = 16$  Hz, 1H), 7.06 (dd,  $J = 4.6$  Hz, 1H), 7.23 (dd,  $J = 3$  and 4.6 Hz, 1H), 7.46 (dd,  $J = 3$  Hz, 1H), 7.55 (s, 1H), 7.62 (s, 1H), 7.90 (d,  $J = 16$  Hz, 1H); MS:  $m/z$  (M+1), 428. Anal. Calcd: C, 53.35; H, 3.06. Found: C, 53.39; H, 3.08.

**(E)-5-(3-(Trifluoromethyl)-5-nitrophenyl)-1-(2-hydroxyphenyl)pent-4-ene-1,3-dione, 4a-e**

Ester **3** (0.002 M) was dissolved in 10 mL pyridine and powdered KOH (2 gm) was added. Reaction mixture was stirred at RT for 3 h. After completion of the reaction (monitored by TLC) contents were poured over crushed ice and acidified with conc. HCl. The solid thus obtained was filtered, dried and crystallized from ethanol to afford **4**.



**(E)-5-(3-(Trifluoromethyl)-5-nitrophenyl)-1-(2-hydroxyphenyl)pent-4-ene-1,3-dione, 4a:** m.p. 102°C. Yield 78%. IR: 3315, 2986, 1699, 1517, 1162  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  6.29 (s, 1H), 6.68 (d,  $J = 16$  Hz, 1H), 6.98 (dd,  $J = 4.6$  Hz, 1H), 7.34 (dd,  $J = 3$  Hz, 1H), 7.56-7.62 (m, 3H), 7.74-7.80 (m, 2H), 7.67 (d,  $J = 16$  Hz, 1H), 11.18 (s, 1H), 14.46 (s, 1H); MS:  $m/z$  (M+1), 380. Anal. Calcd: C, 57.00; H, 3.19. Found: C, 57.03; H, 3.21.

**(E)-1-(5-Fluoro-2-hydroxyphenyl)-5-(3-(trifluoromethyl)-5-nitrophenyl)pent-4-ene-1,3-dione, 4b:** m.p. 128°C. Yield 70%. IR: 3310, 2980, 1695, 1519, 1160  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  6.27 (s, 1H), 6.67 (d,  $J = 16$  Hz, 1H), 6.97 (dd,  $J = 4.6$  Hz, 1H), 7.36 (dd,  $J = 3$  Hz, 1H), 7.54-7.64 (m, 2H), 7.72-7.81 (m, 2H), 7.68 (d,  $J = 16$  Hz, 1H), 11.19 (s, 1H), 14.49 (s, 1H); MS:  $m/z$  (M+1), 398. Anal. Calcd: C, 54.42; H, 2.79. Found: C, 54.45; H, 2.81.

**(E)-1-(5-chloro-2-hydroxyphenyl)-5-(3-(trifluoromethyl)-5-nitrophenyl)pent-4-ene-1,3-dione, 4c:** m.p. 132°C. Yield 72%. IR: 3312, 2982, 1696, 1514, 1158  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  6.24 (s, 1H), 6.63 (d,  $J = 16$  Hz, 1H), 6.95 (dd,  $J = 4$  Hz, 1H), 7.37 (dd,  $J = 3$  Hz, 1H), 7.52-7.63 (m, 2H), 7.70-7.80 (m, 2H), 7.65 (d,  $J = 16$  Hz, 1H), 11.16 (s, 1H), 14.45 (s, 1H); MS:  $m/z$  (M+1), 415. Anal. Calcd: C, 52.25; H, 2.68. Found: C, 52.27; H, 2.69.

**(E)-1-(5-methyl-2-hydroxyphenyl)-5-(3-(trifluoromethyl)-5-nitrophenyl)pent-4-ene-1,3-dione, 4d:** m.p. 118°C. Yield 66%. IR: 3314, 2981, 1692, 1516, 1157  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.10 (s, 3H), 6.22 (s, 1H), 6.62 (d,  $J = 16$  Hz, 1H), 6.93 (dd,  $J = 4.6$  Hz, 1H), 7.34 (dd,  $J = 3$  Hz, 1H), 7.50-7.60 (m, 2H), 7.70-7.80 (m, 2H), 7.64 (d,  $J = 16$  Hz, 1H), 11.17 (s, 1H), 14.47 (s, 1H); MS:  $m/z$  (M+1), 394. Anal. Calcd: C, 58.02; H, 3.59. Found: C, 58.05; H, 3.62.

**(E)-5-(3-(Trifluoromethyl)-5-nitrophenyl)-1-(2-hydroxy-3,5-dimethylphenyl)pent-4-ene-1,3-dione, 4e:** m.p. 158°C. Yield 62%. IR: 3315, 2984, 1693, 1517, 1156  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.10 (s, 3H), 2.12 (s, 3H), 6.24 (s, 1H), 6.60 (d,  $J = 16$  Hz, 1H), 6.90 (dd,  $J = 4.6$  Hz, 1H), 7.32 (dd,  $J = 3$  Hz, 1H), 7.50-7.62 (m, 2H), 7.70 (d, 1H), 7.64 (d,  $J = 16$  Hz, 1H), 11.16 (s, 1H), 14.44 (s, 1H); MS:  $m/z$  (M+1), 408. Anal. Calcd: C, 58.97; H, 3.96. Found: C, 58.98; H, 3.98.

**(E)-1-(5-Chloro-2-hydroxy-4-methylphenyl)-5-(3-(trifluoromethyl)-5-nitrophenyl)pent-4-ene-1,3-dione, 4f:** m.p. 108°C. Yield 64%. IR: 3312, 2983,

1694, 1515, 1162  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.11 (s, 3H), 6.25 (s, 1H), 6.62 (d,  $J = 16$  Hz, 1H), 6.92 (dd,  $J = 4.6$  Hz, 1H), 7.30 (dd,  $J = 3$  Hz, 1H), 7.60 (dd, 1H), 7.68 (s, 1H), 7.70 (s, 1H), 7.64 (d,  $J = 16$  Hz, 1H), 11.15 (s, 1H), 14.46 (s, 1H); MS:  $m/z$  (M+1), 428. Anal. Calcd: C, 53.35; H, 3.06. Found: C, 53.37; H, 3.09.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-4H-chromen-4-one, 5a-e**

Compound **4** (0.002M) was dissolved in acetic acid (15 mL) and minimum quantity of conc. HCl (1.5 mL) was added into it. The reaction mixture was heated under reflux for 2 h. After completion of reaction, it was poured over crushed ice. The product obtained was separated by filtration and crystallized from ethanol to afford the title compound **5**.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-4H-chromen-4-one, 5a:** m.p. 134°C. Yield 60%. IR: 3057, 1696, 1644, 1527, 1331, 1118  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  6.40 (s, 1H), 6.86 (d,  $J = 16$  Hz, 1H), 7.43 (dd,  $J = 3$  Hz, 1H), 7.56-7.64 (m, 4H), 7.65 (dd,  $J = 3$  Hz, 1H), 7.68 (d,  $J = 16$  Hz, 1H), 7.85 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 362. Anal. Calcd: C, 59.84; H, 2.79. Found: C, 59.87; H, 2.81.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-6-fluoro-4H-chromen-4-one, 5b:** m.p. 148°C. Yield 65%. IR: 3054, 1698, 1642, 1524, 1329, 1113  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  6.37 (s, 1H), 6.86 (d,  $J = 16$  Hz, 1H), 7.42 (dd,  $J = 3$  Hz, 1H), 7.54-7.58 (m, 2H), 7.61 (dd,  $J = 3$  Hz, 1H), 7.64 (d,  $J = 16$  Hz, 1H), 7.77 (d,  $J = 8$  Hz, 1H), 7.83 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 380. Anal. Calcd: C, 57.00; H, 2.39. Found: C, 57.03; H, 2.41.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-6-chloro-4H-chromen-4-one, 5c:** m.p. 172°C. Yield 64%. IR: 3058, 1695, 1640, 1523, 1325, 1112  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  6.36 (s, 1H), 6.82 (d,  $J = 16$  Hz, 1H), 7.41 (dd,  $J = 3$  Hz, 1H), 7.52-7.57 (m, 2H), 7.60 (dd,  $J = 3$  Hz, 1H), 7.62 (d,  $J = 16$  Hz, 1H), 7.76 (d,  $J = 8$  Hz, 1H), 7.81 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 396. Anal. Calcd: C, 54.63; H, 2.29. Found: C, 54.64; H, 2.31.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-6-methyl-4H-chromen-4-one, 5d:** m.p. 168°C. Yield 48%. IR: 3056, 1694, 1641, 1522, 1326, 1115  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.38 (s, 3H), 6.35 (s, 1H), 6.80 (d,  $J = 16$  Hz, 1H), 7.38 (dd,  $J = 3$  Hz, 1H), 7.51-7.54 (m, 2H), 7.61 (dd,  $J = 3$  Hz, 1H), 7.60 (d,  $J = 16$  Hz, 1H), 7.70 (d,  $J = 8$  Hz, 1H), 7.80 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 376. Anal. Calcd: C, 60.81; H, 3.22. Found: C, 60.85; H, 3.24.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-6,8-dimethyl-4H-chromen-4-one, 5e:** m.p. 182°C. Yield 54%. IR: 3053, 1694, 1640, 1522, 1323, 1110  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.35 (s, 3H), 2.40 (s, 3H), 6.32 (s, 1H), 6.78 (d,  $J = 16$  Hz, 1H), 7.41 (dd,  $J = 3$  Hz, 1H), 7.50 (d,  $J = 2$  Hz, 1H), 7.54 (dd,  $J = 3$  Hz, 1H), 7.62 (d,  $J = 16$  Hz, 1H), 7.76 (d,  $J = 2$  Hz, 1H), 7.81 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 390. Anal. Calcd: C, 61.70; H, 3.62. Found: C, 61.73; H, 3.64.

**2-(3-(Trifluoromethyl)-5-nitrostyryl)-6-chloro-7-methyl-4H-chromen-4-one, 5f:** m.p. 172°C. Yield 58%. IR: 3052, 1693, 1642, 1523, 1320, 1112  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$ :  $\delta$  2.37 (s, 3H), 6.34 (s, 1H), 6.74 (d,  $J = 16$  Hz, 1H), 7.40 (dd,  $J = 3$  Hz, 1H), 7.54 (s, 1H), 7.58 (dd,  $J = 3$  Hz, 1H), 7.64 (d,  $J = 16$  Hz, 1H), 7.71 (s, 1H), 7.83 (dd,  $J = 3$  Hz, 1H); MS:  $m/z$  (M+1), 410. Anal. Calcd: C, 55.69; H, 2.71. Found: C, 55.71; H, 2.74.

#### Results and Discussion

In current study we have synthesized novel fluorine containing different styryl esters, diketones and chromones. The structures of all the synthesized compounds were confirmed by spectral techniques.

#### Conclusions

Results showed that compounds bearing halogen like fluorine, chlorine have greater yield than compounds bearing alkyl substituent like methyl and dimethyl in diketone and chromone derivatives.

#### Acknowledgement

Authors are thankful to DST for providing support under FIST program and Sanstha Ahmednagar Zilha

Maratha Vidya Prasarak Samaj as well as Principal of New Arts Commerce and Science College Parner for providing necessary facilities.

#### References

- Purser S, Moore P R, Swallow S & Gouverneur V, *Chem Soc Rev*, 37 (2008) 320.
- Wang B, Wang H, Liu H, Xiong L, Yang N, Zhang Y & Li Z, *Chinese Chem Lett*, 31 (2020) 739.
- Wang F, Ren Y-J & Dong M-H, *Bioorg Med Chem*, 24 (2016) 2739.
- Meng H & Kumar K, *J Am Chem Soc*, 129 (2007) 15615.
- Xia Y, Yang Z-Y, Xia P, Hackl T, Hamel E, Mauger A, Wu J-H & Lee K-H, *J Med Chem*, 44 (2001) 3932.
- Isambor C & O'Hagan D, *J Fluorine Chem*, 127 (2006) 303.
- Pradhan J & Goyal A, *Int J Pharma Res Allied Sci*, 4 (2015) 1.
- Fragoza-Mar L, Olivares-Xometl O, Dominguez-Agular M A, Flores E A, Arellanes-Lozada P & Jimenez-Cruz F, *Corros Sci*, 61 (2012) 171.
- Viswanathan A, Sala A, Yli-Harja O & Kandhavelu M, *Eur J Pharm Sci*, 66 (2015) 83.
- Das S & Smid S D, *Toxicology Lett*, 300 (2019) 67.
- Bhise N A, Al-Horaiibi S A, Gaikwad S T & Rajbhoj A S, *Rasayan J Chem*, 12 (2019) 101.
- Rackova L, Firkova S, Kostalova D, Stefek M, Sturdik E & Majekova M, *Bioorg Med Chem*, 13 (2005) 6477.
- Conti C & Desideri N, *Bioorg Med Chem*, 18 (2010) 6480.
- Duan Y-D, Jiang Y-Y, Guo F-X, Chen L-X, Xu L-L, Zhang W & Liu B, *Fitoterapia*, 135 (2019) 114.
- Middleton E, Kandaswami C & Theoharides T C, *Pharmacol Rev*, 52 (2000) 673.
- Bhatnagar S, Sahi S, Kackar P, Kaushik S, Dave M K, Shukla A & Goel A, *Bioorg Med Chem Lett*, 20 (2010) 4945.
- Shaw A Y, Chang C-Y, Liu H-H, Lu P-J, Chen H-L, Yang C-N & Li H-Y, *Eur J Med Chem*, 44 (2009) 2552.
- Takao K, Yahagi H, Uesawa Y & Sugita Y, *Bioorg Chem*, 77 (2018) 436.
- Rocha-Pereira J, Cunha R, Pinto D C G A, Silva A M S & Nascimento M S J, *Bioorg Med Chem*, 18 (2010), 4195.

## 54. Effects of COVID-19 on selected sectors of Indian Economy

MAH MUL/03051/2012 ISSN: 2319 9318 **Hindi, Marathi, English** *Vidyawarta*® December 2018 Issue-29, Vol-01 01

MAH/MUL/ 03051/2012 ISSN :2319 9318

आंतरविद्याशाखीय बहुभाषिक शोध पत्रिका

**विद्यावार्ता**™

December 2018  
Issue-29, Vol-01

**Editor**  
**Dr. Bapu g. Gholap**  
(M.A.Mar.& Pol.Sci.,B.Ed.Ph.D.NET.)

विद्येविना मति गंली, मतीविना नीति गंली  
नीतिविना गति गंली, गतिविना चित्त गंले  
चित्तविना शूद्र खचले, इतके अनर्थ एका अविद्येने केलं  
-महात्मा ज्योतीराव फुले

❖ **विद्यावार्ता** या आंतरविद्याशाखीय बहुभाषिक त्रैमासिकाने व्यक्त झालेल्या मनाशी मालक, प्रकाशक, मुद्रक, संपादक सहमत असतीलच असे नाही **न्यायक्षेत्र:बीड**

"Printed by: **Harshwardhan Publication Pvt.Ltd.** Published by **Ghodke Archana Rajendra** & Printed & published at Harshwardhan Publication Pvt.Ltd.,At.Post. Limbaganesh Dist,Beed -431122 (Maharashtra) and Editor **Dr. Gholap Bapu Ganpat.**

**Harshwardhan Publication Pvt.Ltd.**  
Reg No.U74120 MH2013 PTC 251205  
At.Post.Limbaganesh,Tq Dist.Beed  
Pin-431126 (Maharashtra) Cell:07588057595,09850203295  
harshwardhanpubli@gmail.com, vidyawarta@gmail.com  
All Types Educational & Reference Book Publisher & Distributors [www.vidyawarta.com](http://www.vidyawarta.com)

1

26	डॉ. भास्कर उमराव भवर	समकालीन हिंदी गजल विविध विमर्श	72
27	डॉ. भाऊसाहेब नयनाथ मयले	सामाजिक प्रतिबद्धता की पुरजोर हिमायत : समकालीन हिंदी गजल	74
28	डॉ. जॉन्टन बाबसाहेब माने	डॉ. सुमन जैन की गजलों में व्यक्त नारी संवेदना	77
29	डॉ. बचन चौरे	दुष्यंतकुमार की गजलों में राजनीतिक विमर्श	80
30	डॉ. दीपक रामा तुपे	मी की तलाश करती मुनवर राना की गजल	82
31	डॉ. गायकवाट हनुमंत पंडू	निदा कजली और दुष्यंतकुमार की हिंदी गजलों में सामाजिक विमर्श	84
32	डॉ. जगदीश बन्सीलाल चव्हाण	हिंदी गजलकारी की गजलों में सामाजिक अभिव्यक्ति	86
33	डॉ. जाधराम श्री सुदंश्री	समकालीन हिंदी गजल महानगरों में एव देहाती संतान	88
34	डॉ. मिलिंद सालवे	समकालीन गजलों में राष्ट्रीय एकता के स्वर	90
35	डॉ. सतीश मोटवानी	हिन्दी गजल का विकास	94
36	निवृत्ती शंकराव भोटेकर	21 वीं सदी की हिन्दी गजल में राजनीतिक संतान	97
37	प्रा. डॉ. पी. आर. गवळी	अभिव्यक्ति यती की गजलों में संवेदना के विविध आयाम	99
38	डॉ. पंडित बन्म	दुष्यंतकुमार के गजलों में सामाजिक संवेदना	103
39	प्रा. डॉ. प्रल्हाद विजयसिंग पावस	ज्ञानप्रकाश विवेक की गजलों में वेदना और निराशा के स्वर	105
40	प्रा. डॉ. प्रमोद नाकुड पाटील प्रा. मनिषा गुलाब ठाकरे	जहीर कुरेशी की गजलों में राजनीतिक एव सामाजिक विमर्श	107
41	डॉ. पूनम त्रिवेदी	दोन्दी मन्दावज अकश की गजलों में अंधांधपायी कितन	109
42	डॉ. आर के जाधव	दशकीसवीं सदी की हिंदी-गजलों में विविध विमर्श	111
43	प्रा. डॉ. राजेंद्र रोटे	दुष्यंतकुमार के गजलों में राजनीतिक विमर्श	113
44	डॉ. रेवी अमरला जजित	हिंदी गजल में अन्यान्य विमर्श : नैतिक जीवन – मूल्य	115
45	डॉ. सुनील बापू बनसोडे	बदरौन विलत की गजलों में विविध आम आदमी (बोल, मेरी जिनगी) के संदर्भ में	117
46	प्रा. डॉ. सजय घोषटे	सुरेश भट के गजलों में सामाजिक पक्ष	119
47	डॉ. शंख मोहम्मद शाकिर	हिंदी गजल में स्त्री विमर्श : सुवर्ण परतानी की गजलों के संदर्भ में	122
48	प्रा. डॉ. सुषिता जगन्नाथ गायकवाट	दुष्यंत कुमार की गजलों में सामाजिकता	124
49	अमलापुरे सुरैकांत विघ्ननाथ	21 वीं सदी की हिंदी गजलों में सामाजिक विमर्श	127
50	डॉ. देशाली शिंदे,	21 वीं सदी के हिंदी गजलों में सामाजिक विमर्श	130
51	डॉ. विजय एकनाथ सोनज	रामकुमार कृष्ण की गजलों में सामाजिक बोध	132
52	प्रा. रंजित जाकीर एस	समकालीन हिन्दी गजलों में व्यक्त राजनीतिक बोध	135

## निदा फजली और दुष्यंतकुमार की हिंदी गजलों में सामाजिक विमर्श

प्र. डॉ. रामकृष्ण रामसुभाष वैद्य

## गजल अर्थ और स्वरूप –

गजल जर्दू काव्य का सबसे लोकप्रिय रूप है। यह फारसी की एक लोकप्रिय शैली है। अपनी भाषा का शुद्ध गजल सभी हिन्दी शब्द है। इसका अर्थ है प्रेमिका से बात करना या नारियों के प्रेम की बात करना। हिन्दी बोझ में गजल शब्दका अर्थ इस प्रकार दिया है गजल फारसी और जर्दू में एक प्रकार की कविता, जिसमें एक ही गजल और कविताएँ को अनेक शेर होते हैं। और प्रत्येक शेर का विषय वास्तव एक दूसरे से स्वतंत्र होता है। सांस्कृतिक जर्दू हिन्दी शब्द बोझ में गजल शब्द का अर्थ है- प्रेमिका से बातलाप। "1" हिन्दी साहित्य बोझ में गजल के बारे में इस प्रकार जानकारी दी है "2" "जबकि गजल का हर शेर स्वतंत्र होता है। इसके दो चरखर के टुकड़े होते हैं, जिसको मिसरा कहते हैं "2" और ऐसे पाँच से सत्रह शेरों के संग्रह को गजल कहते हैं। परंतु इस संग्रह के पानल में जर्दू में कोई खास पाकड़ी नहीं है।" हर शेर के अंत में जितने शब्द बार-बार आए उनको सहीद और सहीद के पहले के एक ही आवाज वाले शब्दों को कविताएँ कहते हैं। जैसे मीर के इस शेर में:

‘पता पता बुटा बुटा टाल टगारा जाने है।  
जाने न जाने मूल की जाने बाग तो सारा जाने है।  
जाने है, रफीद है और टगारा, सारा कविता है।’<sup>2</sup>

मिसरा शेर, कविताएँ, सहीद, सतल और सतर आदि गजल के अंग हैं। गजल की प्रत्येक पंक्ति को मिसरा कहा जाता है। दो मिसरों का शेर बनता है। दो मिसरों का जोड़ शेर कहलाता है। गजल की पंक्तियों कि तुक को कविताएँ कहते हैं। यह तुक पंक्तियों के अंतिम अक्षरों से पहले के शब्दों की रहती है। कविताएँ को बंद आनेवाली अंतिम तुकवादी को सहीद कहा जाता है। गजल का आरंभिक शेर सतल कहलाता है। इसकी दोनो पंक्तियों में सहीद और कविताएँ दोनो समान होते हैं। बाद में शैली में केवल दूसरी पंक्तियों में स्वतंत्र तुकवादी होती है। गजल के अंतिम शेर को सतल कहते हैं। इसमें कविताएँ अंतिम तुकवादी का प्रयोग होता है। उपर्युक्त प्रयोग भ होने पर इसे केवल शेर कहा जाएगा सतल सहीद। कम से कम शब्दों में प्रभावी अभिव्यक्ति गजल द्वारा संभव होती है। इसमें गजलकार निदा फजली और दुष्यंतकुमार का महत्वपूर्ण योगदान रहा है। चाहे गजल में प्रेमिका, राष्ट्र, समाजिक आदि संबंधित भाव हो। उसमें महत्वादी और प्रभाव अवधारक है। गजल की इस विशेषता को ही जरी लिखते हैं

‘बदिलो हों तो गजल होती है./सुरी में दालो को गजल होती है।  
जब टूटता है दिल का कोना- कोना/हर एक टुकड़े में गजल होती है।’<sup>3</sup>

दुष्यंत कुमार ने अपनी गजलों के माध्यम से साठोसठे सामाजिक और राजनीतिक स्थिति को उक्ति किया है। इन गजलों में आम आदमी की पीड़ा विशेष रूपसे उल्लेख आते हैं। इस संदर्भ में कमलेश्वर जी का कथन ही हरिधरण शर्मा ने अपनी परलोक में लिखा है ‘दुष्यंतकुमार ने पूरे आत्मविश्वास के साथ स्वीकार किया और हिन्दी को ऐसे गजले दी जो किसी भी भाषा के लिए दुनिया का विषय बन गयी। यही नहीं दुष्यंत ने गजलों को समाजिक की आदिम तुकवादी से निकालकर सीधे आम आदमी की जिंदगी से जोड़ दिया।’<sup>4</sup> दुष्यंतकुमार की कविता गजलों में आर्थिक मात्र में समर्पित होती है। ‘साएँ में तुम की गजलों में उनका प्रभाव देखा जा सकता है। दुष्यंतकुमार की गजलों में तीव्रता और प्रभाव है; वे गजलों जन-जन को अपनी वेदना प्रस्तुती लगती है। अपनी गजलों में आर्थिक मात्रा और पीड़ा को मिले व्यापक जगत्कार को इस शेर में स्वतंत्र अनुभव किया जा सकता है।

‘मेरी जुबान से निकली तो रिफाँ नज्म बनी./तुम्हारे हाथ में आई तो एक मशाल हई।’<sup>5</sup>

हालात में गजल कविता और उसके रूप को बहुत कम लोग समझ पाते हैं। और ये स्थिती तब और कड़ीय हो जाती है जब पारंपारिक गजल की अपेक्षा समाजिक संदर्भ में गजल लिखी जाती है। गजल की जगत्, गजलको के भावार्थमक वैचारिक स्तर को समझना हर किसी की क्षमता से बाहर है। निदा फजली शायर में इस गजल में लिखते हैं की

‘साफ़ में घुप तो होगी जो बल सको तो बलो/सभी है भीड़ में तुम भी निकल सको तो बलो  
यहाँ किसी को कोई सस्ता नहीं देता/पुझे गिरा के अंगर तुम सँभल सको तो बलो’<sup>6</sup>

स्वातंत्र्य के तीन स्तर होते हैं जन्मा, स्वाधीन और बुद्धिजीवी। बुद्धिजीवी वर्ग की भूमिका समाज के लिए अत्यंत महत्वपूर्ण है। यह वर्ग अपने दायित्व समझता से निभाने हुए स्वाधीन और जनता का मार्गदर्शन करते हुए देश और समाज की सुविधाएँ बनाए रखने का महत्वपूर्ण कार्य करता है। अपनी निरंकुश सत्ता के लिए प्रस्थापित स्वाधीन वर्ग जनसंस्कारण का दमन शोषण करता है। ऐसी स्थिती में बुद्धिजीवी यदि अपने दायित्व की अपेक्षा अपने अस्तित्व और स्वार्थ को प्रधानता देता है, तब एक सख्त समाज की अपरिचित होने होती है। बुद्धिजीवी का धर्म है सत्य धोना सत्य का आघात करना परंतु राजनितिक शक्ति के दमन के संशय उनको स्थिति ऐसी है कि सत्य के पक्षर-सत्य कह नहीं पाते उनकी अस्वतंत्रता ब्याख्या को दुष्यंतकुमार जगत्कारों के और जन पर हाया करते हैं। और अपने गजल में कहते हैं।

‘जब है सब को सब नहीं कहते नहीं वो./कुसो- कुसो- उपनिषद खोले हुए है।’<sup>7</sup>

आम आदमी बहुत कठिनतासे अपना जीवन बिताता है। वह यह सोचता है की जीवन कैसे जीए। घर से निकल तो ही सही समस्याओं का सामना उनको करना पड़ता है। निदा फजली अपनी गजल में कहते हैं-

‘घर से निकल तो हो सोचा भी किधर जाओगे/हर तरफ चीज हवाएँ हैं बिखर जाओगे

इतना आसो नही लफजो पे गरोसा करना/घर की बदलीज पुकारेगी गिहर जाओगे।"8  
दुष्पल कुमार ने दुष्काल या प्रेम की बातों को भया भौंटा देकर गजल के नए माध्यम को अपनाया है। दुष्पल का उद्देश्य स्वयं शब्दों को जान पहचान कर त्याग्य बनाना नहीं है जो देश में समुद्र परिवर्तन करने का जवाब देता है। जहाँ विस्मयितों के विस्फोट द्वारा खड़ा करके समुद्री वास्तव्य को बदल जानने का लिए वे प्रयत्नशील हैं। दुष्पलकुमार का मर्द है पीर, इस गजल में गिहरत है नहि-

"सिर्फं तगामा खडा करना मेरा मकसद नही, / मेरी कोशिश है कि ये सूखा बदल-ही नाहि।  
मेरे सीने में नदी तो तेरे सीने में सही / तो कही भी जाय लेकिन जाय नदनी नाहि।"9

इस प्रकार गिहरत फाजली और दुष्पलकुमार ने अपने गजलों में सामाजिक विषय प्रस्तुत किए हैं।

संदर्भ-सूची-

1. हिंदी नद्री कोश- स. आ. रामचंद्र वर्मा पृष्ठ 76
2. हिंदी साहित्य कोश भाग-1 पृष्ठ 216
3. कुल्लू के लहर दु. जी. जयें पृष्ठ -27
4. दुष्पलकुमार और उनका साहित्य दु. जी. हरचरण जयें पृ. 67
5. स्या में गद्य- पृ-58
6. जहाँ भी खर जायगा- गिहरत फाजली- पृष्ठ 32
7. स्या में गद्य- दुष्पलकुमार पृ 19
8. घर का निकल तो तो दु. गिहरत फाजली पृ. 62
9. स्या में गद्य तो मर्द है पीर-दुष्पलकुमार पृ. 30

डॉ. आदेश कोशरी, जगत सहायस नौमिक  
पारमेय विद्या अमरनगर  
हिंदी विभाग  
बी.बी.ए. 20108

**55. Covid-19 Prediction and Detection Using Deep Learning**

The International journal of analytical and experimental modal analysis

ISSN NO: 0886-936747

**Covid-19 Prediction and Detection Using Deep Learning**

Snehal Zarekar

JSPM's Imperial College of Engineering &  
Research, Wagholi, Pune.  
Department of Computer Engineering  
zarekarsr@gmail.com

Vinod Wadne

JSPM's Imperial College of Engineering &  
Research, Wagholi, Pune.  
Department of Computer Engineering  
Vinods1111@gmail.com

**ABSTRACT**

Recent Reverse Transcription – Polymerase Chain Reaction (RT-PCR) framework for the recognition of COVID-19 lacks behind because of restricted accessibility of test units and generally low sure indications in the beginning phases of the infection, encouraging the requirement for elective arrangements. To develop COVID-19 disease prediction tool based on Artificial Intelligence can be helped. In the proposed system CT images of X-rays are trained using Convolutional Neural Network techniques, which can help system to automatically predict the COVID-19 detection. The accuracy has proven to be higher than other techniques. Our proposed system can achieve nearby 93-94% of accuracy for detection of covid-19 on bases of X-ray.

**Keywords:** - COVID-19, CNN Architecture, Deep Learning, X-rays

**1. INTRODUCTION**

Coronavirus is a Severe Acute Respiratory Syndrome (SARS), initially found in the Wuhan district of China in December 2019. Since its origin it has quickly spread across all nations tainting right

around 44 million individuals worldwide and causing casualty of more than 1 million individuals. It is an exceptionally infectious illness the manifestations of which are portrayed by fever, windedness, hack and loss of smell. The hatching time of Covid-19 territories from 1 to 12.5 days with the middle being 5-6 days yet can take up to 14 days. As a result of a long hatching period, the contaminations spread out dramatically since individuals are ignorant of the way that they have gotten the sickness and unwittingly spread it. The identification of COVID-19 sickness is fundamentally critical and essential with the goal that those contaminated can get prompt therapy and care, just as be disengaged to lessen the spread of the illness. As indicated by WHO, it is obligatory that the patients be screened by Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) which can recognize SARS-CoV2 RNA from respiratory examples.

While RT-PCR has been the best quality level test since it is exceptionally explicit, it is tedious and the affectability is inconsistent, numerous reports proposing helpless affectability. Thus a needfulness for a fast screening technique arises that may help specialists to quickly emergency to be additionally allocated to be tried by RT-PCR. Chest radiographs are the most often utilized imaging

Volume XIV, Issue VII, July/2022

Page No : 1445

methodology in radiology. They are less expensive and more effectively accessible than Computed Tomography and Magnetic Resonance Imaging. Coronavirus uncovers some radiological mark that can be effortlessly recognized through chest radiographs. Aside from this, there are different benefits that could be utilized with respect to chest radiographs. Chest radiographs empower quick triaging of patients which should be possible in corresponding with viral testing to moderate the high number of tainted individuals in zones most influenced where the limit is overburdened by request. Alongside this chest radiographs can be taken in a secluded room subsequently decreasing the danger of compression of the infection. The programmed investigation and identification can be utilized with profound learning based methodologies. Convolutional Neural Networks basically have been effective because of their capacity to gain includes naturally from space explicit pictures dissimilar to old style AI calculations. Perhaps the most prevalently embraced techniques in the field of clinical imaging is move learning and to utilize information got from preparing models starting with one area applied over then onto the next. This technique is especially successful when the explained dataset is more modest.

Alongside normal starting ailment like fever and exhaustion, diverse instances re determined tainted with pneumonia and the anomalies have been seemed of their chest CT examination. Serious respiration torments, steady coronary heart damage and different Restricted accessibility of RT-PCR take a look at packs, time had to deal with the take a look at, low positive fees in starting levels and necessity of amazing human talent requests an imaginative method for discovery of COVID-19. In such an -

exceptional circumstance, the elective arrangements investigated should discover less expensive methodologies for perceiving, controlling and treating this overall pandemic. Besides, the recommended technique should assist specialists with altogether understanding the crucial reasons and progression of the sickness. Designing procedures, for example, picture preparing and inventive AI calculations can encourage the recognizable proof of milestone includes and happened injuries, subsequently empowering classification of the info test as an ordinary or infection influenced case. One of the techniques used for the evaluation of pneumonia is Computed Tomography (CT) pics of the chest. I even have proposed the usage of chest CT pics with CNN, U-Net, for detecting of the enter picture as everyday or COVID-19 encouraged cases.

## 2. LITERATURE SURVEY

Domenico Gaglione and Paolo Braca [1], Naive Bayes was been used for tracking an object and for prediction where they proposed strategy can gauge disease and recuperation parameters, and to follow and foresee the epidemiological bend with great precision when applied to genuine data from Lombardia region in Italy, and from the USA. O.S.Albahri, A.S.Albahri and N.A.Rashid [2], Artificial Intelligence (AI) strategies used withinside the detection and class of coronavirus sickness 2019 (COVID-19) clinical images. Their framework validated that the manner closer to comparing and benchmarking of AI grouping techniques which will be applied withinside the identity and backbone of COVID-19 scientific images.

Shuo Wang and Yao Lu[3] , Used the quantitative evaluation of imaging records the usage of synthetic intelligence (AI) and CT, positron



emanation tomography - CT (PET/CT), lung ultrasound, and appealing reverberation imaging (MRI) had been been applied for identification, treatment, and follow-up, which expressed that normal imaging attributes and their progressions can expect a widespread element withinside the detection and the control of COVID-19. Michael, J. Horry and Subrata Chakraborty [4], Data evaluation changed into accomplished on enter sensor values and Reviewed writing available on Covid-19, checking methods, and proposed an IoT primarily based totally design, which may be applied to restrict the spreading of Covid-19.e a few overall performance metrics given.

O.S.Albahri, A.S.Albahri and N.A.Rashid [5] , The gadget constructed from 5 essential segments: Symptom Data Collection and Uploading (utilising wearable sensors), Quarantine/Isolation Center, Data Analysis Center (that utilizations AI calculations), Health Physicians, and Cloud Infrastructure utilising SVM. Nadeem Ahmed and Wanli Xue [6] , Android apps had been been examined in order that next-technology app design, which could facilitate stepped forward tracing and protection performance. An define turned into directed for android programs created for Contact tracing over the world.

Ravi Pratap Singh and Mohd Javaid [7], They Explore, discuss, and highlight the overall applications of the well-proven IoT , Sources of info were taken from web journals and applicable reports and data set from information bases of Google Scholar, PubMed, and SCOPUS utilizing the watchwords "Web of things "or" IoT and Coronavirus".

### 3. IMPLEMENTATION DETAILS OF MODULE

AI and machine learning can be used to detect covid in this sytem. The x-ray scan images are considered under deep learning. There we categorized the results in two separate form i.e. covid +ve or covid -ve, which we will collect and apply algorithm (CNN: - Convolutional Neural Networks)

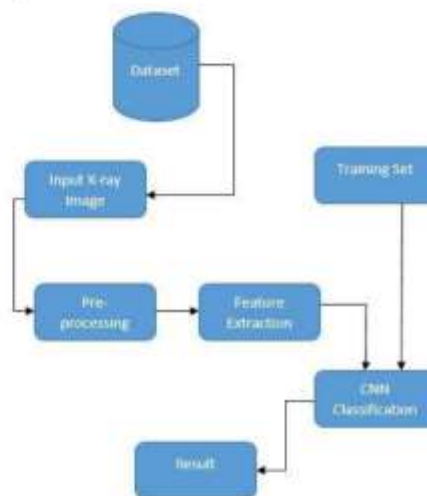


Fig: - System Architecture

Prepare a educated document to examine with similarly peoples data. Convolutional Neural Networks is a famous deep getting to know method for cutting-edge visible reputation tasks. There are 4 layered ideas in Convolutional Neural Networks:

1. ReLu,
2. Pooling and
3. Full Connectedness (Fully Connected Layer).

The input data features will be compared with the already trained image on the basis of closed match the result will be predicted. Once the input image is processed the system further predicts whether the patient is infected with COVID-19 or Not. I have designed a system using python as backend and HTML/CSS as front end, we have a webpage where we can upload an image and submit and system then process that image and output is predicted

**4. EXPERIMENTAL RESULTS AND DISCUSSION**

To carry out take a look at evaluation of the models, distinctive execution measurements like Accuracy, F1-Score, Sensitivity, Specificity, Precision, and Recall may be applied on this work. These evaluation measurements are in particular treasured at the same time as assessing a medical screening framework, that is the purpose picked for the errand of COVID19 forecast too. The following are a few overall performance.

$$\text{Precision} = \frac{TP}{(TP + FP)}$$

$$\text{Recall} = \frac{TN}{(TN + FN)}$$

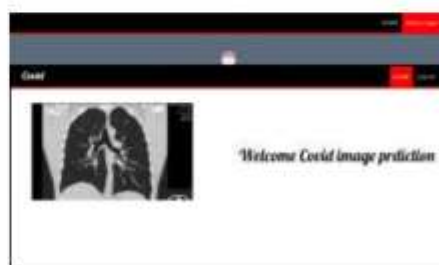
$$\text{F1 - Score} = \frac{2 * (Precision * Recall)}{(Precision + Recall)}$$

$$\text{Accuracy} = \frac{(TP + FN)}{(TP + TN + FP + FN)}$$

$$\text{Sensitivity} = \frac{TP}{(TP + FN)}$$

ultimately a solitary hub forecast layer with sigmoid initiation work. Following is the desk predicated for our frameworks getting ready and expectation time.

Model	Training Time(sec)	Prediction for one sample(sec)
InceptionV3	3505.996002	0.026050332
Resnet50	3499.539274	0.020517541
Dense Net	4480.50542	0.027824167



2.Admin\_Page



3.Step of picture selection



4. Final Result



## 5.CONCLUSION

In the efforts to fulfil the pressing necessity which has emerged to combat towards the COVID-19 pandemic, I even have devised an AI primarily based totally device for automated detection of the COVID-19 disease. The nice overall performance parameters accomplished in phrases of sensitivity, specificity and accuracy, for the enter samples from distinct sources, proves the robustness of the proposed set of rules. In the situations of availability of chest CT samples, the encouraged CNN structure proves a higher preference capable of paintings with little data. The flexibility of CNN to paintings with numerous picture sizes makes the set of rules scale invariant. A assessment of the proposed completely convolutional community towards brand new CNN's indicates that the proposed community outperforms in phrases of schooling samples, scalability, unique pixel locations, robustness and standard accuracy.

Every one of the fashions is done using Python3 Keras library, with TensorFlow as backend. Every fashions are assessed, in which in every break up 80% of the facts is stored for education purpose (teach data) and the relaxation for (checking out data). The Convolution and Pooling quantities of each one of the version is probably trailed through absolutely related layers, with ReLU actuation

## REFERENCES

- [1] Domenico Gaglione and Paolo Braca , "Adaptive Bayesian Learning and Forecasting of Epidemic Evolution Data Analysis of the COVID-19 Outbreak ", IEEE Access ,2020
- [2] O.S.Albahri , A.S.Albahri and N.A.Rashid , "Systematic Review of AI Techniques in the Detection Classification of COVID-19 ", Elsevier , 2020
- [3] Shuo Wang and Yao Lu , "The role of imaging in the detection and management of COVID-19: a review ",IEEE 2020
- [4] Michael. J. Horry and Subrata Chakraborty, "Role of IoT to avoid spreading of COVID-19", International Journal of Intelligent etworks,2020
- [5] Nadeem Ahmed and Wanli Xue , "A Survey of COVID-19 Contact Tracing Apps ",IEEE Access,2020
- [6] Ravi Pratap Singh and Mohd Javaid, "Internet of things (IoT) applications to fight against COVID-19 Pandemic ",2020
- [7] Zhao, X., Liu, L., Qi, S. et al. Agile convolutional neural network for pulmonary nodule classification using CT images. Int J CARS 13, 585–595 (2018). <https://doi.org/10.1007/s11548-017-1696-0>
- [8] Zheng C, Deng X, Fu Q, Zhou Q, Feng J, Ma H, Liu W, Wang X. Deep Learning-based Detection for COVID-19 from Chest CT using Weak Label. medRxiv. 2020 Jan 1.
- [9] Jiayan Ma and Jaideep Chakladar , "Using machine learning of clinical data to diagnose COVID-19: a systematic review and meta-analysis ",Research Article 2020
- [10] Sanjay Kumar and Sonali Agarwal, "COVID-19 Epidemic Analysis using Machine Learning and Deep Learning Algorithms ",Journal 2020
- [11] Domenico Gaglione and Paolo Braca , "Adaptive Bayesian Learning and Forecasting of Epidemic Evolution Data Analysis of the COVID-19 Outbreak ", IEEE Access ,2020
- [12] O.S.Albahri , A.S.Albahri and N.A.Rashid , "Systematic Review of AI Techniques in the Detection Classification of COVID-19 ", Elsevier , 2020
- [13] Shuo Wang and Yao Lu , "The role of imaging in the detection and management of COVID-19: a review ",IEEE 2020
- [14] Alzubaidi MA and Banihani R,"An IoT-based Framework for Early Identification and Monitoring of COVID-19 Cases ", Journal Pre-proof, 2020
- [15] Nadeem Ahmed and Wanli Xue , "A Survey of COVID-19 Contact Tracing Apps ",IEEE Access,2020
- [16] Ravi Pratap Singh and Mohd Javaid, "Internet of things (IoT) applications to fight against COVID-19 Pandemic ",2020
- [17] Krishna Kumar and Rachna Shah, "Role of IoT to avoid spreading of COVID-19", International Journal of Intelligent Networks, 2020
- [18] Gozes O, Frid-Adar M, Greenspan H, Browning PD, Zhang H, JiW, Bernheim A, Siegel E. Rapid ai development cycle for the coronavirus (covid-19) pandemic: Initial results for automated detection patient monitoring using deep learning et image analysis. arXiv preprint arXiv:2003.05037. 2020 Mar 10.
- [19] Barstugan M, Ozkaya U, Ozturk S. Coronavirus (COVID-19) Classification

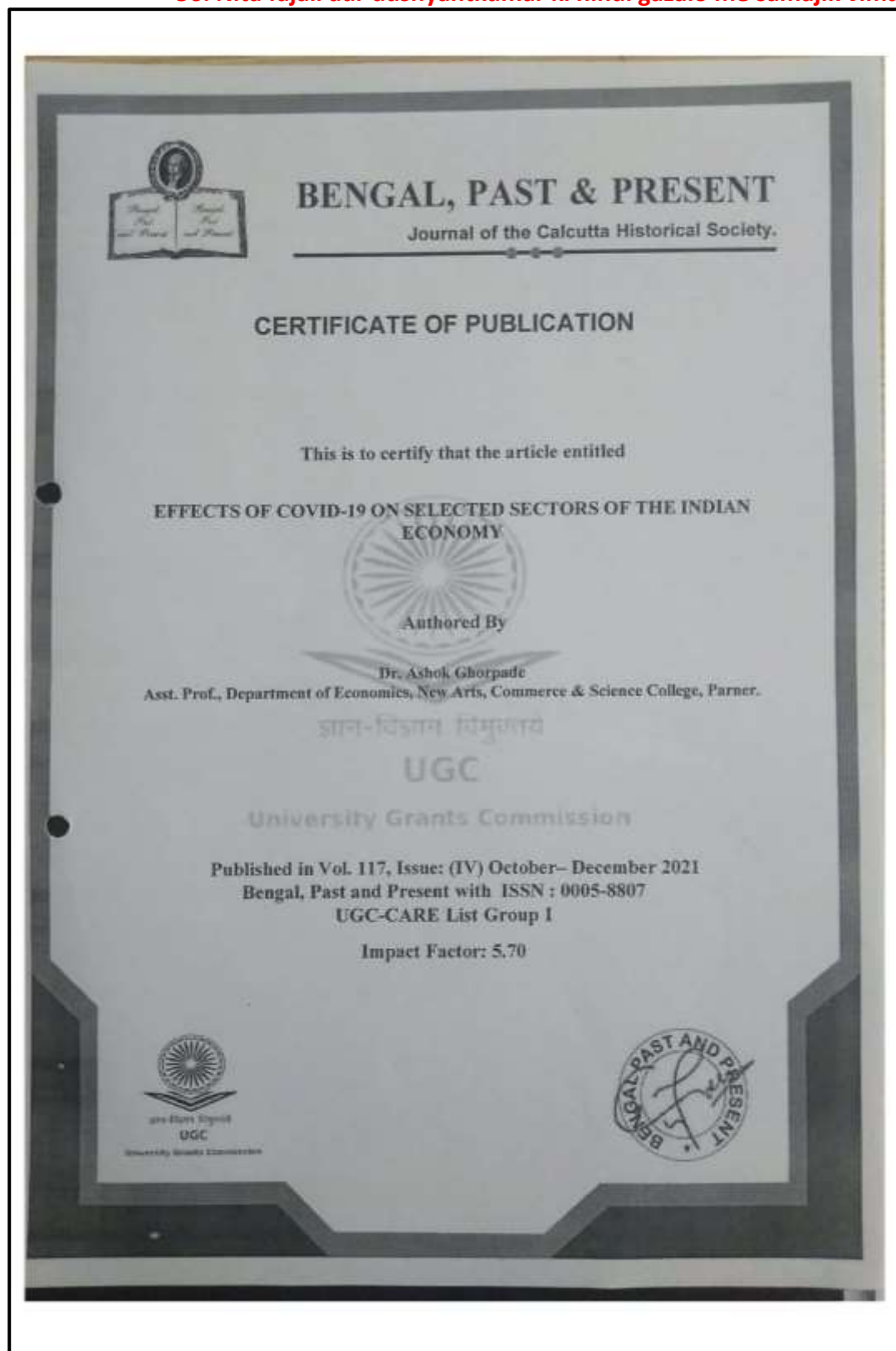
using CT Images by Machine Learning Methods.  
arXiv preprint arXiv:2003.09424.  
2020 Mar 20.

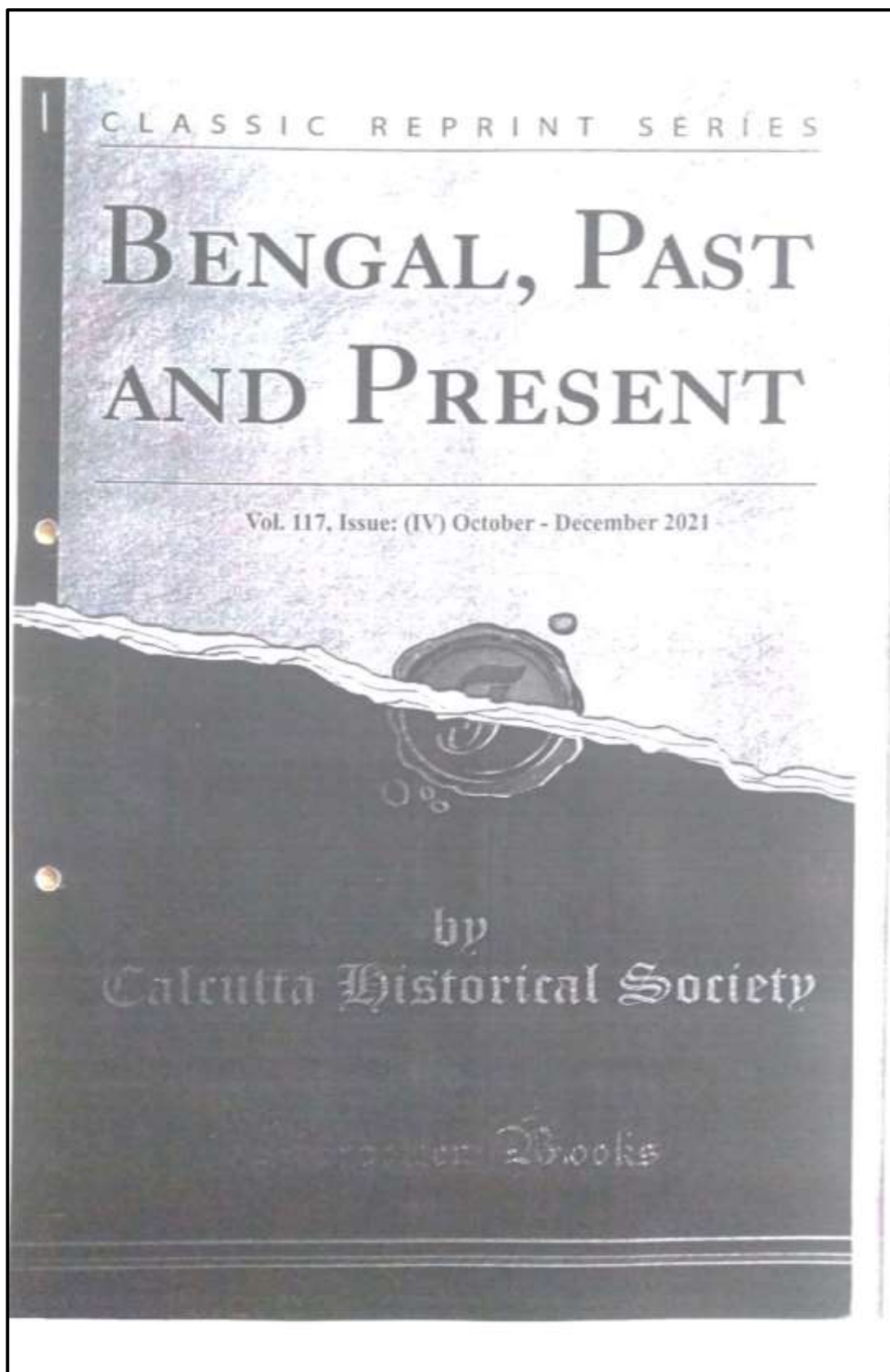
[20] Joseph Paul Cohen and Lan Dao, "COVID-19 Image Data Collection: Prospective Predictions Are the Future", Cornell University

[21] Ahmed Farid and hatem Awad, "A Novel Approach of CT Images Feature Analysis and Prediction to Screen for Corona Virus Disease (COVID-19)"

[22] Ashwin Rachha , " COVID-19 Chest X- RAY Detection : A Transfer Learning Approach ", International Research Journal of Engineering and Technology (IRJET), 2020.

## 56. Nita fajali aur dushyantkumar ki hindi gazalo me samajik vimarsh





## Contents

Sr. No.	Name of Topic	Page No.
1	A STUDY ON PROCESSED FOODS – A CONSUMER'S PERSPECTIVE	1-5
2	COMPARATIVE ANALYSIS OF WATER CONSUMPTION IN CO-OPERATIVE DRIP IRRIGATION AND FLOOD IRRIGATION SCHEMES: A CASE STUDY OF HALADI KT WEIR IN KARVEER TEHSIL OF KOLHAPUR DISTRICT	6-10
3	HARDINESS AND PSYCHOLOGICAL WELL – BEING AMONG COLLEGE STUDENTS	11-14
4	A STUDY OF SMARTPHONE ADDICTION AND LONELINESS AMONG COLLEGE STUDENTS	15-18
5	A STUDY ON THE IMPACT OF ONLINE CLASSROOM TRANSACTION UTILISING UDL GUIDELINES & 7E LEARNING CYCLE BASED LESSON PLANS, ON EXECUTIVE FUNCTION OF LOW ACHIEVERS AT RISK OF ACADEMIC FAILURE STUDYING IN PRIMARY AND MIDDLE SCHOOL LEVEL OF MAINSTREAM SCHOOL	19-29
6	IMPACT OF COVID 19 ON AMCHHOOR PRODUCTION OF AKKALKUWA TAHSIL IN NANDURBAR DISTRICT (MS) INDIA	30-33
7	A STUDY OF THE DIFFERENCE BETWEEN OBEDIENCE AND DISOBEDIENCE TENDENCY OF JUNIOR COLLEGE STUDENTS OF AMBEGAON TAHSIL	34-36
8	ANTHOLOGY AND OTT RELEASE: THE NEW NORMAL IN TAMIL CINEMA POST COVID-19	37-40
9	BONBIBI MYTH: ENVIRONMENTAL CONCERNS IN AMITAV GHOSH'S NARRATIVE	41-45
10	BUDDHIST STUPA: AN ALTERNATIVE WAY OF LIFE FROM SPIRITUAL UPLIFTMENT TO ECONOMIC STABILITY	46-51
11	THE STUDY OF THE IMPLEMENTATION OF TEACHING-LEARNING IN ONLINE EDUCATION DURING THE CORONA PERIOD	52-55
12	COVID 19 AND IMPACT ON LANDLESS AGRICULTURE WOMEN LABOUR WITH SPECIAL REFERENCE TO MOHOL BLOCK	56-62
13	COVID-19 INDIA'S LATER DISRUPTED ECONOMIC POLITICS	63-66
14	THE ROLE OF MEDIA FOR ADOLESCENTS DURING COVID-19 PANDEMIC	67-70
15	EFFECTS OF COVID-19 ON SELECTED SECTORS OF THE INDIAN ECONOMY	71-73
16	IMPACT OF COVID-19 ON WOMEN'S LIFE	74-76
17	ENVIRONMENT EDUCATION	77-81
18	CRITICAL STUDY OF THE USE OF DIGITAL MEDIA DURING THE COVID-19 PANDEMIC	82-90

Sca

Bengal, Past and Present

UGC Care Group 1 Journal  
ISSN : 0005-8807

## EFFECTS OF COVID-19 ON SELECTED SECTORS OF THE INDIAN ECONOMY

Dr. Ashok Ghorpade

Asst. Prof., Department of Economics, New Arts, Commerce & Science College, Parner.

### Abstract

Overall world is stopped due to continuous waves of Covid-19. It is one of the global epidemics. Firstly it was founded in China, later on it spreads in overall world. Near about 190 nations in overall world are under the dark shadow of Covid-19. World economy is passing through a very dangerous period. The economic and social disruption caused by the said pandemic. Millions of peoples are at risk. As far as the Indian economy is taken into account, it is completely collapsed. Industrial sector, Agro sector and Service sector were affected by the stroke of Covid-19. Number of nations has declared lockdown for establishing control on wide spread on Covid-19. Due to lockdown overall industrialization is stopped. Due to this industrial sector is collapsed, as a result of this retrenchment was made on industries. Peoples had lost their jobs. Trade was also stopped in pandemic situation. Only agro sector is working stumbling.

**Keywords:** Covid-19, World economy, Employment.

### Introduction

The disease, which started in China and is currently spreading around the world, has been dubbed covid-19. Before the outbreak began in December 2019, there was no record of a new corona virus or related outbreak in the world. It seems to be more or less widespread in all the countries of the world.

The whole world economy seems to be declining. Before covid-19, India's economic growth rate averaged 7.4 per cent, but due to covid-19, the country's economic growth mortality rate was minus 21.3 %. The country's growth rate is projected to be 2.4 % in FY 2021-22. The nationwide lockout has had a profound effect on all parts of the country.

### Objectives of Research

1. To study the effects of Covid-19 on India's economic development.
2. To study the effects of Covid-19 on the agricultural sector in the country
3. To study the effects of covid-19 on the industrial sector
4. To study unemployment in the country due to covid-19
5. To study the fiscal deficit in the country due to covid-19.

### Assumptions of Research.

1. Covid-19 has affected the agricultural sector
2. Covid-19 has led to an increase in unemployment in the country
3. Covid-19 has affected the industrial sector in the country

### Scope of Research

The scope of the research presented is very large and the global epidemic has crippled not only the Indian economy but also the entire global economy.

### Research Methodology:

A completely second instrument has been used for the present research in which information and statistics will be compiled on the basis of various dailies, magazines, websites and texts.

### Topic extension

The Covid-19 virus had taken people down all over the world. Also in India, it was locked down from March 24, 2020, due to the decision of the Government of India to lock down in the early days. The incidence of corona was reduced and the mortality rate was also reduced.

### Review of Literature:

Vol. 117, Issue: (IV) October – December 2021

71



## Bengal, Past and Present

UGC Care Group I Journal  
ISSN : 0005-8807

This is being recent issue; there are very few articles in newspaper, in books and other sources, I referred those articles.

### Effect of Covid-19 on Various Regions of India:

#### 1. Impact of Covid-19 on India's agricultural sector-

**Covid-19** Prior to this, the average economic growth rate of the agricultural sector in India was 3.3 per cent. According to estimates, the country's GDP in agriculture is projected to increase from 2% in FY19 to 4% in 2020. But the covid-19 layoffs have had a knock-on effect on the agricultural sector. Houses in demand for farmland, decline in exports, closure of transport system, closure of market committees, etc. caused many difficulties in the process of distribution of agricultural commodities. As a result, the economic condition of the farmers has become unfavorable. The Central Government has tried to provide some incentive grants to the farmers but it has not had a very favorable effect on the farming community.

#### 2. Effect of Covid-19 on India's unemployment sector-

According to CMIE, India's unemployment rate was 3.4 % in June 2017 before the strike. Before the strike, India's unemployment rate was 8.7 % in March 2020. This has resulted in stagnation of all industries, trades, etc. except hospitals, drug stores, food related services, etc. In terms of employment, there is a huge increase in unemployment in all sectors except agriculture. Unemployment seems to be on the rise in the unorganized sector in India. The loss of employment in many places such as builders, street vendors, vegetable sellers, peddlers, rickshaw pullers has led to starvation and poverty.

#### Effect of covid-19 on industry sector-

The worst effects of the Covid-19 epidemic have been felt deeper and more widely in the country's industrial sector. Prior to the layoffs, the country's industrial growth rate was 20.1 percent in January 2020. After April 2020, many industries suffered huge losses due to the closure of the industrial sector due to lockouts across the country. Many jobs have been lost due to the shutdown announced in the entire country. As the demand for goods in the economy declined, so did the income of the industry, and as a result, the workers in the industry were laid off.

The ban seems to have hit micro, small and medium enterprises the hardest. In short, the overall manufacturing output fell by 39.3 per cent, the construction sector by 50.3 per cent, trade, hotels, transport and messaging by 47 per cent.

#### Covid-19 the Impact on the Country's Fiscal Deficit

The central government's fiscal deficit swelled to 1.1 per cent of the target set in the fiscal year 2020-21 in November 2020. The fiscal deficit, which is the difference between government expenditure and government revenue, is Rs 10.75 lakh crore. It was observed to increase up to. Due to the Corona epidemic and the lockdown announced by the Raj, the government received less revenue than expected from the disruption in the finance and trade cycle. The government will have to increase its spending to get rid of the severe recession caused by the Corona Nineteen blockade, which will increase the country's fiscal deficit.

#### Conclusion

1. Covid-19 has affected all sectors of the country's economy but the impact on the agricultural sector is long lasting. Covid-19 has caused farmers to lose their standing crops. The farmers are facing financial difficulties due to various reasons such as labor problem, farm price problem, debt repayment problem, illness of family members.
2. Covid-19 has also adversely affected the industrial sector. Micro, small and medium enterprises seem to be hit hard financially. The industry sector is in financial crisis due to raw material problems, labor problems, transportation problems, overdue loan installments, declining production demand.
3. Covid-19 has led to a huge increase in unemployment in the country. About 85 to 90 per cent of jobs are in the unorganized sector, with many semi-skilled and skilled workers, such as handcarts, construction workers, street toy vendors and tea vendors, seen starvation and unemployment on the rise.
4. The crisis of fiscal deficit is likely to be exacerbated in the future as the government has to help the people by raising funds in various ways to strengthen the country's shaky economy and reverse the recession.
5. Inflation in the country has taken a turn for the worse due to various reasons such as the problem of raw materials, the problem of transportation, the problem of fuel. On the one hand, employment has been cut off and on the other hand, inflation has broken the backbone of the common man

Vol. 117, Issue: (IV) October – December 2021

72

## Bengal, Past and Present

UGC Care Group I Journal  
ISSN : 0005-8807

6. Although the Reserve Bank's reduction in interest rates has given some relief to the industry, various factors such as overdue loan installments, rising raw material prices, rising fuel costs, labor shortages have made industry management even more difficult.

**Recommendations:**

1. The government should give five kilos of wheat and five kilos of rice to the poor people for free for a few more months.
2. The government should deposit Rs.5000 per month in the account of the working class in the financial year 2021-22.
3. The government should curb inflation as the rising cost of food grains, the two thousand rupees increase in fuel prices in the financial year announced by the Reserve Bank, has crippled the economic math's of the general public.
4. RBI should not make any change in interest rates for the financial year 2001-22.
5. Meals and accommodation should be provided to unorganized workers at work.
6. Farmers should be provided interest free loans for financial 2021-22.
7. The government should provide tax relief to small and medium enterprises.
8. As long as there is an epidemic of covid-19 in the country, free clinics and medicines should be provided to the poor farmers, workers, artisans, laborers.
9. Foreign investors should be encouraged to invest in the country.
10. Guarantee prices of agricultural commodities to help reduce losses to farmers.
11. Small and medium enterprises should be given some more concessions to encourage them to increase production.

**Bibliography:**

1. [www.esakal.com](http://www.esakal.com) 5 January 2021
2. RBI (2020). Press release of meeting dated 27th March 2020. [rbidocs.rbi.org.in](http://rbidocs.rbi.org.in) Google Scholar
3. [www.orfonline.org/marathi/impact-of-covid-19-on-rural-lives-and-livebook-in-india-654101](http://www.orfonline.org/marathi/impact-of-covid-19-on-rural-lives-and-livebook-in-india-654101)
4. Dainik Loksatta, "antarrashtriya potatach rashtri sampadkiy lekh" dated on 6th May 2020
5. Dainik Loksatta, " Jag badle pan kase parimal"- by Maya Sudhakar dated on 7th May 2020
6. Dainik Sakal, "Udyog Bekar Kamgar"- Anant Bagayatday dated on 11th May 2020
7. Dainik Sakal, " Navya Samsyani Navy Sambodhi" - By Dr. Atul Deshpande dated on 14th May 2020
8. [www.financialexpress.com](http://www.financialexpress.com)- Amit Kumar
9. [www.indiatoday.in](http://www.indiatoday.in)
10. [www.timesofindia.com](http://www.timesofindia.com)
11. [www.bbc.com/marathi/international-52291688](http://www.bbc.com/marathi/international-52291688)
12. [www.aksharnama.com/client/article\\_detail/4243](http://www.aksharnama.com/client/article_detail/4243)
13. [www.wikipedia.org/wiki](http://www.wikipedia.org/wiki)
14. [www.hsph.harvard.edu/viswanathlab/fq/marathi](http://www.hsph.harvard.edu/viswanathlab/fq/marathi)

## 57. 1980 Nanterchya Sriyanche Kaviteche Samajshastriya Mulyamapan

MAH MUL/03051/2012 | *Vidyawarta*<sup>®</sup> | Oct. To Dec., 2021 | 01  
ISSN: 2319 9318 | Peer-Reviewed International Journal | Special Issue

रयत शिक्षण संस्थेचे,  
**एस.एम.जोशी कॉलेज, हडपसर, पुणे-२८.**  
नॅक-ए ग्रेड, संलग्न सावित्रीबाई फुले पुणे विद्यापीठ, पुणे

रयत शिक्षण संस्थेचे,  
एस. एम. जोशी कॉलेज, हडपसर, पुणे-२८.  
मराठी विभाग आयोजित  
आंतरराष्ट्रीय वेबिनार

**विषय:मराठीतील १९६०नंतरचे विविध वाङ्मयीन प्रवाह व सद्य:स्थिती**

आंतरविद्याशाखीय बहुभाषिक शोध पत्रिका  
Impact Factor 3.102 (IJIF)

**विद्यावार्ता**<sup>™</sup>

प्राचार्य डॉ. चंद्रकांत खिलारे

प्रमुख संपादक  
प्रा.डॉ.राजेंद्र ठाकरे  
प्रा.डॉ.अतुल चौर

सहाय्यक संपादक  
प्रा.डॉ.नम्रता मेखरी  
प्रा.डॉ.संदीप वाकडे

शनिवार दि.११ सप्टेंबर २०२१

❖ विद्यावार्ता या आंतरविद्याशाखीय बहुभाषिक त्रैमासिकात व्यक्त झालेल्या मतांशी मालक, प्रकाशक, मुद्रक, संपादक सहमत असतीलच असे नाही. न्यायक्षेत्र:बीड

“Printed by: Harshwardhan Publication Pvt.Ltd. Published by Ghodke Archana Rajendra & Printed & published at Harshwardhan Publication Pvt.Ltd.,At.Post. Limbaganesh Dist,Beed -431122 (Maharashtra) and Editor Dr. Gholap Babu Ganpat.

Reg.No.U74120 MH2013 PTC 251205

**Harshwardhan Publication Pvt.Ltd.**  
At.Post.Limbaganesh,Tq.Dist.Beed  
Pin-431126 (Maharashtra) Cell:07588057695,09850203295  
harshwardhanpubli@gmail.com, vidyawarta@gmail.com

All Types Educational & Reference Book Publisher & Distributors / [www.vidyawarta.com](http://www.vidyawarta.com)

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue 03

प्राचार्य डॉ. चंद्रकांत खिलारे  
संपादक मंडळ  
प्रमुख संपादक  
प्रा.डॉ.राजेंद्र ठाकरे  
प्रा.डॉ.अतुल चौर  
सहाय्यक संपादक  
प्रा. डॉ. नम्रता मेखी  
प्रा. डॉ. संदीप वाकडे

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)

MAH MUL/03051/2012  
ISSN: 2319 9318*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International JournalOct. To Dec., 2021  
Special Issue 06**INDEX**

01) इ.स. १९६० नंतरची ग्रामीण कविता व सद्यःस्थिती प्राचार्य डॉ. शिवलिंग मेनकुदळे, सातारा	14
02) साठोत्तरी दलित कादंबरीचे स्वरूप प्रा. डॉ. बाळासाहेब शेळके, जि. अहमदनगर	19
03) १९८० नंतरची मराठी आदिवासी कादंबरी : एक दृष्टिक्षेप डॉ.पांडुरंग भोसले & डॉ.सचिन सि.रुपनर, पुणे	27
04) १९८० नंतरच्या स्त्रियांच्या कवितेचे समाजशास्त्रीय मूल्यमापन डॉ. हरेश संपत शेळके, पारनेर	36
05) मराठीतील १९६० नंतरचे नाट्यप्रवाह, स्थित्यंतरे व सद्यःस्थिती डॉ. वर्षा दिगंबर गायकवाड, नागपूर	41
06) स्त्रीवाद : संकल्पना व स्वरूप डॉ. प्रमोद भीमराव गारोडे, जि अमरावती	48
07) मराठी ग्रामीण साहित्य प्रवाह व सद्यःस्थिती प्रा.पवार राजकुमार श्रीधर, मंगळवेढा	52
08) ग्रामीण साहित्य प्रवाह डॉ. प्रीती किशोर उमाठे, नागपुर	55
09) मराठीतील १९६० नंतरचे विविध वाङ्मयीन प्रवाह व सद्यःस्थिती — दलित साहित्य प्रा. नाना त्र्यंबक घुगे, नाशिक	59
10) मराठीतील १९६० नंतरचा कथा वाङ्मय प्रवाह व सद्यःस्थिती प्रा.माधुरी हरिभाऊ गवळी, नाशिक	63
11) ऐसे कुणबी भूपालःजमिनदारंच्या कौटुंबिक संघर्षाची गाथा! प्रा. डॉ. सूर्यकांत अ. आजगांवकर, माडुंगा	72
12) मराठी लोकवाङ्मयातील तमाशाची सद्यः स्थिती प्रा.डॉ.राजीव वैजनाथराव यशवंते, जि.परभणी	77

**विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IIJIF)**

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue 036

दिशा आणि दर्शन”, स्वरूप प्रकाशन, औरंगाबाद,  
२०१२, पृ.क्र. १३.

२. रेंगटे, तुकाराम, “आदिवासी साहित्य :  
चिंतन आणि चिकित्सा”, दिलीपराज प्रकाशन, पुणे,  
२०१४, पृ.क्र. ७४.

३. दळवी, शरद, “एकलव्य”, मेहता  
पब्लिकेशन हाऊस, पुणे, पुनर्मुद्रण, २००८, मलपृष्ठ.

४. जामकर, मधु, “संवाद—आस्वाद”, परम  
मित्र पब्लिकेशन, ठाणे, २०१०, पृ.क्र. ६४.

५. देवी, महाश्वेता, “अरण्येर अधिकार”,  
ऊर्जा प्रकाशन, पुणे, २०१०, पृ.क्र. २४.

६. काळे, अक्षयकुमार, “तीरकमठा”, दै.  
महाविदर्भ, चंद्रपूर, दि. २९.११.१९९९, पृ.क्र. ०४.

७. लिंबाळे, शरणकुमार (संपा.), “मराठी  
वाङ्मयातील नवीन प्रवाह”, मधुराज पब्लिकेशन्स  
प्रा. लि. पुणे, १९९३, पृ.क्र. १५२.

□□□

04

## १९८० नंतरच्या स्त्रियांच्या कवितेचे समाजशास्त्रीय मूल्यमापन

डॉ. हरीश संपत शेळके

मराठी विभागप्रमुख,

न्यू आर्ट्स कॉमर्स अँड सायन्स कॉलेज, पारनेर

\*\*\*\*\*

१९८० नंतर साहित्य कलांच्या क्षेत्रात नवी निर्मिती होत होती त्याचप्रमाणे नव्या चळवळीचाही उदय होत होता. काही चळवळी उदयालाही आल्या होत्या. दलित, अंबेडकरी, ख्रिस्ती, मुस्लीम, आदिवासी, ग्रामीण, विद्रोही, समरसता, सत्यशोधक, समता अशी साहित्य संमेलनेही भरू लागली. १९७० पासून ग्रामीण जीवनातले प्रश्नही उग्र होत गेले. शेतीची आणि शेतकऱ्यांची स्थिती दारूण होत गेली. या संपूर्ण कालखंडात संबंध देशात आत्यंतिक अस्वस्थता, प्रक्षोभ, अशांतता निर्माण झालेली दिसून येते. हे सर्व एकीकडे घडत असतानाच संयुक्त राष्ट्रांनी (युनोने) १९७५ ते १९८५ हे स्त्रियांचे दशक म्हणून जाहीर केले. त्याचा महाराष्ट्रातील स्त्री-चळवळीला भक्कम आधार मिळाला. महाराष्ट्रात स्त्री-चळवळ आकारास येऊ लागली. १९७५ मध्येच पुण्यात पहिली स्त्रीमुक्ती परिषद भरली. त्यामध्ये मध्यमवर्गीय स्त्रियांप्रमाणेच श्रमिक आणि ग्रामीण स्त्रियांचा मोठा सहभाग होता. १९७७ पासून निपाणी परिसरात तंबाखू उद्योगातील स्त्रियांची संघटना बांधण्याचे काम सुरू झाले. १९८१ मध्ये मुंबईच्या श्रीमती ना. दा. ठाकरसी महिला विद्यापीठात स्त्री-विषयक अभ्यासाची पहिली राष्ट्रीय परिषद भरली. १९८६ मध्ये चांदवड येथे शेतकरी संघटनेने स्त्रियांचा

विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IIJIF)

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

037

मेळावा घेतला. त्यात १५००० स्त्रिया सहभागी झाल्या होत्या. स्त्रियांच्या प्रश्नांवर विचारविनिमय व्हावा या हेतूने बायजा, महिला आंदोलन पत्रिका, ललकारी, बाई, स्त्रीउवाच, मिळून साऱ्याजणी अशी नियतकालिके सुरू झाली. त्याचप्रमाणे स्त्री-प्रश्नांची चिकित्सा करणारी पुस्तके प्रकाशित होऊ लागली.

१९८० नंतरच्या कवयित्रींच्या कवितेचे समाजशास्त्रीय आकलन करताना १९८० नंतरच्या दशकात जे सामाजिक, सांस्कृतिक राजकीय व आर्थिक बदल वेगाने घडत होते त्याकडेही लक्ष देणे गरजेचे वाटते. कारण आजच्या विज्ञान-तंत्रज्ञानाच्या युगात बुद्धीचा आविष्कार झाला. परंतु विज्ञान-तंत्रज्ञान हे मानवाला मुक्त करणारे साधन दमनाचे, शोषणाचे साधन बनत चालले आहे की काय अशीही शंका उभी राहताना दिसते आहे. दिवसेंदिवस शहरांची वाढ होऊन मनुष्य नैसर्गिक पर्यावरणापासून दूर होत चाललेला दिसून येतो आहे, आधुनिक यंत्र-तंत्रांनी जगण्याची स्वाभाविक लय लोप पावत चालली आहे, सेंद्रिय एकात्मता असलेले समाज कोलमडत चाललेले दिसून येताहेत, व्यक्ती मुक्त, स्वतंत्र झाली असा नुसता आभास होतो आहेण उत्पादन प्रक्रियेत मानवाचे अमानवीकरण, परात्मीकरण होताना दिसते आहे, वास्तवाच्या विघटनाची जाणीव तीव्र होत चाललेली दिसून येते. या सर्व पार्श्वभूमीवर कवयित्रींची कविता नेमकं काय भाष्य करते ते आपण पाहू.

१९८० नंतरच्या बदलत्या पर्यावरणाविषयी कवयित्रींची कविता काय भाष्य करते हे पाहण्याअगोदर समाजशास्त्रीय आकलन म्हणजे नेमकं काय ते पाहू, येथे समाजशास्त्रीय आकलन असे म्हणताना साहित्याचे समाजशास्त्र आणि समाजशास्त्रीय समीक्षा या दोन अंगांनी प्रामुख्याने विचार केला आहे.

कोणत्याही साहित्याचा कर्ता हा स्वतःच्या समाजाचा एक घटक असतो. त्या समाजानेच तो घडविलेला असतो, समाजाचा इतिहास, आशाआकांक्षा, नीतिमूल्ये, सौंदर्यकल्पना, किंबहुना त्या समाजाची संबंध संस्कृतीच ज्यात विणली गेली आहे अशी त्या समाजाची भाषा तो वापरतो आणि साहित्य निर्माण करताना त्याच्या दृष्टीसमोर वाचक असतो तोही समकालीन स्वभाषिकच, साहजिकच त्याचे साहित्य त्याच्या समाजाशी एवढे निगडीत असते, की ते समजून घेण्याकरिता तो समाजच समजून घ्यावा लागतो. समाजात होणारे परिवर्तन, साहित्यनिर्मितीशी असलेल्या नात्याचा शोध घेणे हे साहित्याच्या समाजशास्त्राचे कार्य होय. हा शोध घेत असता साहित्याचे समाजशास्त्र सर्व प्रकारचे व प्रतीचे साहित्य विचारात घेत असते. साहित्य हा या शास्त्राच्या अभ्यासाचा विषय नसून समाज हा असतो.

१९ व्या शतकाच्या उत्तरार्धात समाजशास्त्र या ज्ञानशाखेचा पाश्चात्य जगात उदय झाल्यानंतर साहित्याच्या अभ्यासकांनी एक संबंधीत क्षेत्र म्हणून समाजशास्त्रीय संकल्पनांच्या आधारे साहित्याचा विचार करण्यास सुरुवात केली. यामधून समाजशास्त्रीय समीक्षा हा समीक्षाप्रकार रूढ झाला. समाजशास्त्रीय समीक्षेच्या दोन ठळक पद्धती इतिहासक्रमात दाखविता येतात. ज्या सामाजिक परिस्थितीत साहित्य निर्माण होते, त्या परिस्थितीपासून सुरुवात करून साहित्यकृतीत त्या परिस्थितीचे प्रतिबिंब कसे उमटले आहे, किंवा साहित्यकृतीत त्या परिस्थितीचे वळीभवन कसे झाले आहे ते दाखवून त्याद्वारे साहित्य आणि समाज यांचा संबंध जोडणे ही एक पद्धत (तेनप्रणीत पद्धती व मार्क्सवादी समीक्षा यांमध्ये ही पद्धती पाहता येते.) तर साहित्यिक संहिता हाच मुख्य आधार मानून साहित्यिक संरचना आणि सामाजिक संरचना यांच्या समांतरपणातून

**विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**

MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

038

साहित्य व समाज यांच्यातील संबंध स्पष्ट करणे ही दुसरी पद्धत होय.

समाजशास्त्रीय आकलन म्हणजे काय हे पाहिल्यानंतर आता आपण एकूणच १९८० नंतरची कवयित्रींची कविता स्त्रियांच्या शोषणाबद्दल काय भूमिका मांडते ते पाहूया.

स्त्रियांच्या शोषणाचे बहुस्तरीय पदर व कवयित्रींच्या कवितेतून व्यक्त झालेले दिसून येतात. हे शोषण जसे सामाजिक, सांस्कृतिक, राजकीय, आर्थिक पातळीवर झालेले आहे तसेच ते कुटुंब, नोकरीचे ठिकाण, लैंगिकता, हिंसा, संस्कृती, राज्य अशा सर्व पातळ्यांवर मोठ्या प्रमाणात होताना दिसून येते. या सर्व पातळ्यांवर होण्याच्या शोषणाचे अनेक पदर १९८० नंतरच्या स्त्रियांच्या कवितेतून व्यक्त झालेले दिसून येतात.

या काळातील विशेष कविता प्रभा गणोरकर, रजनी परुळेकर, सुलभा हेल्लेकर, अनुराधा पाटील, वासंती मुद्दमदार, उषा मेहता, मल्लिका अमरशेख, सुरेखा भगत, प्रज्ञा पवार, नीरजा, कविता महाजन, आसावरी काकडे, अरुणा ढेंरे, आश्विनी धोंगडे, सुनंदा भोसेकर, संजोवनी खोजे, विदुला रमाबाई, उषा किरण अत्राम, ज्ञानदा, अंजली कुलकर्णी, हिरा बनसोडे, ज्योती लंजेवार, सिसिलिया काव्हार्लो, मीनाक्षी पाटील अशा अनेकांची आहे.

स्त्री काव्यात घर—अंगण, वात्सल्याच्या प्रतिमा, निसर्गावरही वात्सल्य दृष्टीचा आरोप, हळवा आविष्कार असेच असते असा जो समज होता तो या काळातील कवितेने दूर केला. एका बाजूला ती अधिक अंतर्मुख झाली आणि दुसऱ्या बाजूला बाहेरच्या धगधगत्या वास्तवाला सामोरी गेली. एखाद्या प्रभा गणोरकरच्या कवितेत खिन्न—विमनस्क सूर आले, तर रजनी परुळेकर

यांच्या कवितेत एकाकीपणाचे कडू घोट कवितेतील सौमिश्च प्रतिमेत व्यक्त झाले. अनेक वर्षे परंपरेच्या दडपणामुळे स्त्री रतिप्रेरणेचा संदर्भ देणेही अनौचित्याचे मानीत होती. पण या नव्या काळात स्त्रीवादाचे स्त्रीच्या रतिप्रेरणेच्या नियमनाचा जो विरोध केला त्यातून ते नियमन नाकारणे आले. कधी भूमिका घेऊन तर कधी नितळपणेही स्त्रीच्या देहनिष्ठ अनुभवांचा आविष्कार होऊ लागला. प्रज्ञा पवारांच्या कवितेत तो दिसतो. स्त्रियांनी लिहिलेल्या कथा—कादंबऱ्यांतही असे अनुभव दिसू लागले.

स्त्रियांचे शारीरिक आणि मानसिक पातळीवर झालेले शोषण कवितेतून अतिशय उत्कटपणे व्यक्त झालेले दिसून येते. सतरच्या दशकात लिहिणाऱ्या आणि पुढे ऐंशीच्या दशकावर आपला ठसा उमटवणाऱ्या या कवयित्री आता स्वतःविषयी बोलू लागल्या. स्वतःच्या वेदनेविषयी कोंडमाऱ्याविषयी बोलता बोलता त्या समाजातील सान्या स्त्रियांच्या वेदनेला वाट मोकळी करून देऊ लागल्या.

नकाराची किंमत गळा दाबून वमूल होण्याची शक्यता नाही असं नाही  
रात्र रात्र पापणीवर पापणी मिटत नाही  
आपलं माणूसही आता होऊन जातं परकं  
(उषा मेहता)

असं म्हणतं वर्षानुवर्षे होणाऱ्या स्त्रीच्या घुसमटीला वाचा फोडू लागल्या. चौकटीत आरवून दिलेलं आयुष्य आपण समजतो तेवढं सुरक्षित नसतं याची जाणीव होतानाच आपल्याला हवं तसं आयुष्य जगण्यासाठी वाळवंट तुडवत जायला लागेल हेही सत्य कवयित्री स्वीकारताना दिसून येतात.

आपण समजत असतो  
चौकटीत आपण ठाम सुरक्षित

**विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**



MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

039

पायघोळ झग्याच्या आत दडवतो  
विरुप जखमा  
रेतीवरील नक्षी विस्कटणाऱ्या  
उद्दाम वाऱ्याला अडवताना  
(सुमती लाडे)

समाजात स्वतःची ओळख मिळवू पाहणाऱ्या  
बाईला अजून स्वतःच्या घरात ओळख मिळालेली  
नाही हे सत्य या आजच्या स्त्रीला अस्वस्थ करत ऐंशी  
नंतरच्या कविता लिहिणाऱ्या आणि नव्योदतरी कवितेवर  
आपला ठसा उमटवणाऱ्या या कवयित्रींना आता स्वतःचा  
चेहरा मिळाला आहे. आज त्यांच्या कवितेतील स्त्री  
आत्मविश्वासाने म्हणते आहे—

तसा नाही होऊ शकत पुरुष आधार बाईचा  
बाईमध्ये असत एक निरंतर आकाश  
दुःखाला सामावून घेण्यासाठी  
ती सहज पेलू शकते  
कुंकवाशिवाय कुंकवाखालचं कपाळ  
तुडुंब भरलेलं सटबाईच्या लेखानी  
(नीरजा)

ही स्त्री आता मातृत्वाचं उदात्तीकरणही नाकारते  
आहे. 'माझं गर्भाशय मी कितव्यातरी झाडावर टांगून  
दिलेलं असं म्हणून मातृत्व या संकल्पनेशीच आपली  
नाळ तोडणारी मल्लिका अमरशेखांची कविता असो  
की, 'लग्नसंबंधानंतर स्त्रिया गाभण राहतात  
निसर्गक्रमानुसार' असं म्हणून स्त्रीच्या आई म्हणून  
असलेल्या प्रतिमेलाच छेद देत या समाजानं बाईला  
केवळ मूल प्रसवणारी मादी यापलीकडे कोणतंही  
स्थान दिलं नाही. या जळजळीत वास्तवावर नेमकं  
बोट ठेवणारी रजनी परुळेकरांची कविता बाईवर  
लादलेल्या या पारंपरिक भूमिकांतून तिला बाहेर  
काढण्याचा प्रयत्न करते आहे.

आज लिहिणाऱ्या या कवयित्रीचं महत्वाचं वैशिष्ट्य  
म्हणजे त्या वास्तवाला थेट भिडतात. आपल्याला  
आलेलं हे आत्मभान जपताचाचंवाईमध्ये असणाऱ्या  
अनेक शक्यतांविषयी, सामर्थ्यांविषयी त्या बोलतात.  
बाईनं उभी हयात सोसला




हिंस्र काळोखाचा थयथय जाच  
बाईनं निरंतर तडफडून साहिला  
वासनेच्या गळामिठीचा अपारकाच  
तरी हरपू दिली नाही बाईनं  
तिच्यातून वाहणारी अपार करुणा  
(प्रज्ञा लोखंडे)

प्रत्येक संभोगानंतर  
हरवलेला असतो पुरुष स्वतःतून  
बाई समजून घेते  
त्याच्या सत्त्वहीन अस्तित्वाची दुखरी वेदना  
आणि वाढत राहते स्वतः नवनव्या प्रवाहांना  
सामावून घेत आतल्या आत  
(नीरजा)

बाईतली करुणा, तिच्यातली सर्जकता,  
नवनिर्मितीची क्षमता ही बाईची बलस्थानं आहेत. हे  
स्त्रीला कळलं आहे आणि ती आज तिच्या कवितेतून  
ते मोकळेपणाने व्यक्त करते आहे. गेल्या काही वर्षांतील  
स्त्रियांच्या कवितेचा प्रवास पाहिला तर लक्षात येतं.  
की त्यांच्या कवितेला त्यांनी पुरुष या पारंपरिक चेंद्रेपासून  
बाजूला काढलं आहे. पुरुषांच्या कवितेसारखी कविता  
लिहिण्यापेक्षा त्या आता स्वतःच्या जगण्याची कविता  
लिहू लागल्यात. त्यामुळे त्यांच्या कवितेची आशयसूत्रे  
बदलली आहेत. बाईच्या पारंपरिक चित्राला छेद देताना  
त्यांच्या कवितेतील भाषाही बदलली आहे. प्रतिमासृष्टीत  
तर वैविध्य आलं आहेच पण कवितेच्या रूपबंधाचाही  
त्या विचार करू लागल्या आहेत.

**विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**

## 58. Gramin Sahitya Samelane: Swarup ani Udesh

MAH MUL/D3051/2012 ISSN: 2319 9318	<b>Vidyawarta®</b> Peer-Reviewed International Journal	Oct. To Dec., 2021 Special Issue	01
 <p>रयत शिक्षण संस्थेचे, <b>एस.एम.जोशी कॉलेज, हडपसर, पुणे-२८.</b> नॅक-ए ग्रेड, संलग्न सावित्रीबाई फुले पुणे विद्यापीठ, पुणे</p> <p>रयत शिक्षण संस्थेचे, एस. एम. जोशी कॉलेज, हडपसर, पुणे-२८. मराठी विभाग आयोजित आंतरराष्ट्रीय वेबिनार</p> <p><b>विषय:मराठीतील १९६०नंतरचे विविध वाङ्मयीन प्रवाह व सद्यःस्थिती</b></p>			
 <p>आंतरविद्याशाखीय बहुभाषिक शोध पत्रिका Impact Factor 3.102 (IJR)</p> <p><b>विद्यावार्ता™</b></p>			
<p>प्रमुख संपादक प्रा.डॉ.राजेंद्र ठाकरे प्रा.डॉ.अतुल चौर</p>		<p>सहाय्यक संपादक प्रा.डॉ.नम्रता मेखी प्रा.डॉ.संदीप वाकडे</p>	
<p>शनिवार दि.११ सप्टेंबर २०२१</p>			
<p>❖ विद्यावार्ता या आंतरविद्याशाखीय बहुभाषिक त्रैमासिकात व्यक्त झालेल्या मतांशी मालक, प्रकाशक, मुद्रक, संपादक सहमत असतीलच असे नाही. न्यायक्षेत्र:बीड</p>			
<p>Printed by: <b>Harshwardhan Publication Pvt.Ltd.</b> Published by <b>Ghodke Archana Rajendra</b> &amp; Printed &amp; published at Harshwardhan Publication Pvt.Ltd.,At.Post. Limbaganesh Dist,Beed -431122 (Maharashtra) and Editor <b>Dr. Gholap Babu Ganpat.</b></p>			
 <p>Reg.No.U74120 MH2013 PTC 251205</p> <p><b>Harshwardhan Publication Pvt.Ltd.</b> At Post.Limbaganesh,Tq Dist.Beed Pin-431126 (Maharashtra) Cell:07588057695,09850203295 harshwardhanpubli@gmail.com, vidyawarta@gmail.com</p> <p>All Types Educational &amp; Reference Book Publisher &amp; Distributors / <a href="http://www.vidyawarta.com">www.vidyawarta.com</a></p>			

**संपादकीय....**

त्यागमय जीवनाची अखंड गाथा म्हणजे कर्मवीर भाऊराव पाटील यांचे जीवन होय. सामाजिक समता प्रस्थापित करण्यासाठी रयत शिक्षण संस्थेच्या रूपाने त्यांनी प्रबोधनाची एक पाठशाला सुरु केली. प्रकाशाची आराधना करायला लावणाऱ्या कर्मवीरांनी बहुजन समाजाला सौंदर्यवेधी, भविष्यवेधी, सौंदर्यकुहराचे दालन खुले केले. अंधारयात्रिकाला उजेडाची वाट दाखविणाऱ्या कर्मवीरांना विनम्र अभिवादन!

एस.एम.जोशी कॉलेजने अल्पकाळात संख्यात्मक व गुणात्मकदृष्ट्या नेत्रदीपक प्रगती केली आहे. या महाविद्यालयातील मराठी विभाग हा उपक्रमशील आहे. मराठी विभागात पदवी-पदव्युत्तर वर्गापर्यंतचे शिक्षण दिले जाते. तसेच पीएच. डी. संशोधन केंद्र या वर्षापासून सुरु झाले आहे. मराठी भाषा, मराठी संस्कृती व साहित्याचे ज्ञान विद्यार्थ्यांना देण्यासाठी मराठी विभाग सक्षम आहे. मराठी विभागाने 'मराठीतील १९६० नंतरचे विविध वाङ्मयीन प्रवाह व सद्यःस्थिती' या विषयावर ११ सप्टेंबर २०२१ रोजी आंतरराष्ट्रीय वेबिनार आयोजित केले. उदंड प्रतिसाद लाभला. त्याचे प्रतिबिंब म्हणजे हा विद्यावार्ताचा अंक होय. या वेबिनारचे उद्घाटक हॉलंड, नेदरलँडचे कवी चित्रकार मा. भास्कर हाडे, अखिल भारतीय मराठी साहित्य संमेलनाचे माजी अध्यक्ष डॉ. श्रीपाल सबनीस, रयत शिक्षण संस्थेचे ऑडीटर प्राचार्य डॉ.शिवलिंग मेनकूदळे, डॉ. चिन्मय घैसास, डॉ. तुकाराम रेंगटे, डॉ. सुभाकर शेलार, डॉ. शैलेश त्रिभुवन, डॉ. संदीप सांगळे, तसेच समारोप समारंभाचे प्रमुख पाहुणे सावित्रीबाई फुले पुणे विद्यापीठाचे मराठी विभाग प्रमुख डॉ. प्रभाकर देसाई, अध्यक्ष प्राचार्य डॉ.पांडुरंग गायकवाड या सर्वांनी या वेबिनारमध्ये मोलाचे विचार व्यक्त केले. ज्या संशोधक अभ्यासकांनी या वेबिनारसाठी शोधनिबंध पाठविले. तसेच सहभागी सर्व प्राध्यापक व संशोधक विद्यार्थी यांनाही धन्यवाद देतो. आंतरराष्ट्रीय वेबिनार यशस्वी करण्यासाठी सर्वांनी सहकार्य केले. त्या सर्वांना धन्यवाद देतो.

महाविद्यालयात झालेले आंतरराष्ट्रीय वेबिनार ज्ञानवृद्धीसाठी महत्वपूर्ण ठरले. सांघिक शक्तीवर निष्ठा, कर्तृत्व आणि संयमीपणा यांचा सुरेख-संगम असणारे कुशल प्रशासक प्राचार्य डॉ.चंद्रकांत खिलारे यांच्या प्रोत्साहनामुळे हे वेबिनार आम्ही यशस्वी करू शकलो. उपप्राचार्य डॉ.संजय जडे, उपप्राचार्य डॉ. संजय जगताप, आय.क्यू.ए.सी.चे चेअरमन डॉ. किशोर काकडे, संपादक मंडळ, महाविद्यालयातील शिक्षक व शिक्षकेतर कर्मचारी या सर्वांच्या सहकार्यामुळे हे वेबिनार यशस्वी झाले. विद्यावार्ताचे संपादक डॉ. बापू घोलप सर यांनी मोलाचे सहकार्य केले. सर्वांचे पुन्हा मनस्वी आभार.

प्रा.डॉ.राजेंद्र ठाकरे  
प्रा.डॉ.अतुल चौरे

MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

06

## INDEX

01) इ.स. १९६० नंतरची ग्रामीण कविता व सद्यःस्थिती प्राचार्य डॉ. शिवलिंग मेनकुदळे, सातारा	14
02) साठोत्तरी दलित कादंबरीचे स्वरूप प्रा. डॉ. बाळासाहेब शेळके, जि. अहमदनगर	19
03) १९८० नंतरची मराठी आदिवासी कादंबरी : एक दृष्टिक्षेप डॉ.पांडुरंग भोसले & डॉ.सचिन सि.रुपनर, पुणे	27
04) १९८० नंतरच्या स्त्रियांच्या कवितेचे समाजशास्त्रीय मूल्यमापन डॉ. हरीश संपत शेळके, पारनेर	36
05) मराठीतील १९६० नंतरचे नाट्यप्रवाह, स्थित्यंतरे व सद्यःस्थिती डॉ. वर्षा दिगंबर गायकवाड, नागपूर	41
06) स्त्रीवाद : संकल्पना व स्वरूप डॉ. प्रमोद भीमराव गारोडे, जि अमरावती	48
07) मराठी ग्रामीण साहित्य प्रवाह व सद्यःस्थिती प्रा.पवार राजकुमार श्रीधर, मंगळवेढा	52
08) ग्रामीण साहित्य प्रवाह डॉ. प्रीती किशोर उमाटे, नागपूर	55
09) मराठीतील १९६० नंतरचे विविध वाङ्मयीन प्रवाह व सद्यःस्थिती — दलित साहित्य प्रा. नाना त्र्यंबक घुगे, नाशिक	59
10) मराठीतील १९६० नंतरचा कथा वाङ्मय प्रवाह व सद्यःस्थिती प्रा.माधुरी हरिभाऊ गवळी, नाशिक	63
11) ऐसे कुणबी भूपालःजमिनदारंच्या कौटुंबिक संघर्षाची गाथा! प्रा. डॉ. सूर्यकांत अ. आजगांवकर, मादुंगा	72
12) मराठी लोकवाङ्मयातील तमाशाची सद्यः स्थिती प्रा.डॉ.राजीव वैजनाथराव यशवंते, जि.परभणी	77

विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IIJIF)

MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

09

39) समकालीन स्त्रीवादी कथाकार— आशा बगे (दर्पण—टीर्षकधासंग्रह) डॉ. शीतल मारुती कोरडे, पुणे	200
40) भारतीय स्त्रीवादी साहित्याचे सांस्कृतिक अनुबंध डॉ. चांदोजी सोपान गायकवाड, ता.विक्रमगड	206
41) १९६० नंतरच्या मराठी साहित्यातील ग्रामीण स्त्री चित्रण डॉ. वैशाली शांताराम जाधव, नाशिक	214
42) मराठीतील १९६० नंतरचे दलित वाङ्मयानुसार प्रवाह व सद्यस्थिती कु. वैशाली रामचंद्र धापोडकर, चंद्रपूर	217
43) भटक्या विमुक्त जमातींच्या आत्मकथनाचा प्रवाह राजकुमार बबन शेलार, जि. पुणे	223
44) व—बळीचा: आशयाचे विविध आयाम विजय बालघरे, पुणे	226
45) जागतिकीकरण आणि आदिवासी मराठी साहित्य डॉ.कुंदा बाळासाहेब कवडे, जिल्हा अहमदनगर	231
46) ग्रामीण साहित्य संमेलने: स्वरूप आणि उद्देश डॉ. नंदकुमार भाऊसाहेब उदार, जि. अहमदनगर	235
47) कवी नारायण सुर्वे यांच्या सनद या काव्यसंग्रहातून व्यक्त होणाऱ्या जाणिवांचा अभ्यास प्रा. डॉ. लालबा दुमटकर, जि. अमरावती	242
48) गुन्हेगार जाती—जमातीचे वैचारिक लेखनाची सद्यस्थिती डॉ. एम. के. शिंदे, औरंगाबाद	246
49) साठोत्तरी मराठी—कवितेतील आई प्रा.डॉ. विजय रेवजे, सोलापूर	251
50) १९६० नंतरचे आदिवासी मराठी साहित्य प्रा. राजू शंकर शनवार, जि. ठाणे	253
51) साठोत्तरी मराठी वाङ्मय प्रवाह : प्रेरणा व प्रवृत्ती डॉ.संदीप महादेव उल्हाळकर, जि.पुणे	257

विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (ILIJF)

MAH MUL/03051/2012  
ISSN: 2319 9318Vidyawarta®  
Peer-Reviewed International JournalOct. To Dec., 2021  
Special Issue

0235

46

## ग्रामीण साहित्य संमेलने: स्वरूप आणि उद्देश

डॉ. नंदकुमार भाऊसाहेब उदार  
सहायक प्राध्यापक मराठी विभाग  
न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर,  
जि. अहमदनगर

इ. स. १९७५ नंतर ग्रामीण साहित्य चळवळ उदयाला आली. अनेक ग्रामीण लेखक लिहिते झाले. त्यांनी आपल्या लेखनामधून ग्रामवास्तव मांडले. र. वा. दिघे, श्री. म. माटे, ग. ल. ठोकळ, श्री. ना. पेंडसे, गो. नी. दांडेकर यांसारख्या साहित्यिकांनी ग्रामीण, कथा, कादंबरी लिहिल्या. स्वातंत्र्योत्तर काळात म्हणजे इ. स. १९५० ते इ. स. १९६० च्या दशकात ग्रामीण साहित्याची पहिली पिढी लेखन करू लागली. या काळात दिवाळी अंक व विविध नियतकालिकांमधून ग्रामीण साहित्याला स्थान मिळू लागले. इ. स. १९६० ते इ. स. १९७५ या कालखंडात ग्रामीण साहित्यिकांची दुसरी पिढी लिहू लागली. त्यांनी कथा, कादंबरी, कविता या साहित्यप्रकारात वेगवेगळे प्रयोग केले. इ. स. १९७५ नंतर महाराष्ट्रातील विविध जिल्हांतून तालुक्यांतून साप्ताहिकांच्या स्वरूपात जी स्थानिक वृत्तपत्रे निघत होती. त्यातून तिसरी पिढी ग्रामीण साहित्यनिर्मिती करू लागली. परंतु ह्या पिढीचे लेखन शहरातील नियतकालिकांत प्रसिद्ध होईनासे झाले. स्वातंत्र्योत्तर काळापासून ग्रामीण जीवनाचे चित्रण साहित्यातून होत असले तरी सुद्धा

या साहित्याची अखिल भारतीय मराठी साहित्य संमेलनाच्या व्यासपीठावर दखल घेतली नाही. ही पार्श्वभूमी लक्षात घेऊन डॉ. आनंद यादव यांनी इ. स. १९७५ मध्ये पुण्याच्या भारती विद्यापीठ, एरंडवणे येथील मोरे विद्यालयात पहिला ग्रामीण लेखकांचा मेळावा आयोजित केला. या स्वतंत्र मेळाव्याच्या व संमेलनाच्या आयोजनामागील नेमके कोणते प्रयोजन होते हे पाहणे आवश्यक आहे.

ग्रामीण साहित्यनिर्मितीच्या प्रारंभाचा शोध घ्यायचा झाल्यास या साहित्याची पाळेमुळे संत साहित्यात सापडतात. परंतु ग्रामीण समाजाचे दुःख, काव्य व लिखित साहित्य १९ व्या शतकात म. फुले यांच्या साहित्यातून प्रकट झालेल्या दिसतात. त्यानंतर इ. स. १९७५ पर्यंत ग्रामीण जीवनाचे चित्रण र. वा. दिघे, श्री. म. माटे, ग. ल. ठोकळ, श्री. ना. पेंडसे, गो. नी. दांडेकर, व्यंकटेश माडगूळकर, शंकर पाटील आदी साहित्यिकांनी केलेले आहे. अशा विपुल प्रमाणात ग्रामीण साहित्याची निर्मिती होऊनही या साहित्याची दखल अखिल भारतीय मराठी साहित्य संमेलनाच्या व्यासपीठावर घेतल्याचे दिसत नाही. यासंदर्भात डॉ. आनंद यादव म्हणतात, "मराठीतील ग्रामीण साहित्य म. फुले यांच्या शंभर वर्षापूर्वी लिहिलेल्या शेतक-याचा आसुड' इतके जुने असूनही व त्याचा प्रवाह १९२५ नंतर प्रभावी असूनही गेल्या शंभर वर्षांच्या (इ. स. १८८५ ते १९८०) महाराष्ट्रीय पातळीवरच्या कोणत्याही साहित्य संमेलनात ग्रामीण साहित्याच्या चर्चेला व्यासपीठ का मिळू नये?" असा प्रश्न डॉ. आनंद यादव उपस्थित करतात. डॉ. यादव पुढे म्हणतात, "इ. स. १९४० च्या आसपास र. वा. दिघे, श्री. म. माटे, ग. ल. ठोकळ यांच्यासारखे मातब्बर साहित्यिक ग्रामीण कथा-कादंबरी लिहू

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)

MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

0236

लागले आणि ग्रामीण साहित्याचे चित्र आणखी पालटत जाऊ लागले. त्यांची लोकप्रियता वाढत जाऊ लागली. इ. स. १९५० मध्ये 'बळी'सारखी उत्कृष्ट कादंबरी लिहिली गेली. या दशकात ग्रामीण साहित्याचा प्रवाह झपाटवने वाढत होता आणि दर्जेदार साहित्य निर्मिती करित होता. विशेषतः १९२५-३० च्या आसपास ग्रामीण साहित्य विशेष प्रमाणात का निर्माण होऊ लागले, या ग्रामीण साहित्याचा कल वास्तववादी साहित्याकडेच का आहे, ग्रामीण साहित्यात ग्रामीण जीवनाचे यथार्थ दर्शन घडते काय, ग्रामीण साहित्यातील जीवनावर व पात्रांवर मध्यमवर्गीय संकल्पनांचे आरोपण होते काय, ग्रामीण साहित्य आणि फडकेप्रणीत मनोरंजनवाद, ग्रामीण साहित्य आणि समाजसुधारणा, ग्रामीण साहित्य आणि गांधीवाद, ग्रामीण साहित्य आणि वास्तववाद, ग्रामीण साहित्याची भाषा, ग्रामीण साहित्य आणि पांढरपेशा मध्यमवर्ग, ग्रामीण साहित्यातील मराठी मन इ. अनेक प्रश्नांचे मोहोळ इ. स. १९२५ ते इ. स. १९५० मधील ग्रामीण साहित्य वाचताना जिजासू वाचकांच्या मनात निर्माण होते. तरीही या प्रश्नांची दखल या काळात संमेलनीय व्यासपीठावरून घेण्याची साधी आस्थाही कुणा संवेदनशील समीक्षकाला, विचारवंताला वाटली नाही."२ ग्रामीण जीवनाचे वास्तव चित्रण महात्मा फुले आपल्या साहित्यात करतात. त्यानंतर ग्रामीण जीवनाचे चित्रण साहित्यातून होऊ लागले ते याच काळात. या कालखंडात मध्यमवर्गीय व महानगरीय समाजजीवनाचे चित्रण साहित्यातून मोठव प्रमाणात होत असे कारण समाजजीवनाचे चित्रण करणारा लेखक हा मध्यमवर्गीयच होता, वाचकही मध्यमवर्गीयच होता. लेखक व वाचक यांचा व्यक्तिगत जीवनानुभव हा शहरी व मध्यमवर्गीय असल्यामुळे

ग्रामीण समाजाचे दुःख, ग्रामीण समस्या यांची माहिती असण्याचे काहीच कारण नव्हते. यासंदर्भात डॉ. आनंद यादव म्हणतात, "प्रस्थापितांकडे सांस्कृतिक व वाङ्मयीन स्वत्वाना अभाव असल्यामुळे ग्रामीण साहित्य खरे आपले साहित्य आहे, त्यात आपले आपल्या परिसरातील माणसांचे जीवन प्रतिबिंबित झाले आहे, याची जाणीवच त्यांच्यात निर्माण झालेली नसल्यामुळे ग्रामीण साहित्याला संमेलनातील व्यासपीठावर अजून नीट जागा मिळत नाही."३ या काळात ग्रामीण समाजाचे चित्रण करणारे जे साहित्य लिहिले गेले ते वरवरचे रंजनवादी स्वरुपाचे होते. परिणामी या साहित्याचा दर्जा मध्यमवर्गीय समाजाच्या दृष्टीने दुय्यमच होता. इ. स. १९७९ मध्ये न्या. रानडे यांनी साहित्य संमेलनाचा पाया घातला ते सुद्धा शहरी संस्कृतीमधील होते. परिणामी ग्रामीण साहित्याविषयी अखिल भारतीय मराठी साहित्य संमेलनाच्या व्यासपीठावर चर्चा होऊ शकली नाही. याचे कारण म्हणजे प्रस्थापितांचा ग्रामीण साहित्याकडे पाहण्याचा हीन दृष्टिकोन होय, त्यामुळे या काळात ग्रामीण साहित्याच्या वाटचला उपेक्षाच आली. यासंदर्भात डॉ. आनंद यादव म्हणतात, "इ. स. १९६० नंतरच्या काळात संमेलनातील रसिकांच्या रात्रीच्या मनोरंजनाची विदुषकी भूमिका ग्रामीण कथाकारांकडे दिली जात होती. सामाजिक, सांस्कृतिक, आणि ऐतिहासिक दूरदृष्टी नसलेले व्यंकटेश माडगूळकर, शंकर पाटील, द. मा. मिरसदार यांच्यासारखे कथाकारही तेवढ्यात धन्यता मानून खूश होतात."४ डॉ. आनंद यादव यांनी ज्या लेखकांचा उल्लेख केला ते शहरात सहणारे लेखक होते. त्यांनी जे ग्रामीण जीवन वरवर अनुभवले, पाहिले त्या आधारे त्यांनी ग्रामीण जीवनाचे चित्रण आपल्या

**विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (ILIJF)**

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

0237

साहित्यातून केले. त्यांचे लेखन विनोदी स्वरूपाचे होते. परिणामी ग्रामीण साहित्य दुय्यम दर्जाचे साहित्य आहे असा दृष्टिकोन प्रस्थापित लेखकांचा बळावला. परिणाम ग्रामीण साहित्यावर अखिल भारतीय मराठी साहित्य संमेलनाच्या व्यासपीठावर चर्चा झालीच नाही.

देशाला स्वातंत्र्य मिळाल्यानंतर ग्रामीण भागात शिक्षणाचा प्रसार झाला. त्यामुळे खेडवतील नवशिक्षित वर्गाने आपले ग्रामीण जीवनानुभव साहित्यातून व्यक्त केले. परंतु त्यांच्या साहित्याला समर्थ व्यासपीठ मिळू शकले नाही. यासंदर्भात डॉ. आनंद यादव म्हणतात, "देशाला स्वातंत्र्य मिळाले आणि इ. स. १९५० ते इ. स. १९६० च्या दशकात ग्रामीण साहित्याची एक उत्साही लाट आली. महाराष्ट्राच्या अनेक प्रदेशांतून व ग्रामीण विभागांतून निरनिराळे साहित्यिक ग्रामीण साहित्य निर्मिती करू लागले. ग्रामीण साहित्याशिवाय दिवाळी अंकाचे व मासिकांचे पान हलेनासे झाले. स्वातंत्र्योत्तर साहित्यिकांची ही पहिली पिढी होय. नंतर म्हणजे इ. स. १९६० ते १९७५ या काळात ग्रामीण साहित्यिकांची दुसरी तरुण पिढी आली. कथा—कादंबरीच्या प्रांतात तिने प्रयोग केले, नवी ग्रामीण कविता आकाराला येऊ लागली, ग्रामीण बोलींना साहित्य माध्यमात प्राधान्य मिळून साहित्याचे बहिरंग व अंतरंग पार पालटून गेले. इ. स. १९७५ नंतरच्या काळात महाराष्ट्राच्या अनेक जिल्हांतून तालुक्यांतून दैनिक साप्ताहिकांच्या स्वरूपात जिल्हापत्रे, स्थानिक पत्रे निघू लागली त्यातून तिसरी पिढी ग्रामीण साहित्यनिर्मिती करू लागली. आपल्या आसपासचे बदलते समाजजीवन, ग्रामीण सुधारणांतील नवे ताण रेखाटू लागली. नवनव्या जिल्हापत्रांमुळे, स्थानिक

पत्रांमुळे ह्या पिढीचे लेखन पुण्यामुंबईच्या सांस्कृतिक केंद्राकडे पूर्वीच्या रेटवने येईनासे झाले व आले तरी प्रसिद्ध होईनासे झाले. परिणामी ग्रामीण साहित्यिकांच्या तिसऱ्या पिढीचा धांगपत्ताही पुणे—मुंबईकरांना लागेना. या नव्या पिढीच्या ग्रामीण साहित्यिकांची सर्व महाराष्ट्रातील संख्या इ. स. १९८०-८२ मध्ये तीनशे साडेतीनशेच्या आसपास होती. स्वातंत्र्योत्तर तीस वर्षांतील प्रचंड उलथापालथीची ही फळे होती. हे दृश्य अपूर्व होते."५ स्वातंत्र्योत्तर कालखंडात म्हणजे इ. स. १९५० ते इ. स. १९६० या काळात ग्रामीण साहित्याची पहिली पिढी लेखन करू लागली. ही पिढी स्वातंत्र्यपूर्व काळात व स्वातंत्र्योत्तर काळातही ग्रामीण जीवनाचे चित्रण आपल्या साहित्यातून करत होती. ग्रामीण साहित्याची दुसरी पिढी इ. स. १९६० ते १९७५ या कालखंडात लेखन करू लागली. या पिढीचा जन्म स्वातंत्र्यपूर्व काळात झाला. मात्र प्रत्यक्ष लेखन स्वातंत्र्योत्तर काळात करू लागले याचे साहित्यात स्वातंत्र्यपूर्व व स्वातंत्र्योत्तर काळाचे संदर्भ येताना दिसतात. या लेखकांना आपल्या साहित्याच्या प्रसारासाठी व्यासपीठ मिळण्यास प्रतिकूलता निर्माण झाल्याचे दिसते. यासंदर्भात डॉ. आनंद यादव म्हणतात, "वास्तविक नियतकालिकांची, विविध ग्रंथप्रकाशनांची साहित्यप्रसारासाठी नितांत गरज असते, पण, आर्थिकदृष्ट्या दुबळ्या असलेल्या ग्रामीण विभागात आज तरी ते शक्य नाही, असे दिसते म्हणून छोटी छोटी संमेलनेच त्याची माध्यमे मानून, त्यातून वाङ्मयीन चर्चा, चिकित्सा होण्याची आवश्यकता आहे. ही संमेलनेच तूर्त तरी वाङ्मयीन चर्चेची, चिकित्सेची आणि त्यांच्या प्रसाराची साधने मानली पाहिजेत.६ तिसऱ्या पिढीतील ग्रामीण

**विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**



MAH MUL/D3051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

0238

लेखकांनी लिहिलेल्या साहित्याची दखल शहरातील नियतकालिकांनी न घेतल्यामुळे ग्रामीण लेखकांना व्यासपीठ मिळणे अवघड झाले. आर्थिकदृष्ट्या कमकुवत असलेल्या ग्रामीण लेखकांना स्वतंत्र नियतकालिक सुरु करणे शक्य नव्हते. परिणामी साहित्य संमेलनाचे व्यासपीठ त्यांच्यासाठी महत्त्वपूर्ण ठरले. म्हणजेच ग्रामीण साहित्याचे लेखन करणाऱ्या तीन पिढ्य निर्माण झाल्या. त्यांच्या साहित्याची दखल अखिल भारतीय मराठी साहित्य संमेलनांही घेतली नाहीच पण मुंबई-पुणे हे सांस्कृतिक केंद्र असलेल्या शहरातील नियतकालिकांनीही घेतली नाही. त्यामुळे आपल्या साहित्याची साहित्यव्यवहारात दखल घेतली जावी या हेतूने ग्रामीण साहित्य संमेलनाचे व्यासपीठ निर्माण झाले. या व्यासपीठावरून ग्रामीण साहित्याची सर्वांगीण चर्चा व्हावी हा ग्रामीण साहित्य संमेलनाच्या आयोजनामागील हेतू होता. ग्रामीण समाजातील सामान्य वर्गातील सुशिक्षित तरुण कोडीत सापडला होता. तो आपल्या मानसिक संघर्षाला साहित्यातून वाट मोकळी करून देत होता. त्याच्या घुसमटत्या मनाच्या अविष्कारातून जन्माला येणारे साहित्य समाजाला ग्रामीण पिढीचा दृष्टिकोन समजून देईल. त्यादृष्टीने समाजाचे मन हे साहित्य कमी-अधिक प्रमाणात संस्कारित करू शकेल आणि या तरुण पिढीच्या उमेदीच्या मनाचा योग्य दिशेने विकास साधेल, त्यांच्या अपेक्षांची पूर्ती करण्याचा प्रयत्न समाजाकडून काही प्रमाणात होईल. यासाठी त्याला साहित्यिक भान व एका वैचारिक व्यासपीठाची आवश्यकता होती. ही गरज लक्षात घेऊन डॉ. आनंद यादव यांनी पुण्याच्या भारती विद्यापीठ, एरंडवणे येथील मोरे विद्यालयात तरुण ग्रामीण लेखकांचा पहिला मेळावा आयोजित केला त्या

आयोजनाचा हेतू स्पष्ट करताना डॉ. आनंद यादव म्हणतात, "भारतीय स्वातंत्र्यानंतर गेल्या तीस वर्षांत महाराष्ट्राच्या ग्रामीण समाजात सर्वांगीण क्रांती होऊ शकली आहे. त्यामुळे या समाजात झालेल्या शिक्षणविषयक आस्था आणि जागृतीतून ग्रामीण लेखक पुढे आले आहेत. ते या समाजाची सांस्कृतिक घडण करू लागले आहेत. महाराष्ट्रातील बहुतेक महत्त्वाची नियतकालिके आणि प्रकाशनसंस्था मोठमोठव शहरांमध्येच आहेत. वाचकवर्गही शहरी आहे. त्यामुळे शहरी वाचकवर्गाला योग्य असेच वैचारिक, सामाजिक व ललितलेखन या नियतकालिकांतून प्रसिद्ध केले जाते. यांचा अंतिम परिणाम ग्रामीण समाजाचे प्रश्न विचार, जागृती, चळवळी, टीकालेखन व ललितलेखन यांच्याकडे दुर्लक्ष करण्यात होते. त्यामुळे नव्याने जागृत झालेल्या ग्रामीण लेखकाला आपले विचार व्यक्त करावयाला प्रश्न मांडावयाला व ललितलेखन प्रसिद्ध करावयाला अजूनही महाराष्ट्रात मुक्त व्यासपीठ मिळू शकलेले नाही. याशिवाय शहरामधील दुर्बल समाजाच्या व्यथा आणि आकांक्षा चित्रित करणारा एक नवा लेखकवर्गही पुढे येऊ लागला आहे. या नव्या लेखकवर्गालाही अशा व्यासपीठाची आज गरज भासत आहे. या सर्व अडचणी समजून घेण्यासाठी, त्यावर उपाय शोधण्यासाठी व योग्य तो न्याय मिळण्याच्या दृष्टीने प्रयत्न करण्यासाठी दिशा देण्यासाठी म्हणूनच या मेळाव्याची योजना केली गेली आहे." ७ नव्याने लिहू लागलेल्या ग्रामीण भागातील लेखकाला आपले विचार मांडायला ललित लेखन करण्यास तसेच त्यास प्रसिद्धी देण्यास व्यासपीठ उपलब्ध होत नव्हते. तसेच शहरातील शोषित व दुर्बल घटकांच्या जीवनाचे चित्रण करणारा जो लेखक होता त्यालाही

**विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**

MAH MUL/D3051/2012  
ISSN: 2319 9318Vidyawarta®  
Peer-Reviewed International JournalOct. To Dec., 2021  
Special Issue

0239

व्यासपीठाची आवश्यकता भासत होती. या गरजेतूनच डॉ. आनंद यादवांनी ग्रामीण साहित्य संमेलनाचे व्यासपीठ उपलब्ध केल्याचे त्यांच्या भूमिकेवरून दिसून येते. यासंदर्भात डॉ. राजन गवस म्हणतात, "ग्रामीण भागात नव्याने लिहू पाहणारी शंभरावर पोरं पोरी संमेलनात हजेरी लावत होती. काही ठिकाणी तर नव्याने लिहू पाहणारे नवोदित हेच संमेलनाचे रसिक, अशी अवस्था असते. खेड्यात जगणार्या लिहू पाहणार्या या नवोदितांना मार्गदर्शनाची गरज असते. मार्गदर्शनाचे लेखक घडवता येत नाही. हे खरे असले तरी जाणीव प्रगल्भ करण्यास मार्गदर्शनाची मदत होते. त्यांच्यासमोर त्यांची देशी, अस्सल परंपरा मांडून परंपरेचे भान निर्माण करणे अशा संमेलनातून शक्य होते. त्यामुळे वाङ्मयाकडे गंभीर भूमिकेने बळणारा लेखकवर्ग तयार होऊ शकला असता." ८ खेड्यात राहणार्या व नव्याने लिहिणार्या नवोदित लेखकाला योग्य मार्गदर्शन मिळावे, लेखन दृष्टी प्रगल्भ व्हावी, वाङ्मयाकडे पाहण्याची दृष्टी विकसीत व्हावी, नवोदित लेखकांचे साहित्यलेखनाकडे गांभीर्याने पाहावे या भूमिकेतून ग्रामीण साहित्याचे आयोजन केल्याचे दिसते. यासंदर्भात नामदेवरव देसाई म्हणतात, "ग्रामीण भागात या चळवळीच्या स्थापनेने आनंद झाला. ग्रामीण भागातील नवोदित लेखकांच्या आशा आकांक्षा पल्लवित झाल्या. ग्रामीण भागातील तरुणाला मार्गदर्शन करणारे एक हक्काचे व्यासपीठ निर्माण झाले होते. ग्रामीण भागातील नवोदित साहित्यिकांच्या साहित्याला एक दिशा मिळणार होती. ग्रामीण भागातील साहित्यिकांना प्रकाशनासाठी व्यासपीठ मिळणार होते. म्हणून ग्रामीण भागातील नवोदित साहित्यिकांनी या चळवळीला उदंड पाठीबा दिला.

"९ ग्रामीण भागातील नवोदित लेखकाला त्याच्या साहित्याच्या प्रसिद्धीसाठी वाङ्मयीन चर्चेसाठी एका व्यासपीठाची आवश्यकता होती. ते व्यासपीठ ग्रामीण साहित्य संमेलनामुळे खेड्यात उपलब्ध झाले त्यामुळे ग्रामीण नवोदितांनी लिहिलेल्या साहित्याला योग्य दिशा मिळणार होती. त्यामुळे साहजिकच या ग्रामीण साहित्य संमेलनाचे ग्रामीण भागात स्वागत झाले.

राज्यात व राष्ट्रीय पातळीवर सर्वच क्षेत्रात मोठय प्रमाणावर वैचारिक मतभेद निर्माण झाले आहेत. ते संमेलनासारख्या व्यासपीठांवरून दूर होऊ शकतात असा आशावाद डॉ. आनंद यादव व्यक्त करतात. ते म्हणतात, "मराठी समाजाच्या नव्हे, तर सर्व भारतीय समाजाच्या विविध क्षेत्रांत आज अनेक कारणांनी फुटीरता निर्माण झालेली आहे. ही फुटीरता जीवनाच्या सर्वच पातळ्यांवर आपणांस विनाशाकडे नेत आहे. प्रथमच स्वतंत्र झालेल्या आपल्या देशाला आणि लोकशाहीवादी समाजाला पुन्हा छिन्नविच्छिन्न करू पाहत आहे. अशा वेळी सामाजिक आणि सांस्कृतिक जीवनात समताधिष्ठित एकात्मतेने बळ धरणे, पुन्हा आपली तुटणारी मुळे रुजवणे आवश्यक असते. ती रुजवण या संमेलनाच्या निमित्ताने मराठी सांस्कृतिक जीवनात पुन्हा होत आहे. म्हणून हे संयुक्त व्यासपीठाचे साहित्य संमेलन उद्याच्या सुजाण मराठी जीवनासाठी महत्त्वाचे ठरणार आहे." १० समाजातील सामाजिक व सांस्कृतिक मतभेद दूर झाले तर बऱ्याच अंशी एकोपा निर्माण होऊ शकतो असा दृष्टिकोन डॉ. आनंद यादव यांचा दिसतो. तसेच १९६० नंतर दलित साहित्य, ग्रामीण साहित्य, आदिवासी साहित्य आदी साहित्य प्रवाहांचे नाव धारण करणार्या प्रवाहांची संमेलने राज्यातील विविध भागांतून भरू लागल्यामुळे

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

0240

तेथील लेखकांची साहित्यविषयक जाणीव प्रगल्भ होताना दिसते. व साहित्याचा प्रचार प्रसार मोठ्या प्रमाणात झाला. यासंदर्भात डॉ. आनंद यादव म्हणतात, इ. स. १८७० ते इ. स. १८८७ च्या काळात दलित साहित्य, ग्रामीण साहित्य, आदिवासी साहित्य, भटक्या विमुक्तांचे साहित्य, जनसाहित्य अशी विविध अस्मितावाचक नामाभिधाने धारण करून नवे जीवनवादी मराठी साहित्य जन्माला येत आहे. त्यांची छोटी मोठी संमेलने खेडपाडवतून, जिल्हाच्या तालुक्यांच्या उद्योगकेंद्रांच्या ठिकाणातून भरताना दिसत आहे. त्यातून त्यांची साहित्यविषयक जाणीव पुष्ट होत चालली आहे. त्यांच्या त्यांच्या विशिष्ट जातींना, जमातींना, समाजस्तरांना अशा प्रकारच्या साहित्यामुळे नवा सांस्कृतिक संदर्भ पूर्वी एका विशिष्ट वर्गाला किंवा ठराविक जातींच्या समाजापुरताच मर्यादित होता. असा हा मोलाचा व प्रतिष्ठा असलेला संदर्भ आला. बहुजन समाजाच्या जाती वर्गाला समाजस्तराला लाभतो आहे याचा अ-पूर्व आनंद विविध सामाजिक स्तरांना मिळू लागला आहे. एक सात्विक वाङ्मयीन धुंदी या जाती वर्गांना काही काळ चढलीय चढणे स्वाभाविकही असते. हजारो वर्षांत पूर्वी कधीही मिळाले नव्हते, ते हानी आल्याचा आनंद इतरांना सांगून कळणार नाही. या धुंदीचे रुपांतर काही काळ उदाम मस्तीत झाले, हेही आपण मान्य करू या<sup>११</sup> १९६० नंतर खेडपाडवत शिक्णप्रसार झाला. यामुळे बहुजन समाजाला शिक्ण मिळू लागले, त्याला स्व-अस्तित्वाची जाणीव झाली. समाजात घडणार्या चांगल्या वाईट घटनांचा तो अर्थ लावू लागला व ते जीवनानुभव साहित्यातून शब्दबद्ध करू लागला. परिणामी मराठी साहित्यात नव्या साहित्यप्रवाहाचा व वाङ्मयीन चळवळीचा उदय

झाला. या नवलेखकांना त्यांच्या वाङ्मयीन जाणीवा समृद्ध करण्यासाठी साहित्य संमेलनाचे व्यासपीठ निर्माण झाले ही संमेलने खेडपाडवतून जिल्हाच्या तालुक्याच्या ठिकाणी भरू लागली. त्यामुळे समाजस्तरातील विविध जातीजमातींना नवा सांस्कृतिक संदर्भ प्राप्त झालाच पण त्याचबरोबर साहित्यनिर्मितीच्या कक्षाही रुंदावल्या. इ. स. १९६० नंतर निर्माण झालेले दलित साहित्य, ग्रामीण साहित्य, स्त्रीवादी साहित्य आदि साहित्य चळवळींच्या साहित्याला प्रस्थापित समीक्षकांनी साहित्यसंमेलनाच्या व्यासपीठावर जसे दुर्लक्षित ठेवले तसेच समीक्षेपासूनही हे साहित्य दुर्लक्षित ठेवले याबद्दलची प्रतिक्रिया म्हणून साहित्य संमेलनासारख्या व्यासपीठाची निर्मिती झाली. यासंदर्भात दादा गोरे म्हणतात, "इ. स. १९६० नंतर अनेक सामाजिक चळवळी आल्या दलित, ग्रामीण, स्त्रीवादी, जनसाहित्य, आदिवासी या साहित्यप्रवाहाविषयी लिहिण्याची फारशी इच्छा समीक्षकांना होत नाही. याचे उदाहरण म्हणून कोणताही एखादा समीक्षाग्रंथ तपासून पाहता येईल त्यात केशवसूत, मर्देंकर, तांबे, हरिभाऊ, पेंडसे, वा. म. जोशी, पु. शि. रेगे यांच्या आणि यांच्यासारख्या साहित्यिकांच्याच साहित्याची तीच ती पुन्हा पुन्हा समीक्षा केलेली दिसते. त्यात रंगनाथ पठारे, लक्ष्मण महाडिक, राजन गवस, विश्वास पाटील, महादेव मोरे, वामन होत्राळ, रा. रं. बोराडे, भास्कर चंदनशिव, आसाराम लोमटे या आणि अशा इतर अनेक साहित्यिकांच्या साहित्यकृतींची समीक्षा आपणास केलेली दिसत नाही. असा समीक्षाव्यवहार आज बिनदिक्कतपणे चालू आहे. म्हणून आज स्त्रियांची वेगळी संमेलने, दलितांची वेगळी संमेलने, ग्रामीण संमेलने अशी वेगवेगळी अनेक संमेलने होत असलेली आपणास दिसतात."<sup>१२</sup> समीक्षकांनी

**विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (IJIF)**

MAH MUL/03051/2012  
ISSN: 2319 9318

*Vidyawarta*<sup>®</sup>  
Peer-Reviewed International Journal

Oct. To Dec., 2021  
Special Issue

0241

दलित, ग्रामीण स्त्रीवादी आदी साहित्य चळवळीतून निर्माण झालेल्या साहित्याची दखल न घेणे, त्या साहित्याला जाणीवपूर्वक समाजमान्यता मिळवून न देणे या कारणांमुळे स्वतंत्र साहित्य संमेलने भरविल्याचे दिसून येते.

इ. स. १९६० नंतर निर्माण झालेल्या साहित्यावर चर्चा घडवून आणणे, नवोदित साहित्यिकांना व्यासपीठ निर्माण करून देणे आदि उद्दिष्टपूर्तीसाठी ग्रामीण साहित्य संमेलनांचे आयोजन केले. त्याला मोठा जनाधार मिळत आहे. त्यामुळे संमेलने उत्सवांचे केंद्र न बनता काही शिस्त ठेऊन संमेलनांचे आयोजन व्हावे अशी अपेक्षा डॉ. आनंद यादव व्यक्त करतात. ते म्हणतात, "मराठी समाज, मराठी माणसाचे जीवन आणि त्यातून निर्माण होणारे मराठी साहित्य यांच्या संबंधात निर्माण होणाऱ्या प्रश्नांची चिकित्सा करणे आणि जमल्यास त्यांची उत्तरे शोधणे, हे प्रत्येक साहित्यसंमेलनाचे प्राप्त कर्तव्य असते. अग्रस्थान देऊन हे प्रश्न अशा संमेलनांतून चर्चिते गेले पाहिजेतय अन्यथा आपल्या संमेलनांचे यात्रेचे जत्रेत रुपांतर होण्यास वेळ लागणार नाही." १३ साहित्य संमेलनाच्या व्यासपीठावर साहित्यविषयक चर्चेलाच प्राधान्य दिले पाहिजे, लेखकांमध्ये परस्पर सुसंवाद झाला पाहिजे, वाङ्मयीन अभिरुची वाढीस लागली पाहिजे, या उद्दिष्टांना संमेलनात गतिरोध उत्पन्न होऊ नये अशी अपेक्षा डॉ. आनंद यादव व्यक्त करताना दिसतात.

वरील विश्लेषणावरून असे दिसून येते की, ग्रामीण समाजजीवनाचे वास्तव चित्रण महात्मा फुले यांनी आपल्या साहित्यातून केले. त्यानंतर अनेक लेखकांनी ग्रामीण जीवनाचे चित्रण साहित्यातून केले असले तरी प्रस्थापित समीक्षक व साहित्यिकांचे

जीवनानुभव हे महानगरीय होते, ग्रामीण साहित्य हे रंजनवादी साहित्य आहे. अशा हीन दृष्टिकोनातून प्रस्थापित लेखक व समीक्षक पाहत होते. परिणामी ग्रामीण साहित्याची त्यांनी अखिल भारतीय मराठी साहित्य संमेलनाच्या व्यासपीठावर दखल घेतली नाही. तसेच इ. स. षष्ठकह नंतर लेखन करू पाहणाऱ्या तिसऱ्या पिढीतील खेडवत राहणाऱ्या लेखकांच्या साहित्यावर विधायक चर्चा व्हावी, साहित्यनिर्मितीसाठी त्यांना मार्गदर्शन मिळावे, नवोदित लेखकांना व्यासपीठ मिळावे, लेखनदृष्टी प्रगल्भ व्हावी तसेच समाजातील विविध समाजस्तरात झालेले सामाजिक, सांस्कृतिक मतभेद दूर व्हावेत, ग्रामीण समाजाला नवीन सांस्कृतिक संदर्भ प्राप्त व्हावेत, साहित्यनिर्मितीच्या कक्षा रुंदाव्यात, ग्रामीण लेखकांच्या साहित्याची समीक्षा व्हावी अशी व्यापक भूमिका ग्रामीण साहित्य संमेलनाच्या आयोजनामागे असल्याची दिसते. तसेच या व्यासपीठावर साहित्यविषयक चर्चेलाच प्राधान्य दिले पाहिजे, लेखकांमध्ये परस्पर सुसंवाद झाला पाहिजे, वाङ्मयीन अभिरुची वाढीस लागली पाहिजे ही उद्दिष्टेही ग्रामीण साहित्य संमेलनाच्या आयोजनामध्ये असल्याचे दिसून येते.

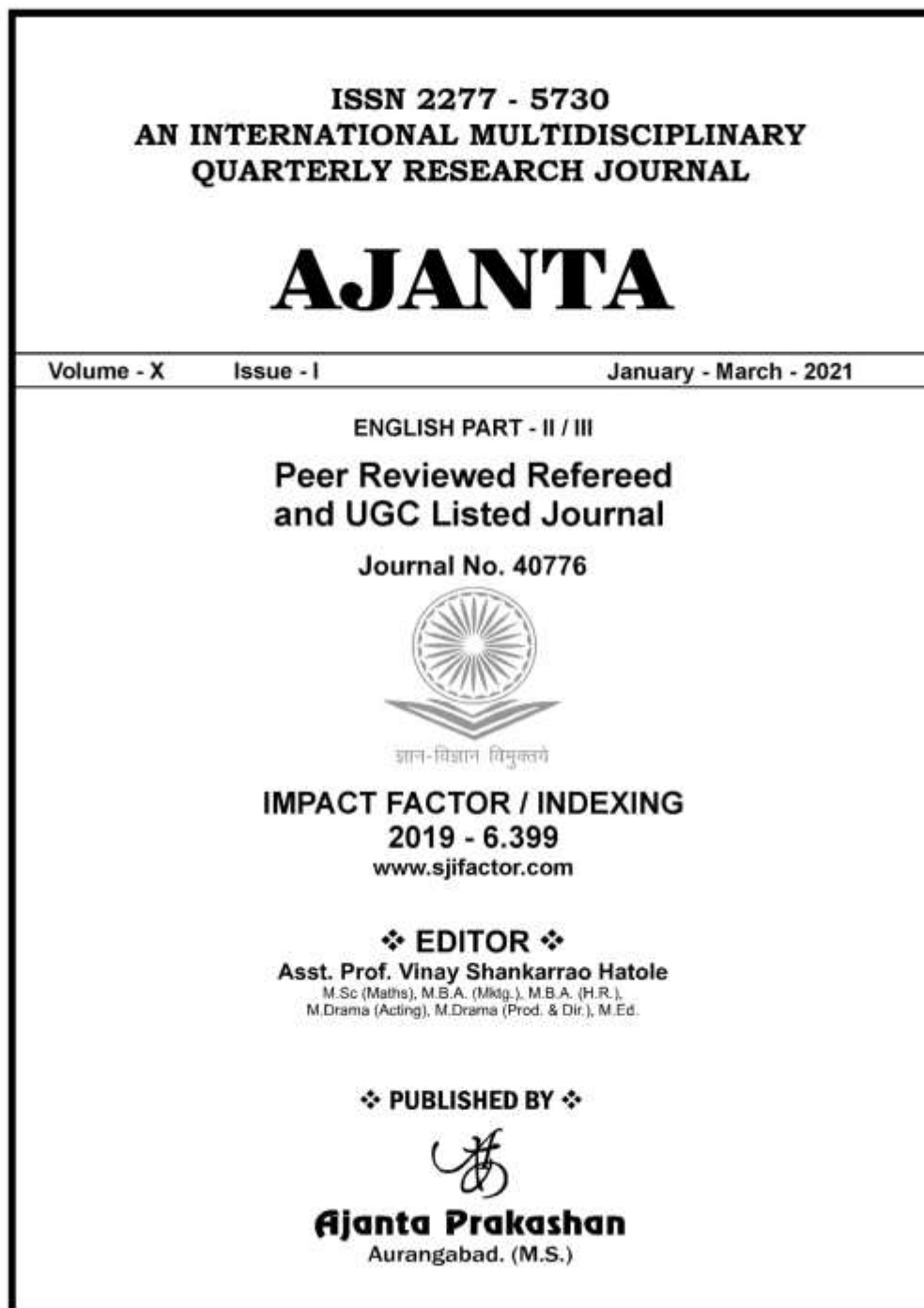
#### संदर्भ सूची

१. यादव आनंद, '१९६० नंतरची सामाजिक स्थिती आणि साहित्यातील नवे प्रवाह, मेहता पब्लिशिंग हाऊस, पुणे, प्रथमावृत्ती, मार्च २००१ पृ. ६०.
२. तत्रैव पृ. ६२.
३. तत्रैव पृ. ६७.
४. तत्रैव पृ. ६४.
५. तत्रैव पृ. ६२ व ६३.

**विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 7.940 (ILIJF)**

## B. 2020-21

## 1. A Scope of Maharashtra State Road Transport Corporation in Ahmednagar District.



The information and views expressed and the research content published in this journal, the sole responsibility lies entirely with the author(s) and does not reflect the official opinion of the Editorial Board, Advisory Committee and the Editor in Chief of the Journal "AJANTA". Owner, printer & publisher Vinay S. Hatole has printed this journal at Ajanta Computer and Printers, Jaisingpura, University Gate, Aurangabad, also Published the same at Aurangabad.

**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)


**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)

Cell No. : 9579260877, 9822620877, Ph. No. : (0240) 2400877

E-mail : ajanta6060@gmail.com, www.ajantapublishan.com

**AJANTA - ISSN 2277 - 5730 - Impact Factor - 6.399** ([www.sjifactor.com](http://www.sjifactor.com))

 <b>EDITORIAL BOARD</b>	
<b>Professor Kaiser Haq</b> Dept. of English, University of Dhaka, Dhaka 1000, Bangladesh.	<b>Roderick McCulloch</b> University of the Sunshine Coast, Locked Bag 4, Maroochydore DC, Queensland, 4558 Australia.
<b>Dr. Ashaf Fetoh Eata</b> College of Art's and Science Salmau Bin Abdul Aziz University. KAS	<b>Dr. Nicholas Loannides</b> Senior Lecturer & Cisco Networking Academy Instructor, Faculty of Computing, North Campus, London Metropolitan University, 166-220 Holloway Road, London, N7 8DB, UK.
<b>Muhammad Mezbah-ul-Islam</b> Ph.D. (NEHU, India) Assot. Prof. Dept. of Information Science and Library Management University of Dhaka, Dhaka - 1000, Bangladesh.	<b>Dr. Meenu Maheshwari</b> Assit. Prof. & Former Head Dept. of Commerce & Management University of Kota, Kota.
<b>Dr. S. Sampath</b> Prof. of Statistics University of Madras Chennai 600005.	<b>Dr. D. H. Malini Srinivasa Rao</b> M.B.A., Ph.D., FDP (IIMA) Assit. Prof. Dept. of Management Pondicherry University Karaikal - 609605.
<b>Dr. S. K. Omanwar</b> Professor and Head, Physics, Sat Gadge Baba Amravati University, Amravati.	<b>Dr. Rana Pratap Singh</b> Professor & Dean, School for Environmental Sciences, Dr. Babasaheb Bhimrao Ambedkar University Raebareilly Road, Lucknow.
<b>Dr. Shekhar Gungurwar</b> Hindi Dept. Vasantrao Naik Mahavidyalaya Vasarni, Nanded.	<b>Memon Sohel Md Yusuf</b> Dept. of Commerce, Nirzwa College of Technology, Nizwa Oman.
<b>Dr. S. Karunanidhi</b> Professor & Head, Dept. of Psychology, University of Madras.	<b>Prof. Joyanta Borbora</b> Head Dept. of Sociology, University, Dibrugarh.
<b>Dr. Walmik Sarwade</b> HOD Dept. of Commerce Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.	<b>Dr. Manoj Dixit</b> Professor and Head, Department of Public Administration Director, Institute of Tourism Studies, Lucknow University, Lucknow.
<b>Prof. P. T. Srinivasan</b> Professor and Head, Dept. of Management Studies, University of Madras, Chennai.	<b>Dr. P. Vitthal</b> School of Language and Literature Marathi Dept. Swami Ramanand Teerth Marathwada University, Nanded.

 **EDITORIAL BOARD** **Dr. Jagdish R. Baheti**

H.O.D. S. N. J. B. College of Pharmacy,  
Meminagar, A/P. Tal Chandwad, Dist. Nashik.

**Dr. Sadique Razaque**

Univ. Department of Psychology,  
Vinoba Bhave University,  
Hazaribagh, Jharkhand.

**Prof. Ram Nandan Singh**

Dept. of Buddhist Studies University of Jammu.

**Dr. Safiqur Rahman**

Assistant Professor, Dept. of Geography,  
Guwahati College Bamunimaidam, Guwahati,  
Assam.



PUBLISHED BY

**Ajanta Prakashan**

Aurangabad. (M.S.)





VOLUME - X, ISSUE - I - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - II ❧

S. No.	Title & Author	Page No.
1	A Critical Study on S. C. & S. T. (Prevention of Atrocities) Act, 1989 with Special Reference to Rule 12 (4) as Annexure 1 - Entitled Norms for Relief Amount <b>Kadamb Rajwantsingh Surendrasingh</b> <b>Dr. Mrs. P. G. Chavan</b>	1-9
2	Affection: Sacrificed at the Altar of Racial Antagonism with Reference to Kamala Markandaya's <i>Some Inner Fury</i> <b>Aashu Rani</b> <b>Dr. Anjana Das</b>	10-13
3	A Comparative Study on Impact of Social Media as a Tool in Improvising Brand Equity in Telecom Industry in India and Thailand <b>Acting Sub Lt. Narongsak Taocome</b> <b>Dr. Kishor L. Salve</b>	14-20
4	A Study on Liquidity Ratios of Automobile Companies in India W.R.T. M & MLtd. & Maruti Suzuki Ltd. <b>Dr. Mahendra D. Dhondge Patil</b>	21-26
5	Dimensions of National Policy on Education in India: An Introspection <b>Dr. Gobinda Chandra Sethi</b>	27-34
6	Homo vs. Hetero in Dattani's <i>Bravely Fought the Queen and on a Muggy Night in Mumbai</i> <b>Dr. Vilas Shripati Patil</b>	35-39
7	Effectiveness of Digital Learning on Reading Performance of Children with Reading Difficulties <b>Suchit Divakar Sagalgile</b>	40-43
8	Reflection of Human Rights in the Indian Constitution <b>Takshashil N. Sutey</b>	44-49
9	Natural Disasters and its Management : A Study <b>Mrs. Anita Bhimrao Davande</b>	50-54

VOLUME - X, ISSUE - I - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - II ❧

S. No.	Title & Author	Page No.
10	High School Students Usage of Social Media Networks <b>Durga Bhavani Koritala</b> <b>Prof. Vanaja M.</b>	55-61
11	Disagreement, Pains and Sufferings in Datta Bhagat's Play <i>Whirlpool</i> <b>Ranvirkar S. G.</b>	62-65
12	E-learning in Rural Area Academic Libraries <b>Shankpale Jyoti Ramesh</b>	66-70
13	Extravagant use of Gadgets by Kids in Present Era <b>Yasmeen Fatema</b>	71-74
14	Effect of COVID-19 on Indian Economy <b>Nagre Vitthal Haribhau</b>	75-80
15	Predicaments in Women's Conditional Life in P. Sivakami's: <i>'The Taming of Women'</i> <b>Varsha Hiranman Kurhe</b> <b>Dr. Prakash Bhimrao Bhangre</b>	81-84
16	The Process of Structural Transformation in Haryana Agriculture and its Economy <b>Manju Bai</b> <b>Dr. Shiv Kumar</b>	85-90

VOLUME - X, ISSUE - I - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - III ❧

S. No.	Title & Author	Page No.
1	Corporate Social Responsibility in India <b>Nitin Malegaonkar</b>	1-9
2	Justification on Selecting Yogic Exercises Effects on Selected Physical Fitness Factors and Volleyball Skills <b>Dr. Shobha Pramod Shinde (Bhagat)</b>	10-16
3	Comparative Study of the Flavonols from <i>Ricinus communis</i> L. and <i>Euphorbia dracunculoides</i> Lam <b>V. T. Narwade</b> <b>V. S. Maske</b>	17-21
4	Efficacy of <i>Glossocardia Bosvillea</i> Leaf Extract against Growth of <i>Rhizoctonia Solani</i> <b>V. S. Maske</b> <b>V. T. Narwade</b>	22-24
5	Study of Health & Fitness on Stay at Home College Students in Corona Virus Pandemic Situation <b>Prof. Dr. Shivraj R. Gaikwad</b>	25-29
6	Yoga Asana Practice on Core Minimum Muscular Fitness of Interschool Male Basketball Players <b>Mr. Sandip Sampatrao Thorat</b>	30-35
7	Role of Technology, Teachers and Plans in ELT <b>Dr. Ramesh B. Jaybhaye</b>	36-39
8	A Systematic Review of Cognitive Behavioral Intervention for Intimate Partner Violence (IPV) Survivors <b>Dr. Amrapali Mahadev Jogdand</b> <b>Dr. Amruta Ashok Magar</b>	40-45
9	Self Confidence and Achievement Motivation among Student <b>Munni Tarachand Rathod</b>	46-51

VOLUME - X, ISSUE - I - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - III ❧

S. No.	Title & Author	Page No.
10	Effect of Screen Dependency on Cognitive and Neuropsychological Development of Children <b>Dr. Amruta Ashok Magar</b> <b>Dr. Amrapali Mahadev Jogdand</b>	52-60
11	Bibliotherapy: An Art of Healing Depression and Anxiety <b>Dr. Namdev Suryawanshi</b>	61-64
12	Benefits of Yoga: Sports and Society <b>Prof. Wakale Madhukar Pandurang</b>	65-68
13	A Scope of Maharashtra State Road Transport Corporation in Ahmednagar District <b>Dr. Yuvaraj M. Waghare</b>	69-74

VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

### 13. A Scope of Maharashtra State Road Transport Corporation in Ahmednagar District

**Dr. Yuvaraj M. Waghare**

H.O.D. and Assistant Professor in Commerce, New Arts, Commerce and Science College,  
Parner Dist- Ahmednagar (MS)

#### **Abstract**

70% of the people in the country are still living in the village and they use the road most for their transportation. On the other side, if road transport is said, then the society thinks about the type of traffic you can afford easily. That is why all the people in the community are using public transport. The public transport that the first priority is for transport. As per changing times, changes are being made according to need. However, if the public transport service is more capable, then the development of that state is much better.

The main objective of this research study is Operation Efficiency of Maharashtra State Road Transport Corporation of Ahmednagar District as it is Ahmednagar District, which is the largest district in the state of Maharashtra, India with the area. Apart from this, Maharashtra's center is to connect connectivity with Marathwada, Vidarbha and North Maharashtra, like metro cities like Mumbai Pune, through Ahmadnagar district. Therefore, the public transport facility in this area must be more efficient.

**Keywords:** MSRTC, Transport, Ahmednagar, Division, Buses, Office, Tehsil, Center.

#### **Introduction**

Ahmednagar district is the largest and central district in Maharashtra, hence it is the district of connecting all the areas of Maharashtra. It is not wrong to say that Ahmadnagar district is working to connect Marathwada and Vidarbha in particular. Therefore, Ahmednagar district is of great importance if public transport is considered. Road transport was created in India in Hyderabad in 1932. It was then started in Mumbai in Maharashtra. In 1935, Dr. Dhananjay Gadgil and the committee submitted its report in the public transport of some of the major districts which included Ahmednagar district. After the formation of a road transport act form in 1948, the first bus in Maharashtra was started on 1st June, 1948 on Pune-Ahmednagar route. The driver of this bus Mr. Tukaram Plateau and responsibility as the carrier.

VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)**

The Ahmednagar Division came under the Nashik division, but this concept was closed after the online transactions were initiated. In the Ahmednagar division, it is currently operating through the following hierarchy.

Divisional Controller  $\Rightarrow$  Divl.Traffic Officer  $\Rightarrow$  Divl. Accounts Officer  
 Divl.Personnel Officer  $\Rightarrow$  Labour Officer  $\Rightarrow$  Depot Manager  $\Rightarrow$

The work of the Division is carried out under the control of the Divisional Controller. After that division, all the work carried out in 4 sections is traffic, accounts, personnel, and labor. In Ahmednagar district there are 11 depots in Tarakpur, Kopergaon, Shrirampur, Sangamner, Shevgaon, Jamkhade, Shrigonda, Parner, Nevas, Pathardi, Akole and Talukas. The functions of these Depots are guided by the depot manager's guidance. The division has Ahmednagar and Shrirampur stations.

#### Objectives of Study

This research project is totally completed in accordance with the following objectives.

1. To study Profile of MSRTC, Ahmednagar Division
2. To study the internal structure of MSRTC, Ahmednagar Division
3. To study Area covered by MSRTC, Ahmednagar Division

#### Research Methodology

The research has been done using primary and secondary data. The study of research is completed by step by step from review of Literature to data analysis and interpretation.

**1. Primary Data:** Primary data has been collected through Field visit, Personal Interview, Observation.

#### 2. Secondary Data

The Secondary data is collected specially from annual administrative reports of MSRTC and various websites including the official website of MSRTC, research publication, Newspapers, Articles, official documents, periodicals, Government records, etc.

#### MSRTC Offices

**Table no 4.1 : Statement showing overall MSRTC infrastructure versus Ahmednagar District (Division) MSRTC.**

Sr. No.	Particular	MSRTC	Ahmednagar Division
01	Central Office	01	N.A.
02	Regional Office	06	N.A.
03	Central workshop	03	N.A.
04	Printing press	01	N.A.

VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

05	Central Training Institute	01	N.A.
06	Divisional office	30	01
07	Divisional Workshops	33	02
08	Depots	247	11
09	Bus Stand	570	30
10	Sheds	400	117

**Sources: Primary Data from Division****MSRTC Employees****Table No. 4.2 : Statement showing the MSRTC Strength in Ahmednagar Division**

Sr. No.	Particulars	No. of Employees
01	Total Employees	4002
02	Driver	1471
03	Conductor	1447
04	Supervisors/ Administrative Staff	456
05	Officer Class-II	22
06	Officer Class-II (Sr.)	04
07	Officer Class- I	03
08	Mechanical Staff	604

**Sources: Primary Data from Division****Ahmednagar Division Position**

**1. Staff Position:** Total number of staff working under Ahmednagar district is 4002 in year 2017-18

**2. Depot Position:** Ahmednagar Division of M.S.R.T.C. Is working with the help of 11 depots which covered all the districts like Tarakpur (Ahmednagar), Shevgaon, Jamkhed, Parner, Shrigonda, Pathardi, Sangamner, Shirampur, Kopargaon, Nevasa, Akole. Karjat taluka of the district is being controlled by Jamkhed Depot and Rahata, Rahuri talukas by Shirampur Depot.

**3. Bus Station Position:** In Ahmednagar district, there are depot in all the talukas except Rahuri, Rahat and Rahuri talukas, but Ahmednagar district is bigger than the area, so bus stations have been constructed for controlling some of the most important stresses for smooth movement of all the road transport. 26 bus stations have been constructed in the entire district. With the bus station in place of each taluka, bus stations are established in some of the important talukas that can be described as follows.

VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)**

### **1. Ahmednagar Tehsil**

Ahmednagar depot has three bus station buses for the old bus station, Tarakpur and Ahmednagar (New Bus Station). Maliwada is the oldest and main bus stations, and it is the middlemost city of Ahmednagar city. Bus buses leaving all buses except Pune and Aurangabad are left in this bus station. Tarakpur is on the road to Nashik, Manmad and Aurangabad routes and there is a bus station for travelers. A third bus station near Ahmednagar's Maliwada bus station is called new bus station. Bus bus stand, especially buses on Pune and Aurangabad routes, have bus stops. These three bus stations have been set up in a convenient perspective of the city's commuters.

### **2. Akole Tehsil**

Ahmednagar to Akole taluka is 118.4 km. And it is so far from Sangamner. Area of this taluka is 1,505.08 km. It is known as taluka and hill. There are big towns like Rajur and Bhandardara in the same taluka. Therefore, Ahmednagar division of MSRTC in Rajur established a bus station in the big cities of 10,046 populated Rajur. So the passengers of the buses got proper bus service.

### **3. Rahata Tehsil**

Shirdi resides in the main religious tehsil of India. Considering the commute of the passengers, there is a big bus station at Shirdi. With this, a bus station has been set up at Ahmednagar to Shirdi via Kolar, Babhaleshwar and on the way to Sanganner to Kolhar, at Loni Prawara, because butter is coming from Maharashtra not only from Maharashtra but also from India for engineering and medical education.

### **4. Rahuri Tehsil**

Basically, there is no main depot in Rahuri, so that a bus station has been set up at taluka place. Also a traffic control center has been constructed at vambhori near Rahuri.

### **5. Karjat Tehsil**

It is a depot at nearby Jamkhed, because they are doing the work of controlling Tejas. Therefore, the bus was set up in Karjat to provide other facilities. A bus station has been set up at Mirajgaon, which has a population of 11,934.

### **6. Shrirampur Tehsil**

A road connecting the Shrirampur Rahri taluka, the Ahmadnagar division has established the Traffic control center at Belapur.



VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

### 7. Parner Tehsil

12 km from Supa village on Parner taluka Ahmednagar Pune highway. Me And Ahmednagar 20 km from the Kalyan Highway. In the intestine. Parner taluka of Ahmednagar district is the largest taluka. This taluka is known as a drought and Parner depot is providing better service to the entire taluka but connectivity of the bus from Pune to Marathwada and Vidarbha is from Ahmadnagar. So, Traffic control center has been established in Pune from Ahmednagar on the road to Supa.

### No of Buses

There are 775 buses in Ahmednagar Division, 17412.71 km. Over 650,000 people have been rendering services in such a sphere.

**Table No. 4.3 : Statement of Area Covered by Ahmednagar Division**

Sr. No.	Name Of Depot	No Of Buses	Total Areas (In K.M.)	Population
1.	Tarakpur	103	1605.74	2,55,862
2.	Shevgaon	67	1031.85	245714
3.	Jamkhed + karjat	69	878.62 + 1503.61	158,380+235,792
4.	Parner	55	1930.28	274167
5.	Shrigondha	68	1605.61	315,975
6.	Pathardi	71	1214.10	258,109
7.	Sangamner	69	1705.06	487,939
8.	Shrirampur+ rahata+rahuri	71	569.87 +759.19+ 1035.11	198,218+320,485+322,823
9.	Kopargaon	86	725.16	237179
10.	Nevasa	55	1343.43	357,829
11.	Akole	61	1505.08	291,950
	TOTAL	775	17412.71	649,779

Source: 1) Website of M.S.R.T.C. (<https://msrtc.maharashtra.gov.in>)

### 2) Census 2011

- **Divisional Workshops:** There are workshops of State transport in Tarakpur (Ahmednagar) and Shirampur in Ahmednagar division. This work is done under the control of the workshop officer. Labor cost is a major expenditure in the workshop, mainly due to the diesel, spare parts, tires, batteries, government tax, electricity bills and other important factors.

VOLUME - X, ISSUE - 1 - JANUARY - MARCH - 2021

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)**

- **Training Center:** There is no training center for the MSRTC employee in Ahmednagar division. The division was coming to Nashik Division. Bhosari in Pune division will be sent to the training center at Central Training Institute.

#### **Conclusion**

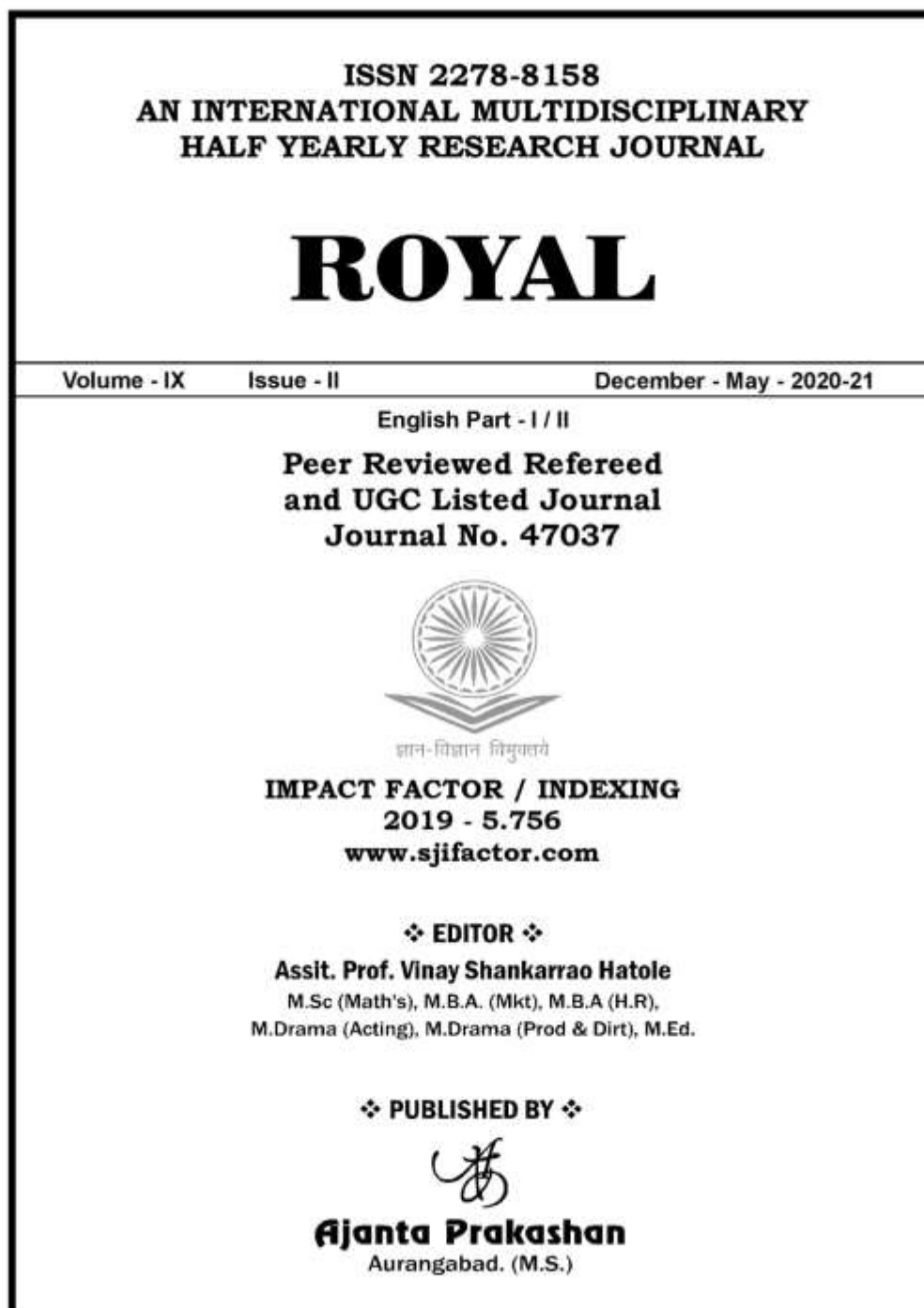
Secondary data analysis shows that Ahmednagar district has got tremendous potential for public road transport business. MSRTC in Ahmednagar district was not able to capitalize it as 40-42% seating capacity of buses was unutilized (Vacant). MSRTC's service mix were analyzed. There are various issues need to be focused by MSRTC.

It was determined that responses from Depot managers whose Passengers were questioned were more valid as depot managers are decision making authorities in MSRTC at Tehsil level, but the higher authority is Ahmednagar division. there are no particulars authorities given to the officers of division. they just follow the routing work and submitted daily report to the head office. So the officers cannot take any quite decision on the issues facing by the division

#### **References**

- <http://MSRTC.gov.in/history.html>. (official website)
- <http://www.censusindia.gov.in/2011census/>
- <https://www.wikipedia.org/>
- Annual Administration Report of MSRTC from 2010-11 to 2017-18
- Report of 20 Point Parameters of MSRTC, Ahmednagar Division, 2009-10 to 2018-19
- Eboli Laura and Mazzulla Gabriella, "Service Quality Attributes Affecting Customer Satisfaction for Bus Transit" *Journal of Public Transportation*, Vol. 10, No. 3, 2007.
- George, William R. and Hiram C. Barksdale (1974), "Marketing Activities in the Service Industries," *Journal of Marketing*, (October), 65-70.
- Gronroos, Christian (1990), *Service Management and Marketing: Managing the Moments of Truth in Service Competition*, Lexington, MA: Lexington Books.
- Gronroos, Christian (1996). "Relationship Marketing: Strategic and Tactical Implications," *Management Decision*, 34 (3), 5-14.

2. The Spiritual Centers (Sansthans) & the Opportunity in the service sector in and around it.



The information and views expressed and the research content published in this journal, the sole responsibility lies entirely with the author(s) and does not reflect the official opinion of the Editorial Board, Advisory Committee and the Editor in Chief of the Journal "ROYAL". Owner, printer & publisher Vinay S. Hatole has printed this journal at Ajanta Computer and Printers, Jaisingpura, University Gate, Aurangabad, also Published the same at Aurangabad.

**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)

**Printed by**

Ajanta Computer, Near University Gate, Jaisingpura, Aurangabad. (M.S.)

Cell No. : 9579260877, 9822620877 Ph. No. : (0240) 2400877

E-mail : [ajanta6060@gmail.com](mailto:ajanta6060@gmail.com), [www.ajantapublishan.com](http://www.ajantapublishan.com)

**ROYAL - ISSN 2278 - 8158 - Impact Factor - 5.756** ([www.sjifactor.com](http://www.sjifactor.com))

 <b>EDITORIAL BOARD</b> 	
<b>Prof. P. T. Srinivasan</b> Professor and Head Dept. of Management Studies, University of Madras, Chennai.	<b>Dr. Rana Pratap Singh</b> Professor & Dean, School for Environmental Sciences, Dr. Babasaheb Bhimrao Ambedkar University Raebareilly Road, Lucknow.
<b>Dr. P. A. Koli</b> Professor and Head (Retd.), Dept. of Economics, Shivaji University, Kolhapur.	<b>Dr. Kishore Kumar C. K.</b> Coordinator Dept. of P. G. Studies and Research in Physical Education and Deputy Director of Physical Education, Mangalore University, Mangalore.
<b>Dr. Sadique Razaque</b> University Dept. of Psychology, Vinoba Bhave University, Hazaribagh, Jharkhand.	<b>Dr. S. Karunanidhi</b> Professor & Head, Dept. of Psychology, University of Madras.
<b>Dr. Uttam Panchal</b> Vice Principal, Dept. of Commerce and Management Science, Deogiri College, Aurangabad.	<b>Dr. Ganesh S. Chandanshive</b> Asst. Prof. & Head of Dept. in Lokkala Academy, University of Mumbai, Mumbai.
<b>Dr. Kailas Thombre</b> Research Guide and Asst. Prof. Deogiri College Aurangabad.	<b>Dr. Rushikesh B. Kamble</b> H.O.D. Marathi S. B. College of Arts and Commerce, Aurangpura, Aurangabad. (M.S.)
<b>Dr. Shekhar Gungurwar</b> Hindi Dept. Vasanttrao Naik Mahavidyalaya Vasarni, Nanded.	<b>Dr. Jagdish R. Baheti</b> H.O.D. S. N. J. B. College of Pharmacy, Memnagar, A/P. Tal Chandwad, Dist. Nashik.
<b>Dr. Manerao Dnyaneshwar Abhimanji</b> Asst. Prof. Marathwada College of Education, Dr. Rafique Zakaria Campus, Aurangabad.	<b>Memon Sohel Md Yusuf</b> Dept. of Commerce, Nizwa College of Technology, Nizwa Oman.
PUBLISHED BY  <b>Ajanta Prakashan</b> Aurangabad. (M.S.)	



VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21  
 ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - I ❧

Sr. No.	Name & Author Name	Page No.
1	Reviving Indian Dyeing Industry: The Contribution of Prof. Balaji Prabhakar Modak <b>Dr. Abhidha Dhumatkar</b>	1-8
2	The Case Study of Bhiwandi Power loom Industry: Issues and Challenges <b>Krishna S. Gaikwad</b>	9-16
3	Symbol to Object: Cloth in Jain Tradition <b>Dr. Hemali Sanghavi</b>	17-21
4	Drag World: Makeup, Wigs and Queens <b>Apurva Sunil Dhage</b>	22-27
5	Dress of Folk Artist of Karnataka with Special Reference to Bidar District <b>Dr. Nalini Avinash Waghmare</b>	28-33
6	Handloom Industry of India <b>Ms. Anita Sanjay Hamand</b>	34-39
7	Samvedi Kupari Christian Attires of North Vasai <b>Dr. Afechine A. Tuscano</b>	40-47
8	Bharuch - A Reputed Weaving Centre <b>Dr. Meher Mistry</b>	48-53
9	India's Iconic Textile from South: Kancheevaram Saree <b>Mrs. R. Vijayalakshmi</b>	54-59
10	Magic of Paithani - Then and Now <b>Dr. Swapna Samel</b>	60-67
11	Religious and Cultural Aspects of the Hand Span and Hand Woven Cloth Called Khadi or Khaddar <b>Dr. Vincent Kaitan D'mello</b>	68-72
12	Evolution and Impact on Indian Dress Style <b>Teresa Thomas Pereira</b>	73-76
13	Textile Mills and Water Pollution: A Case Study of Ichalkaranji City <b>Prof. Kamlesh R. Kamble</b>	77-80

VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21  
 ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - I ❧

S. No.	Title & Author	Page No.
14	Trend of Using Western Outfits in Metropolitan City of India and its Relation to Health <b>Chetali Pandekar</b> <b>Gayathri N.</b> <b>Minakshi Gurav</b>	81-87
15	Textile Industry and Market Growth in India <b>V. H. Rajurkar</b>	88-93
16	The Study of handloom Sector of Maharashtra: Prospects and Challenges: Special Reference to Bhiwandi (Thane) Region <b>Prof. Ravindra S. Netawate</b> <b>Dr. D. B. Bhanagade</b>	94-101
17	Pagri (Turban): A Symbolic Sikh Head-Dress <b>Dr. Ravinder Kaur Cheema</b>	102-108
18	Kota Doria Traditional Fabrics in India <b>Asst. Prof Arvind M. Ganveer</b>	109-114
19	Indian Journal of Fibre and Textile Research: A Bibliometric Study <b>Sachin Garate</b>	115-126
20	Stories on Silk - A Brief Historical Note on the Legacy of Vijayanagara Drape Traditions <b>D. Nagamani</b>	127-132
21	The Challenges of Globalisation and the Role of Human Resources: A Review <b>Dr. Santosh L. Patil</b>	133-140
22	The Concept of Yoga <b>Dr. Shobha Pramod Shinde (Bhagat)</b>	141-148

VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21  
ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - II ❧

S. No.	Title & Author	Page No.
1	Seasonal Effect of Variations on Heterogeneity of Phyto Planktons from Bori Dam, in Naldurg, Dist Osmanabad <b>S. S. Baad</b>	1-5
2	Impact of Talent Management Strategies on the Organisational Performance <b>Mrs. Pradnya Sen</b>	6-11
3	The Spiritual Centers (Sansthan) and the Opportunities in the Service Sector in and around it <b>Dr. Vinay S. Rananaware</b> <b>Dr. Bhushan Bhalerao</b>	12-15



VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21  
ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)

---

### 3. The Spiritual Centers (Sansthan) and the Opportunities in the Service Sector in and around it

**Dr. Vinay S. Rananaware**  
Ahmednagar College, Ahmednagar.  
**Dr. Bhushan Bhalerao**  
N.A.C. & S. College, Parner.

---

#### Abstract

Few Spiritual Centers (Sansthans) in Maharashtra are very well-known centers for the fulfillment of Desires of Devotees. Such Spiritual Centers (Sansthans) act as a "*Centre for the fulfillment of Desire*" of the Devotees scattered not only all over the country but also scattered all over the Globe. In a way such Spiritual Centers (Sansthans) can be described as a "*Power Centre*" in modern era for the *Peace, Satisfaction and Solace*.

The Spiritual Centers (Sansthans) itself and the Private Business Organizations around the Spiritual Centre, create a unique and *Innovative Service Model* at the Spiritual Centre. The Spiritual Centers (Sansthans) are usually considered as a big crowd pulling organizations. Obviously Spiritual Centers (Sansthans) requires a large amount of manpower to satisfy the basic needs of the visitors and the Devotees.

#### Introduction

The Maharashtra state is recognized as the "*Holy Land*" of saints and spiritual Guru's. Maharashtra's *Cultural Environment* is having a great "Spiritual Tradition". Such a spiritual tradition is a result of certain important elements of "Cultural Environment" of Maharashtra viz. Faith, Values & Beliefs. Basically, very important issues or problems in the "*Economic & Social Environment*" of Maharashtra State, do contribute in the creation of "Cultural Environment", full of faith, values and belief. The very basic problems in the society such as:-

- Population explosion.
- Limited opportunities and Resources.
- The modern lifestyles.
- Sense of Insecurity.

VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21

ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)

- Increased worries and tensions. etc.

Somehow, try to shift or move or attract the society, to the spiritual centers (Sansthans) herein after called Sansthans; the society or a "Common Man" in such a society facing the above mentioned problems try to find out a Solution, a Strong Shelter, and a Sound Support at the Spiritual Centers (Sansthans). In turn the Spiritual Centers (Sansthans) acts as or proves to be a "*Centre for the fulfillment of the Desires*" of the society, i.e. the Devotees and volunteer's oftenly visiting such Spiritual Centers (Sansthans). Few Sansthans in Maharashtra are very well-known centers for the fulfillment of Desires of Devotees viz.-

- Shri. Swami Samarath Maharaj Sansthan - Akkalkot
- Shri. Gondawalekar Maharaj Sansthan - Gondawale
- Shri. Gajanan Maharaj Sansthan- Shegaon
- Shri. Saibaba Sansthan- Shirdi

Such Sansthans act as a "*Centre for the fulfillment of Desire*" of the Devotees scattered not only all over the country but also scattered all over the Globe. In a way such Sansthans can be described as a "*Power Centre*" in modern era for the *Peace, Satisfaction and Solace*. The Spiritual Centers (Sansthans) are engaged in *giving the satisfaction, building the confidence, generating the power* among the Visitors- Devotees - Volunteers, on a regular basis, with a very smoothness right from the existence of the Spiritual Guru's till date.

#### Objectives

- To study the opportunities available at the Spiritual Centers (Sansthans).
- To study the reasons behind the available opportunities.
- To study the impact of the Spiritual Centers (Sansthans) on the society.

#### Discussion

The Spiritual Centers (Sansthans) are serving the nationwide scattered and even worldwide scattered Devotees on a regular basis with a great smoothness. The Spiritual Centers (Sansthans) itself and the 'Goods & Services Supplying Centers' i.e. Private Business Organizations around the Spiritual Centre, create a unique and *Innovative Service Model* at the Spiritual Centre.

The very basic needs of even a single Devotee like water, food, shelter and transportation etc. once only, creates a momentum in the Economic Environment in and around the Spiritual Centers. At the Spiritual Centers the number of Visitors and the Devotees are in thousands a day.

VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21

**ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)**

and eventually in lakhs also and more importantly on a regular basis, there is a very "Significant Financial Turnover" in the Spiritual Centers.

The daily gathering of the masses at the different Spiritual Centers as mentioned below clearly underlines the great need of the Business Activities (in the form of Service providing) by the Spiritual Centers (Sansthans).

Spiritual Centers (Sansthans)	Visitors on a daily basis
Shree Gajanan Maharaj Sansthan, Shegaon	45,000 +
Shree Sai Baba Sansthan Trust, Shirdi	Up to 50,000
Gondavalekar Maharaj Sansthan, Gondavale	2,000 +
Shree Swami Samarth Annachhatra Mandal, Akkalkot	20,000 +

In the changing times the response and the flow of the crowd turned towards the Spiritual Centers on a gigantic volume and in a way compelled the Spiritual Centers to expand their activities and functioning of satisfying the very basic needs of the Devotees.

#### **Research Methodology**

##### **Scope of the Study**

The Spiritual Centers within the 'State of Maharashtra' were selected for the research work.

##### **Sample Size**

As per the 'Raosoft' sample size calculator, the sample size for the population of '20,000' comes to '377'. For the sake of convenience, the Sample size was taken as 400 for Respondents within the Spiritual Centers and 400 for Respondents outside the Spiritual Centers totaling to 800 Respondents.

##### **Sample Selection Method**

A Stratified Random Sampling method has been used during the data collection.

##### **Primary Data Collection**

Primary data has been collected from few Spiritual Centers (Sansthans) in Maharashtra.

##### **Observations and Findings**

1. Any Organization, necessarily - directly or indirectly creates various Avenues/ opportunities in & around itself. Such Avenues /Opportunities happens to be the reason for emergence of various Businesses around the Sansthans.

VOLUME - IX, ISSUE - II - DECEMBER - MAY - 2020-21

**ROYAL - ISSN 2278 - 8158 - IMPACT FACTOR - 5.756 (www.sjifactor.com)**

---

2. **Prasadalaya, Bhaktaniwas** and other facilities such as **Amusement Park, Parking's, and Publications** etc. are provided by the Sansthans and the Private Service Organizations.
3. Sansthans are usually considered as a **big crowd pulling organizations**. Obviously there is a requirement of a **large amount of manpower**.
4. The Sansthan itself and other Private Service Providing Organizations which provides various services & facilities to visitors and make some kind of business which has a **significant financial turnover**.

#### **Conclusions**

1. There is a good business opportunity in the **Service Sector** in and around the Sansthans in the form of Employment and Self-employment.
2. Spiritual Centers (Sansthans) play a vital role in the overall **development** around the Sansthan in the form of infrastructure and increased demand for the goods.
3. There is a **huge financial turnover** in and around The Spiritual Centers (Sansthans).

#### **References**

- [www: gajananmaharaj.org](http://www.gajananmaharaj.org)
- [www: sai.org.in](http://www.sai.org.in)
- <https://shrigondavalekarmaharaj.org>
- [www: swamiannacchatra.org](http://www.swamiannacchatra.org)
- <http://www.raosoft.com/samplesize.html>
- [www: goodworks.net/](http://www.goodworks.net/)
- [www: LiveMint.com](http://www.LiveMint.com)
- [www: yourlibraryarticle.com](http://www.yourlibraryarticle.com) by Puja Mondal.

## 3. Electrochemical Synthesis of CuS Thin Film for Supercapacitor Application

FULL PAPER



Macromolecular Symposia



www.ms-journal.de

## Electrochemical Synthesis of CuS Thin Film for Supercapacitor Application

Sukhdev Luxman Kadam, Ravindra Nathuji Bulakhe, Rupali Ashok Kadam, and Manesh Ashik Yewale\*

In present research, walnut like copper sulfide is prepared via a facile single-step potentiostatic electrodeposition method on conducting stainless steel substrate. The walnut like morphology of copper sulfide thin film lies of microplates and further microplates converted to nanogranulars, by means of a change in deposition time and thickness. Copper sulfide thin film electrode reveals a specific capacitance of  $132 \text{ F g}^{-1}$  at  $50 \text{ mA cm}^{-2}$ . The film thickness changes with deposition time. The films acquire maximum thickness of  $610 \text{ nm}$  for  $25 \text{ min}$  of deposition. X-ray diffraction analysis reveals that the CuS thin films is polycrystalline in nature and the crystallite size is  $29 \text{ nm}$ . The peak at  $612 \text{ cm}^{-1}$  in the Fourier transform infrared spectroscopy spectra confirms the formation of CuS. The wettability study shows the hydrophilic nature, the contact angle of water with CuS electrode is  $66^\circ$ , and the charge transfer resistance of CuS electrode is  $7.78 \Omega$ .

cell, photo electrochemical solar cell, nanoswitches,<sup>[6-8]</sup> photo degradation, and cathodic material for lithium battery<sup>[9]</sup> radiation filter. At room temperature, CuS have three phases of a crystalline form, i.e., hexagonal, cubic and tetragonal. Morphology of CuS are described as hollow sphere, plate-like, nanowires, nanowhiskers, rod, ball flowers, tube-like, flower-like, urchin, and micro tubes-like<sup>[10]</sup> structures. Hollow spheres and cubes are synthesized by hydrothermal and solvothermal routes. CuS thin films are synthesized by variety of techniques like SILAR,<sup>[11]</sup> spray pyrolysis,<sup>[12]</sup> chemical vapor deposition,<sup>[13]</sup> salvo thermal method<sup>[14,15]</sup> wet chemical method,<sup>[16]</sup> solid state reaction,<sup>[17]</sup> and chemical bath deposition.<sup>[18]</sup>

### 1. Introduction

Electrochemical supercapacitors have involved several researchers in the current years for their great power density than batteries, long cyclic life, and higher energy density than conventional dielectric capacitors as energy-storage strategies. In latest years, numerous metal oxides, and their nanocomposites such as NiO, CuO, and RuO<sub>2</sub> have been described for their highly reversible reaction, long cyclic stability, high charge storage capacity through physical, and chemical properties. Metal sulfide is one of prominent electrode used for energy storage application. CuS is a p-type semiconductor having outstanding optical, electronic, physical, and chemical properties.<sup>[1-4]</sup> CuS thin films are utilized in gas sensor,<sup>[5]</sup> quantum dot solar

CuS nanoparticles were formed via vacuum thermal evaporation at different time interval and annealed at  $270^\circ \text{C}$ . The size of prepared CuS nanoparticles ranges from  $100$  to  $300 \text{ nm}$ . Counter electrode of CuS is prepared on conducting substrate for solar cell application. The film deposited at  $300 \text{ s}$  shows relatively maximum efficiency of  $3.16\%$  as compared to platinum electrode in polysulfide electrolyte which is reported by Wang et al.<sup>[19]</sup> By using CBD, CuS nano-pea like structures were prepared on FTO substrate at various temperatures. The prepared CuS thin film is utilized in QDSS cells for its uppermost catalytic activity at negligible cost. A typical particle size of the CuS nano peas was obtained in the range of  $180$ – $270 \text{ nm}$  with film thickness  $825 \text{ nm}$  and power transformation efficiency of  $4.01\%$  reported by Kim et al.<sup>[20]</sup> The photo electrochemical performance and electro catalytic properties of CuS electrode prepared utilizing AC etching technique show efficiency of  $3.22\%$  which was much higher than those of platinum and conventional Cu<sub>2</sub>S counter electrodes reported by Quan et al.<sup>[21]</sup> The nanowires of CuS were prepared by the hydrothermal and drop casting method. The diameter of the wire varies from  $200$  to  $500 \text{ nm}$  and length  $100 \mu\text{m}$ . The diffusion charge carrier was significantly smaller than the length of nanowire. These nanowires were damaged down in order to show a photovoltaic device using the Schottky connection of the CuS nanowires with metal electrode, the external quantum efficiency is about  $1.1\%$  explained by Goswami et al.<sup>[22]</sup> Ghahremaninezhad et al.<sup>[23]</sup> synthesized CuS thin film by electrodeposition technique from dilute thiourea and copper solution without any template. The film was prepared at  $-0.85 \text{ V}$  deposition potential.

S. L. Kadam, M. A. Yewale  
Post Graduation Department of Physics and Research Centre  
New Arts Commerce and Science College, Parner  
Ahmednagar, Maharashtra 414302, India  
E-mail: maneshphd@gmail.com

R. N. Bulakhe  
School of Chemical Engineering  
Yeungnam University  
Gyongsan 712749, South Korea

R. A. Kadam  
Department Applied Science  
Shri Chhatrapati Shivaji Maharaj College of Engineering Nepti  
Ahmednagar, Maharashtra 414005, India

DOI: 10.1002/masy.201900209

Macromol. Symp. 2020, 392, 1900209

1900209 (1 of 5)

© 2020 Wiley-VCH GmbH

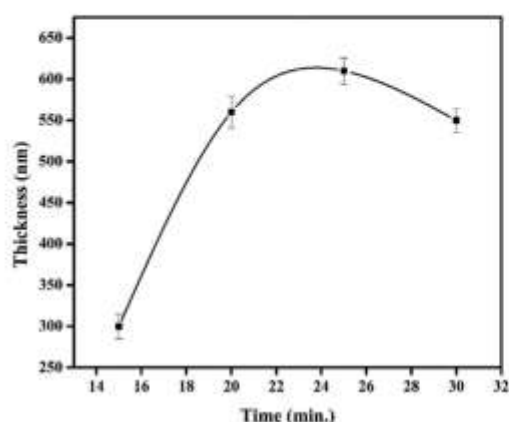


Figure 1. Variation of thickness values of CuS with time.

In present work, CuS thin films are prepared by electrodeposition technique. Electrodeposition technique is beneficial because this technique has some advantages over other deposition technique. Experiments were performed under the distinct composition ratios, distinct concentrations, and deposition time and studied their electrical physical properties.

## 2. Results and Discussion

### 2.1. Thickness Measurement

The variation of thickness with deposition time is demonstrated by Figure 1. The thickness of CuS thin film depends upon deposition time, as time increased thickness also increased till 25 min. After 25 min, the thickness decreases due to the piling of material as overgrowth of material is further at deposition time more than 25 min. The thickness of CuS thin films are 300, 520, 610, and 550 nm for deposition time of 15, 20, 25, and 30 min, respectively. Maximum thickness is obtained for 25 min deposition time. At this thickness maximum electrode and electrolyte interaction occur.

### 2.2. XRD Study

Figure 2 displays XRD patterns of CuS film deposited at 25 min with 0.1 and 0.3 M bath concentrations of  $\text{CuSO}_4$  and  $\text{Na}_2\text{S}_2\text{O}_3$ , respectively.

The phase of CuS is identified with the help of XRD pattern, the peaks were indexed as (100), (102), (006), (104), (106), (108), (112), (204), (206), (208), and (214) as reported cubic phase of CuS (JCPDS Card No.03-65-3929). XRD patterns show the formation of polycrystalline structure of CuS. The orientation of peak confirming formation in CuS nanograins. The average crystallite size of CuS nanograins is 29 nm

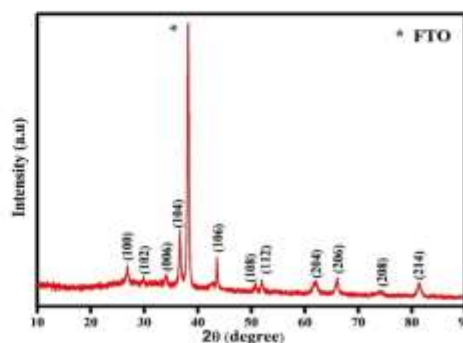


Figure 2. X-ray diffraction patterns of CuS thin films for 25 min.

### 2.3. Scanning Electron Microscopy

The morphology of CuS thin films were examined by SEM analysis. Figure 3 shows the SEM microstructure of CuS films prepared at 25 min at different magnifications. The micrographs reveal the entire coverage of walnut like morphology formed entirely over whole substrate. Careful analysis of the image shows the walnut morphology which indicates that the nanograins are linked to each other. Initially, small granules are formed at low concentration; as thickness of the film is increased, the granules are interlinked and form a bunch of nanograins. The bunch of nanograins is non-uniformly dispersed over whole substrate surface which may be responsible for nucleation center to a bunch of nanograins.

### 2.4. Compositional Analysis

The compositional analysis of material is examined with the help of EDAX analysis. The EDAX spectra specify the atomic ratio of copper and sulfur atoms as 53.60:46.40, which is very near to the target 1:1 ratio as shown in Figure 4a. From EDAX observation, it is clear that CuS film is approximately stoichiometric.

### 2.5. Fourier Transform Infrared Spectroscopy

Figure 4b depicts Fourier transform infrared spectroscopy spectra of CuS film prepared at 25 min at optimized concentrations of  $\text{CuSO}_4$  and  $\text{Na}_2\text{S}_2\text{O}_3$  in the range of wavenumber 550 to  $1600\text{ cm}^{-1}$ . The absorption peak at  $913\text{ cm}^{-1}$  was observed from the spectra showing the deformation of O-H bond.<sup>[26]</sup> The peak observed at  $615\text{ cm}^{-1}$  indicates vibrational peaks of Cu-S stretching modes.<sup>[27]</sup>

### 2.6. Contact Angle Study

Wettability of material was measured by the contact angle measurement. If the wettability is small then aqueous solution makes

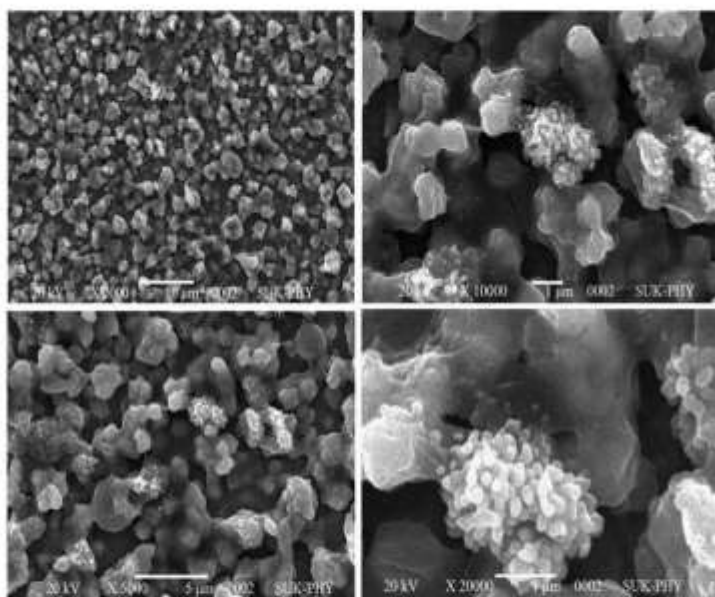


Figure 3. Scanning electron microscopy micrographs of CuS thin films at different magnification for 25 min.

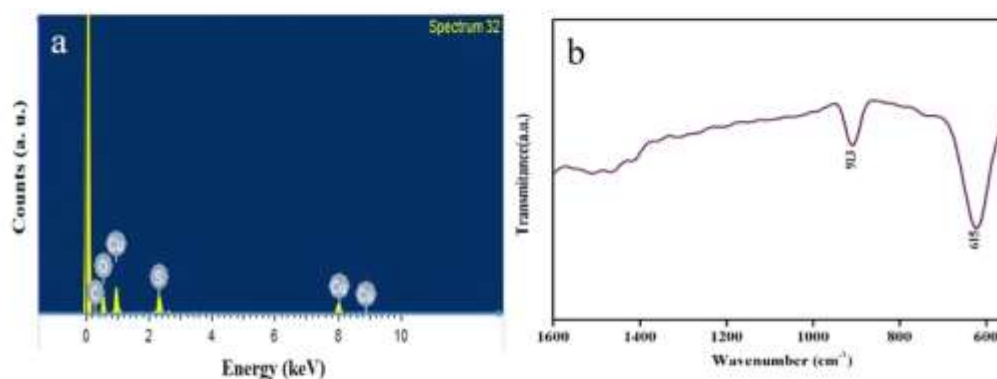


Figure 4. a) EDAX of CuS thin films and b) Fourier transform infrared spectroscopy of CuS thin films deposited for 25 min.

a higher contact and material surface is referred as a hydrophobic surface. If a drop of aqueous solution were placed on a surface of CuS film, the water droplet makes  $60^\circ$  contact angle with a surface of CuS film as shown in Figure 5. It may be due to cohesive force between hydrous content in CuS thin film and water droplet. From Figure 6 it can be concluded that, the film is hydrophilic in nature.<sup>[26]</sup> Hydrophilic surface is very significant in supercapacitor. When electrolyte is in contact with the electrode, large amount of electrolyte interact with electrode. The interac-

tion between electrode electrolytes alters supercapacitance of the material with the contact angle.

### 2.7. Cyclic Voltammetry

Figure 6 displays cyclic voltammetry (CV) of the CuS nanograins electrodes electrodeposited for 25 min. CV of the material were obtained using three electrodes system in 1 M NaOH aqueous

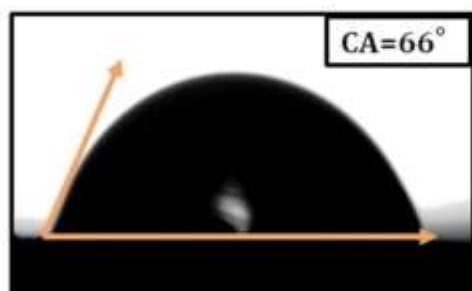


Figure 5. Contact angle of CuS thin films deposited for 25 min.

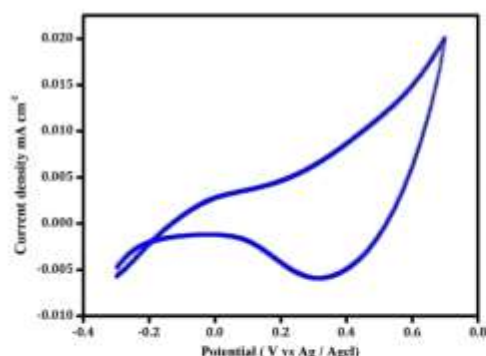


Figure 6. Cyclic voltammetry of the CuS electrodes in 1 M NaOH electrolyte for different scan rates.

electrolyte. CV curve were obtained between a potential windows of  $-0.4$  and  $0.8$  V. Inside the potential window, a minute hump was observed which was equivalent to an anodic and cathodic peak that indicates the supercapacitive behavior of CuS thin films in aqueous electrolyte.

The probable reaction may be completed conversion from Cu(0) to Cu(II) species.<sup>[27–29]</sup> Figure 6 demonstrates the CV of CuS nanograins noted in aqueous 1 M NaOH electrolyte at several scan rate. If we raise scan rate, the cathodic and anodic peak shift near negative and positive potential, respectively, showing a quasi-reversible reaction. The capacitance at scan rate  $50 \text{ mV s}^{-1}$  is  $132 \text{ F g}^{-1}$  for 25 min.

### 2.8. Electrochemical Impedance Spectroscopy

Charge transportation dynamics of supercapacitor cells were examined by using electrochemical impedance spectroscopy (EIS) method. The charge transfer dynamics has been studied by execution of EIS measurement of CuS samples using 1 M NaOH electrolyte. The measurement was executed in AC frequency range of 100–20 Hz. Figure 7 demonstrates the Nyquist plots of samples. The spectra have been fitted in a comparable circuit shown in inset of Figure 7. At maximum frequency, a cut off to

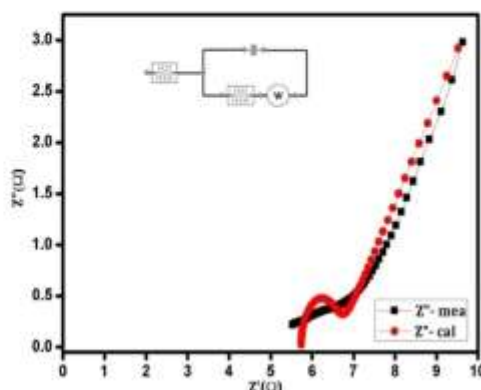


Figure 7. Electrochemical impedance spectra of CuS samples deposited at 25 min.

real axis is termed as equivalent series resistance  $R_s$ . This resistance may be due to the combine resistance of substrate, electrolyte, and depositing material which is about  $7.78 \Omega$ .

### 3. Conclusions

In conclusion, we have successfully synthesized CuS thin films by inexpensive and simple electrodeposition method. The polycrystalline nature with pure cubic phase of CuS is confirmed by the XRD spectra. The peak at  $615 \text{ cm}^{-1}$  confirms the formation of CuS film. The highly porous morphology as well as minimum value of the contact angle of CuS sample leads to a better response to supercapacitor for 25 min deposition time, walnut like morphology is observed and films are nearly stoichiometric. The CuS thin film based supercapacitor exhibits maximum specific capacitance of  $132 \text{ F g}^{-1}$  in NaOH electrolyte and equivalent series resistance of  $7.78 \Omega$  at an optimum deposition time.

### 4. Experimental Section

**Materials:** Fluorine doped tin oxide (FTO) glass slides ( $75 \text{ mm} \times 25 \text{ mm} \times 1 \text{ mm}$ ) were used as substrates purchased from Sigma-Aldrich, Copper sulfate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ), sodium thiosulfate  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ , sulfuric acid ( $\text{H}_2\text{SO}_4$ ), and alcohol (methanol) were purchased from SD fine Chemicals Limited.

**Synthesis:** The chemical reagents used in the present work were of analytical grade and all of them were purchased from SD Fine Chemical. Deposition of CuS thin films was made by a simple chemical method known as electrodeposition technique. Electrochemical cell contains 50 mL aqueous solution of  $0.1 \text{ M CuSO}_4 \cdot 5\text{H}_2\text{O}$  and 50 mL aqueous solution of  $0.3 \text{ M Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2–3 by dropwise addition of 10% sulphuric acid. CuS thin films are deposited for different deposition time ranging from 15–30 min.

**Characterizations:** The different characteristics like structural, compositional, and electrical properties of the electrodeposited CuS thin films were studied by various techniques. X-ray diffraction (XRD) study was done by a Rigaku Rint-2000 X-ray diffractometer using  $\text{Cu}/30 \text{ kv}/15 \text{ mA}$  radiation with a scan step of 0.001. The compositional analysis of CuS was confirmed by energy-dispersive X-ray analysis, using JEOL model,





JSM-6300 (LA). The surface morphology of the as-synthesized CuS films were studied by using scanning electron microscopy (SEM) using JEOL model, JSM-6360 (LA). The capacitance and resistance were studied by using (CH 500) work station.

### Conflict of Interest

The authors declare no conflict of interest.

### Keywords

CuS thin films, EDAX, electrodeposition, SEM, supercapacitor, XRD

- [1] H. Lee, S. W. Yoon, E. J. Kim, J. Park, *Nano Lett.* **2007**, *7*, 778.
- [2] F. A. Sabah, N. M. Ahmed, Z. Hassan, M. A. Almessiere, *Sens. Actuators B* **2017**, *247*, 197.
- [3] J. Zhang, Z. Zhang, *Mater. Lett.* **2008**, *62*, 2279.
- [4] A. Debart, L. Dupont, R. Patrice, J. Tarascon, *S. S. Sciences* **2006**, *8*, 640.
- [5] A. A. Sagade, R. Sharma, *Sens. Actuators B* **2008**, *133*, 135.
- [6] T. Sakamoto, H. Sunamura, H. Kawaaura, T. Hasegawa, T. Nakayama, M. Aonob, *Appl. Phys. Lett.* **2003**, *82*, 3032.
- [7] C. Ratanatawanate, A. Bui, K. Vu, K. J. Balkus, *J. Phys. Chem. C* **2011**, *115*, 6175.
- [8] L. Reijnen, B. Meester, A. Goossens, J. Schoonman, *Mater. Sci. Eng. C* **2002**, *19*, 311.
- [9] J. S. Chung, H. - J. Sohn, *J. Power Sources* **2002**, *108*, 226.
- [10] U. Shamraiz, R. A. Hussain, A. Badshah, *J. Solid State Chem.* **2016**, *238*, 25.
- [11] S. D. Sartale, C. D. Lokhande, *Mater. Chem. Phys.* **2000**, *65*, 63.
- [12] W. Y. Kim, B. M. Palve, H. M. Pathan, O. S. Joo, *Mater. Chem. Phys.* **2011**, *131*, 525.
- [13] P. Gautama, H. Toyota, Y. Iwamoto, X. Zhu, S. Nomura, S. Mukasa, *Precis. Eng.* **2017**, *22*, 1.
- [14] Z. Nan, X. Y. Wang, Z. Zhao, *J. Cryst. Growth* **2006**, *295*, 92.
- [15] F. Li, J. Wu, Q. Qin, Z. Li, X. Huang, *Powder Technol.* **2010**, *198*, 267.
- [16] K. Tezuka, W. C. Sheets, R. Kurihara, Y. Jin, H. Imoto, T. J. Marks, K. R. Poeppelmeier, *Solid State Sci.* **2007**, *9*, 95.
- [17] C. C. Munce, G. K. Parker, S. A. Holt, G. A. Hope, *Colloids Surf. A* **2007**, *295*, 152.
- [18] S. Wang, W. Dong, X. Fang, S. Zhou, J. Shao, Z. Deng, R. Tao, Q. Zhang, L. Hu, J. Zhu, *Electrochim. Acta* **2015**, *154*, 47.
- [19] H. J. Kim, J. H. Kim, K. Pavan, D. Punnoose, S. K. Kim, C. V. V. M. Gopi, S. S. Rao, *J. Electroanal. Chem.* **2015**, *739*, 20.
- [20] L. Quan, W. Li, L. Zhu, X. Chang, H. Liu, *RSC Advances* **2014**, *4*, 32214.
- [21] S. K. Goswami, J. Kim, K. Hong, E. Oh, Y. Yang, D. Yu, *Mater. Lett.* **2014**, *133*, 132.
- [22] A. Ghahremaninezhad, E. Asselin, D. G. Dixon, *Electrochim. Commun.* **2011**, *13*, 12.
- [23] S. Pandiarajan, M. Umadevi, M. Briget Mary, R. K. Rajaram, V. Ramakrishnan, *J. Raman Spectrosc.* **2004**, *35*, 907.
- [24] S. S. Jadhav, C. K. Hong, P. S. Patil, P. N. Bhosale, G. N. Mulik, *Mater. Lett.* **2018**, *217*, 215.
- [25] S. S. Latthe, R. S. Sutar, V. S. Kodag, A. K. Bhosale, A. M. Kumar, K. K. Sadasivuni, R. Xing, S. Liu, *Prog. Org. Coat.* **2019**, *128*, 52.
- [26] C. Justin Raj, B. C. Kim, W. J. Cho, W. G. Lee, Y. Seo, K. H. Yu, *J. Alloys Compd.* **2014**, *586*, 191.
- [27] Y. Hsu, Y. Chen, Y. Lin, *Electrochim. Acta* **2014**, *139*, 401.
- [28] M. A. Yewale, A. K. Sharma, D. B. Kambale, C. A. Pawar, S. S. Potdar, S. C. Karle, *J. Alloys Compd.* **2018**, *754*, 56.
- [29] A. K. Sharma, M. A. Yewale, G. A. Chavan, D. B. Kambale, S. S. Potdar, *Mater. Sci.* **2015**, *33*, 397.

4. Mycorrhizal efficacy on chemical composition of the *Tejetes erecta*, L (Marigold).

I J R B A T, Issue (VIII), Vol. II, May 2020: 06-08  
A Double Blind Peer Reviewed Journal

OPEN ACCESS  
Original Article

e-ISSN 2347 – 517X

INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY  
© VMS RESEARCH FOUNDATION www.ijrbat.in

**MYCORRHIZAL EFFICACY ON CHEMICAL COMPOSITION OF THE *TEJETES ERECTA*, L (Marigold)**

R. K. Aher  
New Arts, Commerce and Science College Parner, Dist- Ahmednagar, M S., India

Communicated : 19.02.2020      Revision : 15.03.2020 & 25.4.2020      Published: 30.05.2020  
Accepted : 18.05.2020

**ABSTRACT:**  
*Tejetes erecta* (Marigold) is a hairy erect annual herb 1-2 ft high. It consists of chemical compositions like salicyclic acid, essential oil. Essential oil containing azulenogenic sesquiterpenes. Flowers contain calendulin, traces of essential oin, oleanolic acid, a gum, a sterol, cholesterol and arnidiol. Insulin in roots. This plant is vulnerary, astringent and styptic. Leaves are resolvent and diaphorties. Flowers and plant used to treat wounds and injuries hence this plant taken for experimental study. The purpose of this study was to observe effect of mycorrhizha on plants and its different biochemical composition. The leaves of *Tejetes* showed good antioxdiant activity (82.17%) and UV-Visible spectra shows growth factor of plant. These observations are suggested that use of mycorrhizha for the growth of plant is useful and also shows positive impact on biochemical composition of plant *Tejetes*.

**Key wards:-** Mycorrhiza, Chemical composition, *Tejestes erecta*, L.

**INTRODUCTION:**  
During the present investigation, effect of AM fungi on the growth of medicinal plants were studied. Medicinal plants like *Tejetes erecta*, L selected for the present study because they are common, seasonal and medicinally most important. *Tejatus erecta* is a hairy erect annual herb 1-2 ft high. It consists of chemical compositions like salicyclic acid, essential oil. Essential oil containing azulenogenic sesquiterpenes. Flowers contain calendulin, traces of essential oin, oleanolic acid, a gum, a sterol, cholesterol and arnidiol. Insulin in roots. This plant is vulnerary, astringent and styptic. Leaves are resolvent and diaphorties. Flowers and plant used to treat wounds and injuries hence this plant taken for experimental study. (Jain, 2008).  
Due to number of medicinal properties *Tejetes* is selected for pot culture experiment. The purpose of this study was to observe effect of mycorrhizha on plants and its different biochemical composition.

**MATERIAL AND METHOD:**  
To test the effect of mycorrhiza on the chemical composition of the medicinal plant, plant extract prepared from the leaves and twigs of respective *Tejetes* plants after 40 days of sowing of the seedling.  
**Analysis of *Tejetes* extract**  
Sample Plantation and Collection - The purpose of this study was to observe effect of mycorrhiza on plants and its different biochemical composition. *Tejetes* sample was planted in soil of Parner (Ahmednagar, Maharashtra) in period of June - July 2018, and grows under observation. Plants grow in soil which contains mycorrhiza (Experimental) and another one (Control) is grows under normal soil condition.  
**Sample Preparation** - *Tejetes* leaves taken and clean by using distilled water and dried using distilled water. Exactly 1 g of leaves weighed and taken into motor and pestle and prepared paste of it. Paste was transferred into solvent extraction cell and added 50 ml methanol and extracted twice. Collected

Page 6

09/17/2019 Journals Details

## Journal Detail

Journal Name	INTERNATIONAL JOURNAL FOR RESEARCHES IN BIOSCIENC
ISSN (P)	2347-517X
ISSN (O)	
Country	In
Frequency	Quarterly
Journal Discipline	Multidisciplinary
Area of specialization	
Organization	
Journal Language	
Year of First Publication	2013
Web Site	<a href="http://www.ijrbat.in">www.ijrbat.in</a>
Editor	Dr. Ashish Lambat
Indexed	Yes
Email	<a href="mailto:lambatashish@gmail.com">lambatashish@gmail.com</a>
Phone No.	9372727927
Cosmos Impact Factor	2015 : 4.935 2018 : 5.365

## 5. Effect of *Glomus fasciculatum* on biochemical composition of *Catharanthus roseus*. 2020.

### RESEARCH ARTICLE

SAMRIDDHI Volume 12, Special Issue 2, 2020

Print ISSN: 2229-7111

Online ISSN: 2454-5767

## Effect of *Glomus fasciculatum* on Biochemical Composition of *Catharanthus roseus* L.

Rangnath K.Aher\*

PG Department of Botany, New Arts, Commerce and Science College, Parner-414302, District Ahmednagar, MS, India

### ABSTRACT

*Catharanthus roseus* was selected for the present investigation because it is the most important medicinal plant in India. It consists of abortifacient effect, acid phosphatase inhibition, acid phosphatase stimulation anti-ascariasis activity, antibacterial activity, antidiuretic activity, antihyperglycemic activity, antihypertensive activity, anti-inflammatory activity, antimitotic activity, antispasmodic anti-viral activity, cardiotoxic activity, cytotoxic activity, hyperglycemic activity, hypotensive activity, insect sterility induction activity, leucopenic activity, uterine stimulant effect, as well as, weight loss activity, etc. The purpose of this study was to observe the effect of mycorrhizae, like *Glomus fasciculatum* on *C. roseus* and its different biochemical composition. The leaves of *Catharanthus* showed good antioxidant activity (82.17%) and UV-visible spectra show a growth factor of plant. These observations are suggested that the use of mycorrhiza, like *G. fasciculatum* for the growth of the plant, is useful and also shows a positive effect on the biochemical composition of plant *C. roseus*.

**Keywords:** Antioxidant, Biochemical changes, *Catharanthus roseus*, *Glomus fasciculatum*.

SAMRIDDHI : A Journal of Physical Sciences, Engineering and Technology (2020); DOI: 10.18090/samriddhi.v12i52.16

### INTRODUCTION

During the present investigation, the effect of *G. fasciculatum* fungi on the growth of medicinal plants, like *C. roseus* was studied. Medicinal plants, like *C. roseus* L. family Apocynaceae, were selected for the present study because they are common, seasonal, and medicinally most important. It is native and endemic to Madagascar. Periwinkle is cultivated as an ornamental, as well as, medicinal purpose throughout the tropical and subtropical world. Plant flowering occurs throughout the year, upper leaf axils are tubular, 1.5–4 cm long, five-lobed, color may be white, crimson eye, or lavender-pink. It has the main source of drug vincristine.<sup>1,2</sup> The roots of the plants consist of various drugs. They are popular to possess toxic and stomatic properties. This plant has importance as an alkaloid. Roots of *Catharanthus* have ajmalicine. The alkaloids possess hypotensive, sedative, and tranquilizing properties (Jain, 2008).<sup>3</sup>

It consists of abortifacient effect, acid phosphatase inhibition, acid phosphatase stimulation anti-ascariasis activity, antibacterial activity, antidiuretic activity, antihyperglycemic activity, antihypertensive activity, anti-inflammatory activity, antimitotic activity, antispasmodic anti-viral activity, cardiotoxic activity, cytotoxic activity, hyperglycemic activity, hypotensive activity, insect sterility induction activity, leucopenic activity, uterine stimulant effect, as well as, weight-loss activity, etc. Due to the number of medicinal properties, *Catharanthus* is selected for pot culture experiment. The purpose of this study was to observe

**Corresponding Author:** Dr. Rangnath Kisan Aher, PG Department of Botany, New Arts, Commerce and Science College, Parner-414302, District Ahmednagar, MS, India, e-mail: rkaheer69@gmail.com

**How to cite his article:** Aher, R.K. (2020). Effect of *Glomus fasciculatum* on Biochemical Composition of *Catharanthus roseus* L. SAMRIDDHI : A Journal of Physical Sciences, Engineering and Technology, 12(SI-2), 82-84.

**Source of support:** Nil

**Conflict of interest:** None

the effect of mycorrhizae, like *G. fasciculatum*, on plants and their different biochemical composition.<sup>4</sup>

### MATERIAL AND METHOD

To test the effect of *G. fasciculatum* mycorrhiza on the chemical composition of the medicinal plant, plant extract prepared from the leaves and twigs of respective plants after 40 days of sowing of the seedling. *G. fasciculatum* culture isolated from rhizosphere soil of maize in the laboratory.

#### Analysis of *Catharanthus* Extract

##### Sample Plantation and Collection

The purpose of this study was to observe the effect of mycorrhiza on plants and their different biochemical composition. *Catharanthus* sample was planted in the soil

© The Author(s). 2020 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Effect of *Glomus fasciculatum*

of the botanical garden of New Arts, Commerce and Science College, Parner (Ahmednagar, Maharashtra), in the period of June and July 2018, and grows under observation. Plants grow in soil which contains mycorrhiza (experimental) and another one (control) is grown under normal soil condition.<sup>5</sup>

Sample Preparation

The sample was prepared in the research lab of our college. *Catharanthus* leaves are taken and cleaned by using distilled water and dried using distilled water. Exactly 1-gram of leaves weighed and taken into motor and pestle and prepared paste of it. The paste was transferred into the solvent extraction cell and added 50 mL methanol and extracted twice. Collected extract into 100 mL volumetric flask and make up the final volume to 100 mL with methanol.

Plant Extract

Di phenyl picryl hydrazyl (DPPH) assay was performed according to recommended methods of and interpretation measurement mentioned by Philip Molyneux. Each plant extract sample's stock solution (1 mg/mL) was diluted to a final concentration of 1,000 µg/mL in methanol. Volume was made up to 2 mL with methanol. 2 mL of 0.004% of DPPH was added to the sample solution. These were test samples. 2 mL of methanol was added to the sample solution of different concentrations. These were blank solutions, 2 mL of DPPH solution was added to 2 mL of methanol and used as a negative control. The blank for this solution was methanol. Similarly, ascorbic acid as DPPH is sensitive to light, it was exposed to the minimum possible light.<sup>6-9</sup> These solutions were kept at room temperature in dark for 30 minutes to complete the reaction (Shamim *et al.*, 1994). The absorbance was measured at 518 nm and converted into the percentage antioxidant activity using the following equation<sup>10</sup>:

$$\text{Scavenging capacity (\%)} = \frac{[\text{Absorbance of negative control} - \text{Absorbance of test}] \times 100}{\text{Absorbance of negative control}}$$

corresponding chlorophyll-b, for experimental extract it contains absorption of 1.617 and that for control sample is 1.135, and absorption at 668.2 nm also corresponding to chlorophyll-a, for experimental extract it contains absorption of 2.760 and that of control sample is 2.515, it clearly shows that impact of mycorrhiza on formation of these biochemical substances in the *Catharanthus* plants (Karthikeyan *et al.*, 2009)<sup>5,6</sup> (Figure 1).

Antioxidant Activity

DPPH Assay

An antioxidant is a molecule that inhibits the oxidation of other molecules. Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactions that damage cells. Antioxidants terminate these chain reactions by removing free radical intermediates and inhibit other oxidation reactions. They do this by being oxidized themselves. The antioxidant effectiveness of indigenous medicinal plant *Catharanthus* leaves extract, and fraction with a solvent, like methanol, was assessed for DPPH radical scavenging activity. The *Catharanthus* extracts and fractions contained appreciable levels of the antioxidant activities of leaves of *Catharanthus*.<sup>7</sup> The leaves of *Catharanthus* showed good antioxidant activity (82.17%) as compared to control. The result tallies with Akerele *et al.*, 1991. Nilima S. Rajurkar (2011)<sup>8</sup> was reported that the phenolic content in the extracts showed a much higher correlation with reducing power than with the radical scavenging activity. It was estimated that the phenolic compounds present in the extracts act as antioxidants directly through the mechanism of the reduction of oxidized intermediate in the chain

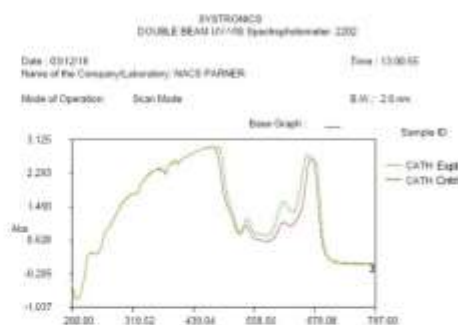


Figure 1: Absorbance

RESULTS AND DISCUSSION

During the result, we have observed UV-visible spectroscopic analysis and antioxidant activity.

UV-Visible Spectroscopic Analysis of *Catharanthus* and its Interpretation

The UV-visible spectra of *Catharanthus* show absorption at 543.6 nm, which shows it contains chlorophyll-a, for experimental extract it contains absorption of 1.252 and that of control sample is 1.018, absorption at 613.3 nm

Table 1: Antioxidant activity

Sample/standard	% inhibition at time (min)					
	5	10	15	20	25	30
<i>Catharanthus</i> , experimental	70.83	72.45	74.88	76.9	77.71	82.17
<i>Catharanthus</i> , control sample	62.72	63.94	67.18	67.99	76.09	78.93
Ascorbic acid	74.88	77.71	79.34	80.15	82.29	87.03



Effect of *Glomus fasciculatum*

reaction of extract. Analysis of the phytochemical contents and antioxidant activities of crude extracts from *Tulbaghia* species observed by Samkeliso *et al.*, (2018).<sup>9</sup> Biochemical screening showed flavonoids, terpenoids, glycosides, saponins, and steroids were present in the *Tulbaghia* species. The total phenolic acid and flavonoid contents varied in the different plant extracts (Table 1).<sup>11,12</sup>

### CONCLUSION

The plant extract of *Catharanthus* showed good antioxidant activity (82.17%) and UV-visible spectra show a growth factor of plant. These observations are suggested that the use of *G. fasciculatum* mycorrhiza for the growth of the plant is useful and also impact on biochemical composition of plant *Catharanthus*.

### ACKNOWLEDGMENT

The author is thankful to the authorities of Savitribai Pune University, Pune, for funding for this project.

### REFERENCES

- [1] Akerele, O., Heywood, V. & Synge, H. (1991). Conservation of medicinal plants. Cambridge University Press, Cambridge.
- [2] Adholeya, A. & A. Gaur. (1994). Estimation of VAM spores in soil: a modified method. *Mycorrhiza News*, 6(1) : 10-11.
- [3] Jain, S. K. (1991). Dictionary of Indian Folk Medicines and Ethnobotany, Deep publication, New Delhi.
- [4] Joshi, S. G. (2006). Medicinal Plants, Oxford and IBH Publishing Company Private Limited, New Delhi.
- [5] Karthikeyan, B., M. M. Joe & C.A. Jaleel. (2009). Response of Some Medicinal Plants to Vesicular Arbuscular Mycorrhizal Inoculations. *J. Sci.* 1 (1) : 381-386.
- [6] Karthikeyan, B., M. M. Joe & C. A. Jaleel. (2009). Response of some medicinal plants to vesicular arbuscular mycorrhizal inoculation. *J. Sci. Res.*1(1): 381-386.
- [7] Cooper Raymond. (2016). Africa's gift to the world. Chemistry of Plants. CRC press. : 46-51.
- [8] Rajurkar, B. & S. M. Hande. (2011). Estimation of phytochemical content and antioxidant of some selected Indian medicinal plant. *Indian J Pharm Sci*, 2011, 73 (2): 146-151.
- [9] Samkeliso Takaidzaa, Fanyana Mtunzib & Michael Pillaya. (2018). Analysis of the phytochemical contents and antioxidant activities of crude extracts from *Tulbaghia* species. *Journal of Traditional Chinese Medicine* 38(2): 272-279.
- [10] Shamim, D., Ahmed, T. & Ayub, N. (1994). Influence of seasonal variations of
- [11] VAM infection in perennial plants. *Pakistan Journal of Phytopathology* 6(2) : 77-86.
- [12] Verkade, S.D., Elson, L.C. & Hamilton. D.P. (1988). Effect of inoculation on growth following transplanting of *Cornus sericea* cuttings and seedlings. *Horticulture*. 227 : 248-250.



## 6. Studies of Shri Mulikadevi Mahavidyalaya Nighoj, Dist. Ahmednagar (MS),



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research  
Vol. 11, Issue, 04 (D), pp. 38254-38259, April, 2020

---

**International Journal of  
Recent Scientific  
Research**


---

DOI: 10.24327/IJRSR

**Research Article****PHYTODIVERSITY STUDIES OF SHRI MULIKADEVI MAHAVIDYALAYA NIGHOJ, DIST. AHMEDNAGAR (MS), INDIA****<sup>1</sup>\*Aher, SK., <sup>2</sup>Adsul, AA., <sup>2</sup>Shelke, PD and <sup>2</sup>Lanke SR**<sup>1</sup>Post Graduate Department of Botany, New Arts Commerce and Science College Parner, Dist. Ahmednagar (MS) - 414 302<sup>2</sup>Department of Botany, Shri Mulikadevi Mahavidyalaya, Nighoj, Tal. Parner, Dist. Ahmednagar (MS) - 414 602DOI: <http://dx.doi.org/10.24327/ijrsr.2020.1104.5272>**ARTICLE INFO****Article History:**Received 24<sup>th</sup> January, 2020  
Received in revised form 19<sup>th</sup>  
February, 2020  
Accepted 25<sup>th</sup> March, 2020  
Published online 28<sup>th</sup> April, 2020**Key Words:**

Floristic Diversity, Parner Tehsil, Exotic plants, Field survey, Ex-situ Conservation

**ABSTRACT**

The present paper focuses on the floristic diversity of Shri Mulikadevi Mahavidyalaya Nighoj Campus from Ahmednagar District of Maharashtra via survey conducted during 2017-2019. During the course of investigation total 193 species belong to 169 genera and 79 families have been reported. These 79 families comprise 56 families belongs to dicotyledons with 143 species, 14 families of monocotyledons with 36 species, 5 families of gymnosperms with 8 species and 5 families of pteridophytes with 6 species. The herbaceous plants flora contributed 25.90%, shrubs with 37.82%, trees with 30.56 and climbers with 5.69% to the total floral diversity. Family Fabaceae, Apocynaceae, Cactaceae, Crassulaceae and Euphorbiaceae were among the dominant families. The rare, endangered, exotic, ornamental, medicinal and plants of economic and ecological importance have been reported in the present communication. The present study will provide the baseline data for the stakeholders to plan the conservation of plant diversity in the study area.

Copyright © Aher, SK., Adsul, AA., Shelke, PD and Lanke SR, 2020, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

**INTRODUCTION**

Floristic diversity generally refers to the variety and variability of plants in a given area. Floristic diversity deals with the enumeration of plant species growing in a particular region at a particular time. Floristic assessments are considered as the basic requirement to understand the current status of phytodiversity of a particular region. Floristic studies provide required knowledge about the various plant species, regarding their nomenclature, distribution, utility and ecology (Lath *et al.*, 2018). Floristic diversity assessments are necessary to understand the present diversity status and conservation of biodiversity. Floristic study is a necessary prerequisite for much fundamental research in tropical community ecology, such as modelling patterns of species diversity or understanding species distributions (Phillips *et al.*, 2003). Biodiversity provides a variety of environmental services from its species that are essential at the global, regional and local level.

Across the world, 25 hotspots have been identified on the basis of species endemism and degree of threat through habitat loss. India is a rich centre of plant diversity having around 45000 species spread over the country (Maheswari, 2011).

India has two major biodiversity hotspots – the Western Ghats and the Himalayas having variety of flora and fauna and ranks 10<sup>th</sup> in the global diversity of flowering plants. The Western Ghats of India ranked fifth in the world in terms of potential products. However the Western Ghats today is one of the most significance repositories of biodiversity of India. The components of these resources constitute the basic raw material, which was used by peoples from ancients. About 33 per cent of Angiosperm occurring in India or about 28 per cent of total Indian flora is endemic to the country (Singh and Singh, 2002). India is the homeland of 167 important cultivated plant species. 320 species of wild relatives of domesticated crops originated in the Indian Subcontinent (Arora and Nayar, 1984). Recent studies showed about 25% of the species will undergo extinction rapidly due to human population growth, short term economic development, industrialization, urbanization (deforestation) and changes in land use pattern (Rao *et al.*, 2017).

Floristic studies acquire increasing importance in recent years in response to the need of developing and under developing countries to assess their plant wealth (Veduya and Kharadi, 2011). Survey and documentation of a country's or community's natural resources is an important prerequisite for

\*Corresponding author: Aher, SK

Post Graduate Department of Botany, New Arts Commerce and Science College Parner, Dist. Ahmednagar (MS) - 414 302

proper utilization of its raw materials. Full knowledge of various plants is necessary, so as to change proper utilization (Choudhari *et al.*, 2008). The diversity of life on earth is so great that if we use it sustainably we can go on developing new products from biodiversity for many generations. This can only happen if we manage biodiversity as a precious resource and prevent the extinction of species.

Destruction of the natural habitat, over-exploitation, nontechnical collection, developmental activities etc. are responsible for loss of the biodiversity in any specified area. A sharp decreasing trend of the biological species is coming on light day by day. So, it is necessary for assessment of plant diversity, so that it can be made effort to conserve the needful bio-species. The first and foremost process in appreciating the biodiversity is the taxonomic treatment of living organisms. Without appropriate knowledge of the exact species composition, it will be difficult to identify and implement conservation priorities for any ecosystem (Ragavan *et al.*, 2016). Therefore, preservation of biological resources is essential for the wellbeing and the long term survival of mankind. In recent years, comprehensive floristic accounts have been published for various states, districts and regions of India (Kumar *et al.* 2007). As regards the botanical explorations of Ahmednagar District of Maharashtra, several people have made notable contributions such as Pradhan and Singh (1999), Santapau (1951), Santapau and Irani (1962). Most of these works resulted in enrichment of the herbaria except few publications, like Shirke (1978). Hooker *et al.* (1872-1897), Cooke (1909-1917) recorded plants from Ahmednagar district in their publications. However, extensive work on the flora of the Ahmednagar district has been done by Pradhan and Singh (1999). Recently Waman *et al.* (2013); Auti *et al.* (2004); Mulay and Sharma (2012, 2014); Aher (2015a,b,c); Deshmukh (2013) have made significant contribution to study the flora of Ahmednagar district.

There is a lot of demand for database of plants and animals all over the world especially from biodiversity rich countries as there are a number of economically and medicinally important plants available, which are untapped till now. Keeping this in view, the present study was conducted as the first ever attempt from the region to explore and identify the plant diversity.

## MATERIALS AND METHODS

### Study Area

Parner is one of the Tahsil in Ahmednagar district of Maharashtra (India). The tahsil is drought prone with very less rainfall. As there are extremities in temperature, humidity and less average rainfall, it has very characteristic floral diversity. Shri Mulikadevi Mahavidyalaya Nighoj, Tal. Parner, Dist. Ahmednagar (MS) i.e. the study area lies between 18° 49' 40" to 19° 21' 13" N latitude and 74° 10' 22" E to 74° 38' 34" E longitude at an elevation of about 750-800 m above mean sea level. The weather, in general, can be said to be hot and dry. The average day temperature ranges from 25°C to 36°C. Relative humidity is extremely low for major part of the year (between 35 to 51%) while it is highest (83%) during monsoon.

The study area is rich with different kinds of Angiosperms. The investigation was carried out in order to explore the

existing floristic composition. Entire study area was periodically visited and an extensive floristic survey was carried out. Plant species belonging to various life forms were collected and identified taxonomically with the help of available literature and preserved in the form of herbarium and photographs (Cooke, 1967; Jain and Rao, 1967; Pradhan and Singh 1999; Singh and Kartikeyan, 2000; Singh *et al.*, 2001). The lists of rare, endangered, exotic and ornamental plants found in study area were prepared with the help of published works (Ahmedullah and Nayar, 1986; Nayar and Sastry, 1990; Nayar 1996).

## RESULTS AND DISCUSSION

Floristic information and in depth knowledge about vegetation dynamics is considered as a necessary prerequisite for understanding the plant diversity of any region (Reddy and Pattanaik, 2009). Floristic and taxonomical surveys were conducted in 32 acres of Shri Mulikadevi Mahavidyalaya Nighoj (Tal. Parner, Dist. Ahmednagar) campus during 2017 – 2019. The eco-friendly college campus is associated with rich flora of trees, shrubs, herbs, palms and climbers and some interesting fauna. During the course of investigation about 193 plant species belonging to 169 genera and 79 families were collected and documented. It also shows that about 43 families are represented by solitary genus (Table 1). Out of 169 genera, 150 genera are represented by only one species. The genus *Ficus* exhibits maximum diversity with six species, followed by *Euphorbia*, *Dracaena* and *Aloe* with four species each on second position and *Opuntia* with three species stood at third position. Table 2 summarizes the number and percentage of the families, genera and species of dicotyledons, monocotyledons, gymnosperms and pteridophytes as found in the study area.

Habit wise analysis shows that 26% of species are herbs, 38% are shrubs, 6% climbers and 30% are trees (Figure 1). Out of total 79 families, monocotyledons share 17.72% (14 families), dicotyledons share 69.62% (56 families), gymnosperms and pteridophytes each share 6.32% (5 families). Out of 169 genera, monocotyledons share 18.93% (32 genera), dicotyledonous share 73.37% (124 genera), gymnosperms share 4.73% (8 genera) while pteridophytes represents 2.95% with five genera. Out of total 193 species, monocotyledonous share 18.65% (36 species), dicotyledonous share 74.09% (143 species), gymnosperms share 4.14% (8 species) and pteridophytes share 3.10% (6 species). (Table 2).

The most diverse families are Fabaceae (13 species), Cactaceae, Apocynaceae and Crassulaceae (each with 10 species), Euphorbiaceae (8 species), Moraceae (7 species), and by Myrtaceae, Asparagaceae and Araceae each with 6 species. About 76 species diversity is restricted to above 9 dominant families.





151	<i>Portulaca oleracea</i> L.	Ghol	Portulacaceae	Herb
152	<i>Psidium guajana</i> L.	Peni	Myrtaceae	Shrub
153	<i>Panicum grassatum</i> L.	Dalimb	Lythraceae	Shrub
154	<i>Ravenala madagascariensis</i> Sonch.	Travellar Palm	Strelitziaceae	Tree
155	<i>Ricinus Communis</i> L.	Erand	Euphorbiaceae	Tree
156	<i>Rosa alba</i> L.	Rose	Rosaceae	Shrub
157	<i>Rosa minutior</i> L.	Buton Galab	Rosaceae	Shrub
158	<i>Saccharum officinarum</i> L.	Sugarcane	Poaceae	Shrub
159	<i>Samsevieria trifasciata</i> hort.	African bowstring-herp	Asparagaceae	Herb
160	<i>Santalum album</i> L.	Chandan	Santalaceae	Tree
161	<i>Sarcococca roxb.</i>	Ashoka tree	Fabaceae	Tree
162	<i>Scaevola obovata</i> Edgew.	Bramh Kamal	Asteraceae	Shrub
163	<i>Scariosa taccada</i> L.	Bench cabbage	Goodeniaceae	Tree
164	<i>Schlumbergera truncata</i> Haw.	Christmas cactus	Cactaceae	Herb
165	<i>Solanum album</i> L.	White Stone Crop	Crassulaceae	Herb
166	<i>Solanum grandiflorum</i> L.	Hadaga	Fabaceae	Tree
167	<i>Solanum melongena</i> L.	Brijal	Solanaceae	Shrub
168	<i>Spathiphyllum</i> Spp.	Spathiphyllum	Araceae	Herb
169	<i>Spatheniscala trilobata</i> L.	Wedelia	Asteraceae	Herb
170	<i>Syngonium podophyllum</i> Schott	African evergreen	Arecaceae	Shrub
171	<i>Syzygium aromaticum</i> L.	Lavang	Myrtaceae	Herb
172	<i>Syzygium cumini</i> L.	Jambul	Myrtaceae	Tree
173	<i>Tabernaemontana divaricata</i> R.Br.	Tagar	Apocynaceae	Shrub
174	<i>Tamarindus indica</i> L.	Chinch	Fabaceae	Tree
175	<i>Taxodium distichum</i> (L.) Rich.	Bald cypress	Cupressaceae	Tree
176	<i>Tecoma stans</i> L.	Tecoma	Bignoniaceae	Shrub
177	<i>Tectona grandis</i> L.	Teak	Lamiaceae	Tree
178	<i>Ternstroemia chebulata</i> (Retz)	Hindu	Combretaceae	Tree
179	<i>Thuja occidentalis</i> L.	Morphankhi	Cupressaceae	Shrub
180	<i>Tinospora cordifolia</i> (Thunb.) Miems	Galvet	Acanthaceae	Climber
181	<i>Trachycarpus fortunei</i> Hook.	Chusan Palm	Arecaceae	Tree
182	<i>Tradescantia spathulacea</i> Sw.	Rheo	Commelinaceae	Herb
183	<i>Triplaris procumbens</i> L.	Ekdandi	Asteraceae	Herb
184	<i>Fachellia nitida</i> L.	Babool	Fabaceae	Tree
185	<i>Verbena officinalis</i> L.	Verbena	Verbenaceae	Shrub
186	<i>Vetiveria zizanioides</i> (L.) Nash	Wala	Poaceae	Shrub
187	<i>Vitex nigundo</i> L.	Nirgadi	Verbenaceae	Shrub
188	<i>Withania somnifera</i> L.	Ashwagandha	Solanaceae	Shrub
189	<i>Wodyenia bifurcata</i> A.K.Irvine	Fossil palm	Araceae	Tree
190	<i>Zamia furfuracea</i> L.	Zamia	Zamiaceae	Tree
191	<i>Zamiaulacae Zamifolia</i> Engl.	ZZ Plant	Araceae	Shrub
192	<i>Zingiber officinale</i> Roscoe	Ginger	Zingiberaceae	Herb
193	<i>Ziziphus jayuta</i> Mill.	Bar	Rhamnaceae	Tree

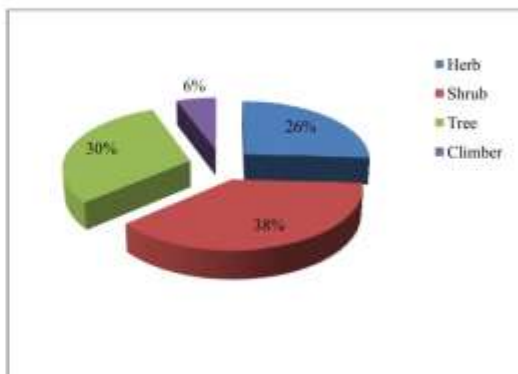


Figure 1 Showing habit wise percentage of plants

The study area is explored with medico botanical view point. *Withania somnifera*, *Adhatoda vasica*, *Averrhoa carambola*, *Hylocereus undatus*, *Pandanus amaryllifolius*, *Caralluma adscendens*, *Curcuma caesia*, *Vetiveria zizanioides*, *Datura stromanum*, *Embllica officinalis*, *Santalum album*. Aher and Adsl (2017) reported 56 medicinally important species from the study area. *Sedum album*, *Curio talinoides*, *Euphorbia milii*, *Dracaena spp.*, *Curio talinoides*, etc. were the representatives of the succulent plants. Family Fabaceae was dominant in terms of number of species followed by Apocynaceae, Cactaceae, Crassulaceae, Euphorbiaceae (Figure 2). The ornamental flora is mostly represented by shrubs, herbs and climbers viz. *Bismarckia nobilis*, *Breynia distica*, *Michelia champaca*, *Schlumbergera truncata*, *Thuja occidentalis*, *Wodyetia bifurcate*, *Spathiphyllum Spp.*, *Lilium candidum*, *Dracaena reflexa*, *Hydrilla*, *Vallisneria* and *Nymphaea* were the representatives of hydrophytes. The study revealed that the area comprised a number of exotic species introduced for ornamental and study purpose. Introduction to exotics in the region may be adventitious and intentional for purposes of medicine, ornamental, avenues, etc. The commonly occurring exotic plants were mainly represented by *Callistemon lanceolatus*, *Eucalyptus spp.*, *Ravenala madagascariensis*, *Mimosa pudica*, *Hamelia patens*, *Cycas spp.*, *Cupressus sempervirens*, etc.

Table 2 showing family, genus and specieswise distribution of the plants

Group	Class	Total No. of Families	Total No. of Genera	Total No. of Species
Angiosperm	Dicotyledons	56	124	143
	Monocotyledons	14	32	36
Gymnosperm		05	08	08
Pteridophytes		05	05	06

The tree species of the study area include *Tamarindus indica*, *Acacia arabica*, *Azadirachta indica*, *Pongamia pinnata*, *Cassia fistula*, *Butea monosperma*, *Ficus religiosa*, *Aegle marmelos*, *Mangifera indica*. The shrubs comprise *Allamanda blanchetii*, *Vitex nigundo*, *Tecoma stans*, *Polyscias scutellaria*, *Mimusops elengi*, *Lantana camara*, *Caesalpinia pulcherrima*. Climbers reported were *Passiflora coccinea*, *Clitoria ternatea*, *Tinospora cordifolia* *Combretum indicum*, *Mansoa alliacea*, *Epipremnum aureum*, *Philodendron bipinnatifidum*, *Asparagus racemosus*.

Cacti plants were mainly represented by *Acanthocalycium thionantaum*, *Aeonium arboretum* *Aloe maculata*, *Echinocereus triglochidiatus*, *Kalanche blossfeldiana*, *Opuntia tomentosa*, *Echinocereus triglochidiatus*, etc. (Table 3).

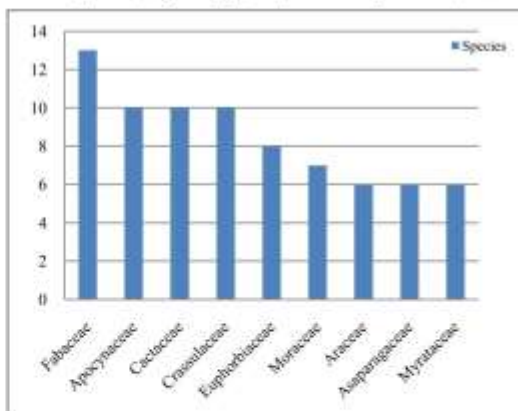


Figure 2 Species wise dominant families

Aher, S.K., Adul, A.A., Shilke, P.D and Lanke S.R., *Phytodiversity Studies of Shri Mulikadevi Mahavidyalaya Nighoj, DIST. Ahmednagar (ms), India*

**Table 3** List of the cacti with their botanical name, common name and family

Sr. No.	Botanical Name	Common Name	Family
1	<i>Opuntia ficus-indica</i> L.	Opuntia	Cactaceae
2	<i>Crasula falcata</i> J.C.Wendl.	Airplane Plant	Crassulaceae
3	<i>Beaucarnea ricarvata</i> Lem.	Ponytail Palm	Crassulaceae
4	<i>Echeveria ranunculif</i> Rose.	Mexican Hen	Crassulaceae
5	<i>Adromischus maculatus</i> Lem.	Calico Hearts	Crassulaceae
6	<i>Echinocereus triglochidiatus</i> L.	Strawberry Cactus	Cactaceae
7	<i>Myrtillocactus cochal</i> Cuscol.	Blue Candle	Cactaceae
8	<i>Kalanche blossfeldiana</i> Poelln.	Christmas Kalanchoe	Crassulaceae
9	<i>Ferocactus glaucescens</i> Britton.	Blue Barrel cactus	Cactaceae
10	<i>Armatocereus godongianus</i> Backeb.	Armatocereus	Cactaceae
11	<i>Acanthocalycium thimantium</i> L.	Thiomantha	Cactaceae
12	<i>Acanthocalycium thimantium</i> L.	Thiomantha	Cactaceae
13	<i>Acrotium arborescens</i> Weeb.	Acrotium	Crassulaceae
14	<i>Bryophyllum pinnatum</i> Lam.	Peelias	Crassulaceae
15	<i>Dudleya vires</i> Moran.	Bright green dudleya	Crassulaceae
16	<i>Graptopetalum paraguayense</i> L.	Graptopetalum	Crassulaceae
17	<i>Hyloteleium unilobus</i> Haworth.	Dragon Fruit	Cactaceae
18	<i>Opuntia microdasys</i> Lehmann.	Bunny -ears	Cactaceae
19	<i>Opuntia monriviensis</i> L.	Velvet opuntia	Cactaceae
20	<i>Schlotheimia truncata</i> Haw.	Christmas cactus	Cactaceae
21	<i>Sedum album</i> L.	White Stone Crop	Crassulaceae
22	<i>Aloe vera</i> L.	Korhad	Asphodelaceae
23	<i>Aloe arborescens</i> L.	Candelabra aloe	Asphodelaceae
24	<i>Aloe arborescens</i> L.	Torch plant	Asphodelaceae
25	<i>Aloe variegata</i> L.	Tiger Aloe	Asphodelaceae
26	<i>Caralluma adscendens</i> L.	Makal shing	Asclepiadaceae

**Ex-situ conservation of plants**

Destruction of natural habitat, non-technical collection, developmental activities, over exploitation are responsible for the loss of biodiversity. A sharp decreasing trend of the biological species is coming on light day by day. It was found that, the college has made an efforts to ex-situ conservation and multiplication of medicinally important rare, endangered plants like *Curcuma caesia*, *Vitivera zizanioides*, *Caralluma fimbriata*, *Tinospora cordifolia*, etc.

**References**

Aher S.K. (2015a). Floristic Diversity Assessment of Parner Tahsil, Maharashtra (India). *Indian J. Applied & Pure Bio.*, 30(2): 123 - 130.

Aher S.K. (2015b). Biodiversity of weed species in crop fields of Parner Tahsil from Ahmednagar District (MS), India. *Indian Journal of Plant Sciences*, 4(4): 112 - 120.

Aher S.K. (2015c). Weed diversity and their ethnomedicinal uses in the Parner Tahsil, Dist. Ahmednagar, Maharashtra (India). *Indian Journal of Fundamental and Applied Life Sciences*, 5 (4): 128-135.

Aher S.K. (2017). Study of some sacred plants of Ahmednagar District, Maharashtra, India. *International Journal of Current Research*, 9(10): 59706 - 59709.

Aher S.K. and Adul A.A. (2017). Medicinal plants of Shri Mulikadevi College Nighoj, Campus (MS), India: A Survey. *Flora and Fauna*, 23(1): 109 - 115.

Ahmedullah, M. and M.P. Nayar (1987). *Endemic Plants of the Indian Regions*. Botanical Survey of India, Calcutta.

Arora R.K., Nayar E.R. (1984). *Wild relatives of crop plants in India*. NBPGR science monograph no. 7. New Delhi, India, pp. 90.

Auti B.K., Pingale S.D. and Aher R.K. (2004). Survey of weeds and their medicinal value from Shirampur tahsil (Ahmednagar District (M.S.)), *Advances in Plant Sciences* 17(II): 395 - 401.

Choudhary K., Singh M., Pillai U. (2008). Ethnobotanical Survey of Rajasthan - An Update. *Am- Euras. J. Bot.*, 1(2): 38 - 45.

Cooke T. *Flora of Presidency of Bombay*. Vol. 1 - 3. Botanical Survey of India, Calcutta, India (1967).

Cooke T. *The Flora of Presidency of Bombay*, London 2 Vol. (Repr. Ed.1958. 3 Vol. Govt. of India) (1901 - 1908).

Deshmukh B. S. 2013. Medicinal plant diversity of Akole tahsil, district Ahmenagar, *Flora and Fauna*, 19(1): 379 - 383.

Hooker J.D. *The Flora of British India* London. VII Vols. (1872 - 1897).

Jain S.K. and Rao R.R. *A handbook of field and herbarium methods*, Today and Tomorrow Printers and Publishers, New Delhi (1967).

Kumar P., Jalal J.S. and Rawat G.S. (2007). *Orchidaceae, Chotanapur, state of Jharkhand, India*. *Check List*, 3(4): 297 - 304.

Lath A., Surender Singh G. and Manoj Kumar (2018). Floristic inventory of district Rohtak (Haryana) India. *Plant Archives*, 18: 219 - 226.

Maheswari J. (2011). Patenting Indian medicinal plants and products, *Indian Journal of Science and Technology*, 4: 298 - 301.

Mulay J.R. and Sharma P.P. 2013. An assessment of floristic diversity of Ahmednagar, Maharashtra, *Bioinfolet* 10(4A): 1121 - 1127.

Mulay J.R. and Sharma P.P. (2012). Some useful weeds from Ahemadnagar district, Maharashtra, India. *Internat. Multidisciplinary Res. J.*, 2(12): 05 - 08.

Nayar M.P. *Hot Spots of Endemic Plants of India, Nepal and Bhutan*. Tropical Botanical Garden and Research Institute (TBGRI), Thiruvananthapuram, Kerala (1996).

Nayar P.H. and Sastry A.R.K. *Red Data Book of Indian Plants*, Botanical Survey of India, Calcutta, India (1990).

Phillips O.L., Martinez R.V. and Vargas P.N. (2003). Efficient plot-based floristic assessment of tropical forests. *J. Tropi. Eco.*, 19: 629 - 645.

Pradhan S.G. and Singh N.P. *Flora of Ahmednagar District, Maharashtra*. B.S. Mahendra Pal Singh, Dehradun (1999).

Ragavan P., A. Saxena R.C.S. Jayaraj P.M. Mohan and K. Ravichandran *et al.* (2016). A review of the mangrove floristics of India. *Taiwania*, 61(3): 224 - 242.

Rao P.S., Yadav A.M. and Shah R.C. (2017). A survey on biodiversity of J. M. Patel College Campus, Bhandara, Maharashtra. *International Journal for Environmental Rehabilitation and Conservation*, VIII(2): 29 - 33.

Reddy C.S. and C. Pattanik (2009). An assessment of floristic diversity of Gandhamardan hill range, Orissa, India. *Bangladesh J. Plant Taxon.*, 16(1): 29 - 36.

Santapau H. and Irani N.A. (1962). *The Asclepiadaceae and Periplocaceae of Bombay*. *Uni. Bombay. Bot.* 4 (iv): 118.

Santapau H. (1951). The genus *Dioscorea* in Bombay. *Ibid.* 49: 624-636.

Sharma B.D., Kartikeyan S., Singh N.P. *Flora of Maharashtra State Monocotyledons*, Botanical Survey of India, Calcutta, India (1996).

*International Journal of Recent Scientific Research Vol. 11, Issue, 04 (D), pp. 38254-38259, April, 2020*

- Shirke D.R. (1983). The study of the flora of Ahmednager. J. Univ. Poona Sci. Tech. 56: 55 - 70.
- Singh N.P., Lakshminarasimhan P., Kartikeyan S., and Prasanna P.V. Flora of Maharashtra State (Dicotyledons Vol. 2), Botanical Survey of India, Calcutta, India (2001).
- Singh N.P. and Kartikeyan S. Flora of Maharashtra State Dicotyledones. Vol. (1)., Botanical Survey of India, Kolkata (Eds). (2000).
- Singh N.P. and Singh K.P. Floristic diversity and conservation strategies in India. Botanical Survey of India (BSI), Calcutta, India (2002).
- Vediya S.D. and Kharadi H.S. (2011). Floristic diversity of Isari zone, Megharj range forest District Sabarkantha, Gujarat, India, *Int. J. of Pharm. & Life Sci*, 2(9): 1033-1034.
- Waman M.B., Wagh B.D. and Dandawate S.C. (2013). Floristic composition of Marutiban sacred grove of Kalsubai Harishchandragarh wild life sanctuary, Flora and Fauna, 19(1): 63 – 65.

**How to cite this article:**

Aher, SK., Adsul, AA., Shelke, PD and Lanke SR.2020, Phytodiversity Studies of Shri Mulikadevi Mahavidyalaya Nighoj, DIST. Ahmednagar (ms), India. *Int J Recent Sci Res*. 11(04), pp: 38254-38259.  
DOI: <http://dx.doi.org/10.24327/ijrsr.2020.1104.5272>

\*\*\*\*\*

## 7. Estimation and evaluation of chlorophyll content and chlorophyll stability index of some antiallergenic medicinal plants of Parner tehsil.

I J R B A T, Issue (VIII), Vol. III, Sept 2020: 84-86

A Double-Blind Peer Reviewed &amp; Refereed Journal



e-ISSN 2347 – 517X

Original Article



INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

© VMS RESEARCH FOUNDATION [www.ijrbat.in](http://www.ijrbat.in)

### ESTIMATION AND EVALUATION OF CHLOROPHYLL CONTENT AND CHLOROPHYLL STABILITY INDEX OF SOME ANTIALLERGENIC MEDICINAL PLANTS OF PARNER TAHSIL

Gitanjali Kakade and Sajan Khapke\*

New Arts, Commerce and Science College, Parner -414302 (M. S.)

\*Corresponding Author: [sajankhapke@gmail.com](mailto:sajankhapke@gmail.com)

Communicated: 15.07.2020

Revision :18.07.2020 &amp; 11.08.2020

Published: 30.09.2020

Accepted: 26.08.2020

#### ABSTRACT

Medicinal plants have been used from the Vedic era. For thousands of years, they have been used to treat and prevent many types of diseases along with epidemics. The study was aimed to understand chlorophyll content and chlorophyll stability index of some antiallergenic medicinal plants. This study is helpful to know the photosynthetic growth potential of the medicinal plants and to know the ability of plants to withstand in the adverse environmental conditions. Chlorophyll is most prominent and important pigment in plants. Chlorophyll shows structural similarities to human blood and hence it has many health benefits. The chlorophyll content was estimated by spectrophotometric method by using acetone as a solvent. The total chlorophyll content is higher in *Acacia concinna* (0.685mg/gfw) and lower in *Aloe barbadensis* (0.066mg/gfw). *Bixa orellana* shows higher chlorophyll stability index (CSI) i.e. 0.317 and lower in *Lawsonia inermis* i.e. 0.043.

**Key words:** - Chlorophyll, Chlorophyll Stability Index, Antiallergenic Medicinal Plants, Parner Tahsil

#### INTRODUCTION:

From ancient period plant parts are used in traditional medicine to cure various diseases. Some medicinal plants are specifically used to treat allergic disorders. Allergy is a prominent problem worldwide. Allergy is caused by allergens like dust mites, pollens etc. Some common medicinal plants show antiallergenic activities, they are *Aloe barbadensis* (Mill.) (Gwarpatha), *Azadirachta indica* (Linn.) (Neem), *Acacia concinna* (Shikakai), *Adhatoda vasica* (Nees.) (Adulsa), *Aegle marmelos* (Corr.) (Bel), *Bauhinia racemosa* (Lam.) (Aapata), *Bixa orellana* (Linn.) (Shendari), *Butea monosperma* (Lam.) (Palas), *Cydonia oblonga* (Mill.) (Dogri) and *Lawsonia inermis* (Linn.) (Mehandij). All plants are easily available in our area. Almost all parts of the plants i.e. stem, bark, branches, leaves, fruits, seeds etc. are medicinally important. The stem bark extract of Neem shows anti-inflammatory activity

(Tidjani *et al.*, 1989). Medicinal plants are effective against various diseases because of their pharmacological efficacy which depends on their elemental concentrations. Phytochemical like primary and secondary metabolites are formed in various combinations of major, minor and trace elements which play curative and preventive role in most of the dangerous diseases. (Pawar and Kamble, 2016). The lower concentration of chlorophyll content of leaf can directly control the photosynthetic ability (Curran *et al.*, 1990, Filella *et al.* 1995). Chlorophyll stability index is an ability of the plants to withstand the adverse conditions and hence it most important parameter of the plants. Under adverse environmental conditions like water scarcity, salt stress, aging etc, the chlorophylls is degraded fast, which affects photosynthesis process. The degree of degradation of

chlorophyll varies from plant to plant. In certain plants chlorophylls are more stable under adverse conditions. Such plant species shows high chlorophyll stability index (Pawar and Kamble, 2015). Under the circumstances it is essential to observe chlorophyll stability index of medicinally important plants. The chlorophyll has a key role in photosynthesis process. From the recent research it is clear that chlorophyll has many medicinal properties like anti-mutagenic, anti-atherogenic, antioxidant, anti-carcinogenic, anti-diabetic, antibacterial, anti-fungal, anti-viral, anti-inflammatory, anti-allergic activities.

#### MATERIAL AND METHODS:

##### Plant material:

Healthy fresh green leaves of *Aloe barbadensis*, *Azadirachta indica*, *Acacia concinna*, *Adhatoda vasica*, *Aegle marmelos*, *Bauhinia racemosa*, *Bixa orellana*, *Butea monosperma*, *Cydonia oblonga* and *Lawsonia inermis* have been used as plant materials for experimentation.

Extraction and Estimation of Chlorophyll: Chlorophyll were extracted and estimated by Arnon's (1949) method. The green leaves from medicinal plants were cut into small pieces and 0.1 g of sample was homogenized in chilled 80 % acetone in mortar and pestle. The acetone extract was filtered through Whatman No. 1 filter paper. The final volume of the extract was made to 20 ml with 80 % acetone. The absorbance of acetone extract was read at 645 and 663 nm using UV-visible spectrophotometer 117 (Systronics) using 80 per cent acetone as a reference.

##### Chlorophyll Stability Index (CSI)

Chlorophyll Stability Index was estimated by using the method of Murthy and Majumdar (1962) and calculated by following formula, CSI= Total Chlorophyll content of heated plant material / Total Chlorophyll content of fresh plant material

#### RESULTS AND DISCUSSION:

The amount of chl.a, chl.b, total chlorophyll content and chlorophyll stability index (CSI) as per calculations are presented in Table No 1. It was found that *Acacia concinna* have the highest amount of total chlorophyll content i.e. 0.685mg/gfw followed by *Bixa orellana* (0.568 mg/gfw), *Adhatoda vasica* (0.433mg/gfw), *Cydonia oblonga* (0.355mg/gfw), *Butea monosperma* (0.295mg/gfw), *Azadirachta indica* (0.282mg/gfw), *Aegle marmelos* (0.251mg/gfw), *Bauhinia racemosa* (0.250mg/gfw), *Lawsonia inermis* (0.116mg/gfw) and *Aloe barbadensis* (0.066mg/gfw) (Table No 1). Pawar and Kamble, 2015 evaluated chlorophyll content and chlorophyll stability index of some antiallergenic medicinal plants.

Chlorophyll is one of the primary compounds having capacity to harvest sunlight for photosynthesis. Chlorophyll content in plants indicates the growth potential and photosynthetic capability of the plants (Jain and Gadre, 1998). Primary metabolites are the precursor of secondary metabolites. Secondary metabolites like flavonoids, alkaloids, lipids, polyphenols etc play important role in the formulation of drug. Chlorophyll stability index (CSI) of plant *B. orellana*, *A. concinna*, *C. oblonga*, *B. racemosa*, *A. marmelos*, *B. monosperma*, *A. vasica*, *A. indica*, *A. barbadensis* and *L. inermis* are 0.317, 0.266, 0.242, 0.235, 0.230, 0.212, 0.136, 0.120, 0.052 and 0.043 respectively. *B. orellana* shows highest chlorophyll stability index (0.317) and *L. inermis* have lowest chlorophyll stability index (0.043).

#### CONCLUSION:

In the present study all the ten anti-allergenic medicinal plants of Parner tahsil under study showed that they have higher photosynthetic capability and growth potential due to higher

concentration in chlorophyll content. All plants have ability to withstand the adverse environmental conditions because they show high chlorophyll stability index (CSI). Among these ten plants *A. concinna* have high total chlorophyll content and *Bixa orellana* have high chlorophyll stability index than remaining nine plants.

**ACKNOWLEDGEMENT:**

The authors are thankful to Prin. Dr. R. K. Aher and Dr. R. N. Deshmukh, Head, Dept. of Botany, New Arts, Commerce and Science College, Parner for continuous encouragement and facilities provided during present investigation.

**REFERENCES:**

Arnon D.I. (1949); Copper enzymes in isolated chloroplasts polyphenol oxidase in *Beta vulgaris*. *Plant Physiol.* **24**:1-15.  
 Curran P.J., Dungan J.L. and Gholz H.L. (1990). Exploring the relationship between reflectance red edge and chlorophyll content in slash pine. *Tree Physiology* **7**: 33-48.  
 Filella I., Serrano L., Serra J. and Peñuelas J. (1995). Evaluating wheat nitrogen status with canopy reflectance

indices and discriminant analysis. *Crop Science* **35**: 1400-1405.  
 Jain M. and R. Gadre, (1998). Inhibition of chlorophyll synthesis and enzymes of nitrogen assimilation by selenite in excised maize leaf segments during greening. *Water Air Soil, Pollut.* **104**: 161-166.  
 Murthy K.S. and Majumdar S.K. (1962): Modification of the technique for determination of chlorophyll stability index in relation to studies of drought resistance in rice. *Current Science*.**31**:470- 471.  
 Pawar S.G. and Kamble V.M. (2015). Evaluation of chlorophyll content and chlorophyll stability index of some anti-allergenic medicinal plants. *Asian Jr. of Multidisci. Studies.* **3**(1):17-19  
 Pawar S.G. and Kamble V.M. (2016). Elemental analysis of anti-allergenic indigenous plants and their possible correlation with therapeutic activity. *Internat. Jr. of Pharmaceutical and Clinical Res.* **8**(9): 1290-1295  
 8. Tidjani M.A., Dupont C. and Weppierre J. (1989). *J.Planta Med, Phytother.* **23**:259-266.

**Table No 1: Chl.a, Chl.b, Total Chlorophyll Content and Chlorophyll Stability Index (CSI).**

Sr. No.	Name of Plant	Chlorophyll (mg/gfw)			CSI
		Chl.a	Chl.b	Total Chl.	
1	<i>Aloe barbadensis</i>	0.035	0.031	0.066	0.052
2	<i>Azadirachta indica</i>	0.143	0.138	0.282	0.120
3	<i>Acacia concinna</i>	0.320	0.365	0.685	0.266
4	<i>Adhatoda vasica</i>	0.246	0.187	0.433	0.136
5	<i>Aegle marmelos</i>	0.128	0.122	0.251	0.230
6	<i>Bauhinia racemosa</i>	0.118	0.131	0.250	0.235
7	<i>Bixa orellana</i>	0.338	0.230	0.568	0.317
8	<i>Butea monosperma</i>	0.181	0.113	0.295	0.212
9	<i>Cydonia oblonga</i>	0.199	0.156	0.355	0.242
10	<i>Lawsonia inermis</i>	0.052	0.063	0.116	0.043

## 8. Character Association and Path Analysis Studies in Soybean Mutant Progenies

J. Soils and Crops 30 (2) 321-325, December 2020

ISSN 0971-2836 (p)  
ISSN 2582-2756 (e)

### CHARACTER ASSOCIATION AND PATH ANALYSIS STUDIES IN SOYBEAN MUTANT PROGENIES

Vaishnavi Deshmukh<sup>1</sup>, M. P. Meshram<sup>2</sup>, Chaitali Mane<sup>3</sup> and R. N. Deshmukh<sup>4</sup>

#### ABSTRACT

The experimental material comprised of 20 soybean mutant lines along with 2 checks TAMS-38 and JS-335. The experiment was conducted at Shankar Nagar, Research field of Agricultural Botany section, College of Agriculture, Nagpur during *kharif* 2019. Mutant lines with checks were evaluated for days to 50% flowering, days to maturity, plant height, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, 100 seed weight, oil content and seed yield plant<sup>-1</sup>. The data were analysed for character association i.e. correlation and path analysis. Correlation study revealed that plant height, number of pods plant<sup>-1</sup>, 100 seed weight had strong positive correlation with seed yield plant<sup>-1</sup>, while path analysis suggested number of pods plant<sup>-1</sup> followed by 100 seed weight and plant height recorded magnitudinally highest positive direct effect on seed yield plant<sup>-1</sup>.

( Keywords: Soybean, correlation, path analysis )

#### INTRODUCTION

Soybean (*Glycine max* L. Merrill) is a leguminous and self-pollinated crop, having chromosome number  $2n = 40$ . Soybean is also known as "Gold of soil" due to its various qualities such as ease in cultivation, less requirement of fertilizers and labour resulting in high cost-benefit ratio. Soybeans, like most legumes, perform nitrogen fixation by establishing a symbiotic relationship with the bacterium *Bradyrhizobium japonicum* capable of transforming nearly 60-100 kg atmospheric nitrogen into 30-40 kg nitrogen in the soil. *Glycine max* is probably polyploid in its origin although the exact nature of its origin is yet to be understood (Darlington and Janaki Ammal, 1945). It is categorized as an oilseed rather than a pulse, despite being the rich source of protein and used as food and feed by the human as well as livestock across the globe.

This soybean has grown within China used for more than 4000 years (Hymowitz, 1970). Soybean being predominantly self-fertilized, inherent variability in this crop may not be sufficient to develop new varieties possessing different desirable characters. It carries a very high nutritional value which contains about 40% proteins, possessing high level of essential amino acids except methionine and cysteine, 20% oil rich in polyunsaturated fatty acids specially omega-6 and omega-3 fatty acids, 6 to 7% total minerals, 5 to 6% crude fibre and 17 to 19% carbohydrates (Chauhan *et al.*,

1988). Besides, it has a number of nutraceutical compounds such as tocopherol, iron, vitamin B-complex, lecithin and isoflavones such as daidzein, genistein of glycytin made it one of the most valuable agronomic crops in the world (Khan and Tyagi, 2013). Yield and related characters are controlled by the polygenic system. Under such situation, mutation breeding is now playing an important role in developing new genetic resource and breakage of unwanted linkages.

The induced mutation has generated a vast amount of genetic variability and is now widely used for the development of gene controlling traits and understanding the functions and mechanism of actions of these genes in plants. The cultivar TAMS-38 is taken for the study because this cultivar is recommended as high yielding, better adoptable into the area of Vidarbha but highly susceptible to root rot and moderately susceptible to YMV. This situation heads breeders on to new breeding technologies.

The knowledge of association of plant characters as determined by the correlation coefficient is helpful for selection of desirable characteristics under a breeding programme. Thus, measurement of correlation between characters is a matter of correlation response. The estimate of path coefficient analysis is important for better understanding of the crop. It gives specific measure on the direct and indirect of each component character upon yield. Hence, it is important to have the knowledge of association of yield and yield contributing traits among themselves.

1 and 3 , P.G. Students, Agril. Botany section, College of Agriculture Nagpur, Maharashtra  
2. Asst. Professor, Agril. Botany Section, College of Agriculture, Nagpur  
3. Head, Dept. of Botany NAC&S College Parne, Maharashtra



**MATERIALS AND METHODS**

The experiment was conducted at Shankar nagar, Research field of Agril. Botany section, College of Agriculture, Nagpur during *khariif* 2019. In *khariif* 2019-20 all the harvested seed from each (20) mutants of M<sub>0</sub> generation along with 2 checks (TAMS-38 and JS-335) were sown to raise M<sub>1</sub> generation using Randomized Block Design replicated thrice. All the recommended cultural practices were followed to raise a good crop.(Table 1).

The data on days to 50 % flowering, days to maturity, plant height (cm), number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, 100 seed weight (g), oil content (%) and seed yield plant<sup>-1</sup>(g) were recorded. Correlation and path analysis were calculated for all characters according to the methods suggested by Dewey and Lu (1959).

**RESULTS AND DISCUSSION**

In correlation study (Table 2), days to 50% flowering, days to maturity, number of branches and oil content (%) had negative correlation with seed yield plant<sup>-1</sup>. Malik *et al.* (2006) reported correlation coefficient for bean yield was positive with leaf area, first pod height, days to flowering, days to maturity, plant height and number of branches also. Muhammad *et al.* (2007) reported grain yield

had positive and significant correlation with all the characters except days to flowering.

Similar results were reported by Mahbub *et al.* (2015).They stated that plant height, pod length, number of seeds per pod, number of pods plant<sup>-1</sup>,hundred seed weight, branches plant<sup>-1</sup> and number of seeds pod<sup>-1</sup> showed significant positive genotypic and phenotypic correlation with seed yield. Jain *et al.* (2014) reported number of pods plant<sup>-1</sup> and 100 seed weight exhibited positive and significant correlation with seed yield plant<sup>-1</sup>.Oil content reported negative but significant correlation at both genotypic and phenotypic level (-0.4991, -0.3161) with seed yield plant<sup>-1</sup>. Similar results were reported by Haghi *et al.* (2012). They found positive and significant correlation among 100 seed weight and oil content. Number of pods plant<sup>-1</sup> followed by plant height and 100 seed weight also exhibited positive and significant correlation at both the levels with seed yield plant<sup>-1</sup>.

In path analysis (Table 3) it was found that number of pods plant<sup>-1</sup> (0.4098) recorded magnitudinally the highest positive direct effect on seed yield plant<sup>-1</sup> followed by 100 seed weight (0.3938) and plant height (0.0393). The characters days to 50% flowering (-0.5369) recorded highest but negative direct effect on seed yield plant<sup>-1</sup> followed by oil content (-0.2514), days to maturity (-0.0227) and number of branches (- 0.0405). The residual effect was found to be

**Table 1. Details of treatments (Mutant lines) used in the study**

Mutant line no.	Pedigree	Characters
1	T2/5/8-1	Early flowering and elliptic leaves
2	T2/19/2-1	High yielding and more number of Pods
3	T2/5/4-1	High yielding, oblong leaves, more branches and pod
4	T2/20/6-1	Early maturity
5	T2/20/7-1	High yielding
6	T2/20/6-1	Early maturity
7	T2/5/3-2	Early maturity
8	T2/20/12-1	High yield and good plant type
9	T2/21/6-1	Early maturity and more pods
10	T2/2/1-1	More number of pods and branches
11	T2/18/2-1	More number of pods, late maturity
12	T2/23/5-1	More number of pods and branches
13	T2/20/10-1	Early maturity and high yielding
14	T2/5/1-1	Early flowering
15	T2/23/5-3	More number of pods and branches
16	T2/19/4-2	High yielding
17	T2/5/5-1	More number of pods and high Yielding
18	T2/20/11-1	High yielding
19	T2/20/4-1	High yielding
20	T2/21/15-1	Early flowering and maturity
21	TAMS-38	Check variety
22	JS-335	Check variety

Table 2. Genotypic and phenotypic correlation of different traits with seed yield plant<sup>-1</sup>

Characters		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches plant <sup>-1</sup>	No. of pods plant <sup>-1</sup>	100 seed weight (g)	Oil content (%)	Seed yield plant <sup>-1</sup>
Days to 50% flowering	G	<b>1.000</b>	0.5335**	-0.2237	-0.0431	-0.2019	0.5308**	-0.2827**	-0.3588**
	P	<b>1.000</b>	0.2865*	-0.2102	-0.1257	-0.0874	0.0759	-0.1617	-0.1574
Days to maturity	G		<b>1.000</b>	-0.4313**	-0.0266	-0.3420**	0.0096	0.3531**	-0.5520**
	P		<b>1.000</b>	-0.1994	-0.1169	-0.2290	-0.0194	0.2504*	-0.2417*
Plant height (cm)	G			<b>1.000</b>	-0.1299	0.5114**	0.2456*	-0.5491**	0.6188**
	P			<b>1.000</b>	-0.1269	0.3624**	0.2509*	-0.4529***	0.3866**
No. of branches plant <sup>-1</sup>	G				<b>1.000</b>	-0.1485	0.0959	0.1903	-0.0828
	P				<b>1.000</b>	0.0900	0.1088	0.1304	0.1021
	G					<b>1.000</b>	0.1535	-0.4522**	0.7262**
No. of pods plant <sup>-1</sup>	P					<b>1.000</b>	-0.0009	-0.2806*	0.7834**
	G						<b>1.000</b>	-0.4531**	0.2912**
	P						<b>1.000</b>	-0.3019	0.1052
100 seed weight (g)	G							<b>1.000</b>	-0.4991**
	P							<b>1.000</b>	-0.3161**
Oil content (%)	G								<b>1.000</b>
	P								<b>1.000</b>
Seed yield plant <sup>-1</sup> (g)	G								<b>1.000</b>
	P								<b>1.000</b>

123

Table 3. Direct and indirect effects of seven variables on yield of soybean mutant lines

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches plant <sup>-1</sup>	No. of pods	100 seed weight (g)	Oil content	Seed yield plant <sup>-1</sup>
1	Days to 50% flowering	<b>-0.5369</b>	-0.0121	-0.0088	0.0017	-0.0827	0.2090	0.0711	-0.3588**
2	Days to maturity	-0.2865	<b>-0.0227</b>	-0.0169	0.0011	-0.1401	0.0038	-0.0888	-0.5502**
3	Plant height (cm)	0.1201	0.0098	<b>0.0393</b>	0.0053	0.2096	0.0967	1.1381	0.6188**
4	No. of branches	0.0231	0.0006	-0.0051	<b>-0.0405</b>	-0.0609	0.0378	-0.0378	-0.0828
5	No. of pods plant <sup>-1</sup>	0.1084	0.0078	0.0201	0.0060	<b>0.4098</b>	0.0604	0.1137	0.7262**
6	100 seed weight (g)	-0.2850	-0.0002	0.0096	-0.0039	0.0629	<b>0.3938</b>	0.1139	0.2912**
7	Oil content (%)	0.1518	-0.0080	-0.0216	-0.0061	-0.1853	-0.1785	-0.2514	-0.4991**

124

325

0.479 which reveals that sufficient characters were included in the path coefficient and hence, the information drawn can be used. From the foregoing discussion we concluded that plant height, number of pods plant<sup>-1</sup> and 100 seed weight were emerged as major components of seed yield in soybean.

Similar results also reported by Balla and Ibrahim (2017). They detected highly positive direct effect for grain yield with days to 50% flowering, days to maturity, plant height and number of pods plant<sup>-1</sup>. Ekka and Lal (2016) reported that seed index, plant height and pod length showed positive direct effect with seed yield plant<sup>-1</sup>. Shilpashree *et al.* (2019) studied path analysis on vegetable soybean and revealed that number of pods plant<sup>-1</sup> showed highest direct positive effect on green pod yield plant<sup>-1</sup> followed by pod weight, days to first harvest and pod length. Jogdande *et al.* (2017) identified parameters like stalk length, canopy diameter, stem girth and plant height for primary selection based on positive significant and high direct effect. Based on these characters five characters were selected for further purification

## REFERENCES

- Balla, M. Y. and S. E. Ibrahim, 2017. Genotypic correlation and path coefficient analysis of soybean [*Glycine max* (L.) Merrill] for yield and its components. *Agri. Res. and Tech., Open Access J.* 7(3): 555-715.
- Chauhan, G. S., N. S. Verma and G. S. Bains, 1988. Effect of extrusion processing on the nutritional quality of protein in rice-legume blends. *Nahrung*, 32(1): 43.
- Darlington, C. D. and E. K. J. Ammal, 1945. *Chromosome atlas of cultivated plants*. George Allen and Unwin Ltd., London. Pp-397.
- Dewey, D. R. and K. H. Lu, 1958. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* 51:515-518.
- Ekka, N. P. and G. M. Lal, 2016. Study on genetic variability and character association in soybean [*Glycine max* (L.) Merrill] germplasm at vindhyan zone of Uttar Pradesh. *Agri. Sci. Digest* 36 (1) : 69-71.
- Haghi, Y., B. Pardis, M. Mahshid, H. Manna, E. Pegah, E. Foroozandeh and D. Shokooh, 2012. Correlation and path analysis for yield, oil and protein content of soybean [*Glycine max* L.] genotypes under different levels of nitrogen starter and plant density. *Bih. Biol.* 6(1):32-37.
- Hymowitz, T. 1970. On the domestication of the soybean. *Econ. Bot.* 24(4): 408-421.
- Jain, S., S. C. Srivastava, S. K. Singh, Y. M. Indapuekar and B. K. Singh, 2014. Studies on genetic variability, character association and path analysis for yield and its contributing traits in soybean [*Glycine max* (L.) Merrill]. *Legume Res.* 38 (2): 182-184.
- Jogdande, P. N., Shanti Patil, V. S. Jayade, R. V. Chahande and V. R. Jaybhange, 2017. Character association & path coefficient analysis in ruse (*Rosa spp.*). *J. Soils and Crops.* 27(2): 109-115.
- Khan, M. H. and S. D. Tyagi, 2013. A review on induced mutagenesis in soybean. *J. Cereals Oilseeds*, 4(2): 19-25.
- Mahbub, M. M., M. M. Rahman, M. Hossain, F. Mahmud and M. M. Kabir, 2015. Genetic variability, correlation and path analysis for yield and yield components in soybean. *American-Eurasian J. Agric. and Environ. Sci.* 15 (2): 231-236.
- Malik, M.F.A., M. Ashraf, A. Qureshi and A Ghaffor, 2007. Assessment of genetic variability, correlation and path analysis for yield and its components in soybean. *Pak J. Bol.* 39 (2) : 405-413.
- Muhammad, A., A. Nazar and A. Ghaffoor, 2007. Character correlation and path coefficient in soybean [*Glycine max* L.) Merrill]. *Pak. J. Bol.* 38 (1) : 121-130.
- Shilpashree, N., S. N. Devi, P. Anitha and P. Indira, 2019. Character Association and Path Analysis Studies in Vegetable Soybean (*Glycine max* L.). *Int. J. Curr. Microbiol. App. Sci.* 8(08): 1011-1018.

Rec. on 05.10.2020 & Acc. on 25.10.2020

## 9. Eco-Friendly Synthesis of New Thiazole Anchored N'-Benzylidene Carbohydrazone Derivatives

Scholars Impact: International Multidisciplinary Multilingual Peer Reviewed Research Journal

8.

### ECO-FRIENDLY SYNTHESIS OF NEW THIAZOLE ANCHORED N'-BENZYLIDENE CARBOHYDRAZIDE DERIVATIVES

Vaibhav P. Landage<sup>1</sup>, Hemant N. Akolkar<sup>2</sup>, Dilip R. Thube<sup>1\*</sup> And Bhausaheb K. Karale<sup>2\*</sup>

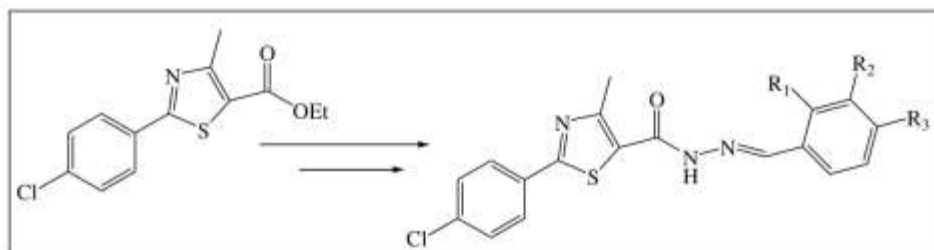
<sup>1</sup>Department of Chemistry, Ahmednagar Jilha Maratha Vidya Prasarak Samaj's New Arts, Commerce and Science College, Savitribai Phule Pune University, Parner, Ahmednagar, India

<sup>2</sup>Department of Chemistry, Rayat Shikshan Sanstha's Radhabai Kale Mahila Mahavidyalaya, Savitribai Phule Pune University, Ahmednagar, India

Email: drthube@rediffmail.com

#### Abstract

The 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazone **3** and aromatic aldehyde **4** were heated together in alcohol under ultra-sonication to get new series of thiazolyl benzylidene carbohydrazone **5A-K**. Structures of newly synthesized compounds were verified by spectral and elemental analysis. Eco-friendly, excellent yield with shorter time are the benefits of the method.



#### Key Words

Benzylidene carbohydrazone, Thiazole, Ultra Sonicator irradiations.

#### Introduction

Environmental pollution can be minimized by applying green chemistry principles [1]. Ultrasound effect is an acoustic wave cavitation, which accelerates organic reactions [2]. Ultra-sonication irradiation is one of the eco-friendly approaches with littler time. On application of ultrasound waves, increase in reaction rates and yields improved [3]. Ultrasound irradiation has been employed to hasten number of synthetic organic reactions [4].

For design of new drug, heterocyclic compound plays vital role due to their worthy biological potential. 1,3- thiazole a five membered heterocyclic compound bearing sulfur and nitrogen in the ring. Thiazole derivatives are found to possesses wide range biological properties including antimicrobial [5] antitubercular [6], antitumor [7], anti-inflammatory [8], anti-HIV [9], antioxidant [10], anticonvulsant [11] and anticancer [12].

Carbohydrazone compounds containing active fragment (-CONHN=CH-) generally exist in drug molecules. Carbohydrazone derivatives are known to have broad range biological activities such as anticancer [13], anti HIV [14], antitubercular [15], anti-inflammatory [16], antimalarial [17], and antimicrobial [18].

Above synthetic and biological importance of thiazole and carbohydrazone, promoted us to synthesize a new series of thiazolyl benzylidene carbohydrazone.

#### Results And Discussion

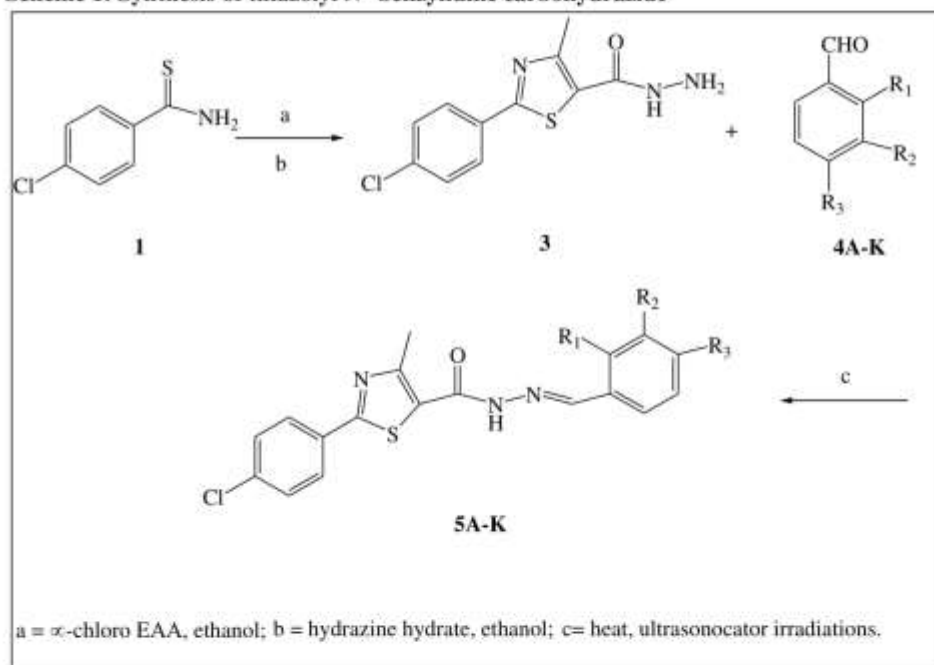
VOL.7 | ISSUE 4 | Oct To Dec 2020 www.scholarsimpact.com|scholarsimpact@yahoo.com

39

Scholars Impact: International Multidisciplinary Multilingual Peer Reviewed Research Journal

In the present study, non-conventional syntheses of new benzylidine carbohydrazone derivatives were projected according to **scheme 1**. The structures of newly synthesized compounds were predictable by taking spectral data such as proton nuclear magnetic ( $^1\text{H}$  NMR), fourier- transform infrared (FT-IR) and mass spectrometry (MS). Eleven benzylidine carbohydrazone derivatives **5A-K** were synthesized and characterized. Data of all the FT-IR,  $^1\text{H}$  NMR and liquid chromatography-MS spectra were specific according to the proposed structures of the final compounds. Elemental data were also in acceptable range to confirm the formation of these derivatives. We carried out the proposed synthesis of (*E*)-*N'*-benzylidine-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazone **5A-K** under ultrasonicator irradiation, using equimolar mixture of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazone **3** and aromatic aldehydes **4A-K**. The IR spectra of **5A-K** showed a strong absorption band at  $3165\text{-}3273\text{ cm}^{-1}$  and  $1653\text{-}1657\text{ cm}^{-1}$  due to N-H of carbohydrazone and carbonyl group respectively. The  $^1\text{H}$  NMR spectra showed two singlets at  $\delta$  7.89-8.55 ppm and  $\delta$  12.08-12.19 ppm for the CH=N- and NH-N=C- groups respectively. The mass spectrum of one of the represented compound **5G** showed a molecular ion peak at  $m/z = 401.2$  ( $M+1$ )<sup>+</sup>, endorsed the formation of desired product.

**Scheme 1: Synthesis of thiazolyl *N'*-benzylidine carbohydrazone**



**Table1: Physical data of the synthesized compounds**

Scholars Impact: International Multidisciplinary Multilingual Peer Reviewed Research Journal

Comps	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	M.P. (°C)	Ultrasonication Method	
					Time (min.)	Yield <sup>a</sup> (%)
5A	H	H	Cl	278-280	21	87
5B	H	H	Br	286-288	21	85
5C	H	H	OH	266-268	24	84
5D	Cl	H	H	280-282	21	76
5E	H	H	H	250-252	18	82
5F	H	H	OCH <sub>3</sub>	260-262	24	83
5G	H	H	NO <sub>2</sub>	288-290	15	89
5H	NO <sub>2</sub>	H	H	282-284	15	90
5I	OH	H	OCH <sub>3</sub>	276-278	27	86
5J	H	OCH <sub>3</sub>	OCH <sub>3</sub>	284-286	27	77
5K	H	H	CH <sub>3</sub>	268-270	21	82

### Experimental Section

The chemicals used were of AR grade. Melting points were determined by open capillary method and are uncorrected. The homogeneity of compounds was checked on silica gel TLC plates. IR spectra were recorded on a FT-IR spectrophotometer RZX (Perkin Elmer) and Mass spectra were recorded on a Q-TOF MICRO WATER, MS ES+3.79e3. <sup>1</sup>H NMR spectra were recorded on a BRUKER AVANCE NEO 500 NMR spectrometer with DMSO-*d*<sub>6</sub> as a solvent and chemical shift (δ) are expressed in ppm using TMS as internal standard.

### General Procedure-

#### (*E*)-*N'*-(2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazides, 5A-K

Ultra-Sonication, Eco-friendly method

An equimolar mixture of compound **3** (0.01 mole) and aromatic aldehyde **4** (0.01 mole) with 3 drops of conc.H<sub>2</sub>SO<sub>4</sub> in soluble amount of alcohol was heated under ultra-sonication per interval of 3 minute till completion of reaction (checked by TLC), thus obtained solid product was cooled, filtered and recrystallized from alcohol to give benzylidine carbohydrazide **5**.

#### 5D: (*E*)-*N'*-(2-(2-chlorobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3245 (N-H), 3058 (C-H), 1653 (C=O), 1090 (Ar-Cl), 832 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 390.27 (M)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.77 (s, 3H, CH<sub>3</sub>), 7.48 (d, 2H, Ar-H), 7.54 (dd, 1H, Ar-H), 7.62 (d, 2H, Ar-H), 8.03 (m, 3H, Ar-H), 8.55 (s, 1H, N=C-H), 12.08 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>OCl<sub>2</sub>N<sub>3</sub>S: C, 55.39; H, 3.36; N, 10.77. Found: C, 55.37; H, 3.34; N, 10.75 %.

#### 5G: (*E*)-*N'*-(4-nitrobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3273 (N-H), 3052 (C-H), 1657 (C=C), 1522 (Ar-NO<sub>2</sub>), 1344 (C-N), 1090, 846 (Ar-Cl), 827 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 401.29 (M+1)<sup>+</sup>, 403.29 (M+3); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.77 (s, 3H, CH<sub>3</sub>), 7.61 (d, 2H, Ar-H), 8.03 (d, 2H, Ar-H), 8.07 (d, 2H, Ar-H), 8.23 (s, 1H, N=C-H), 8.36 (d, 2H, Ar-H), 12.19 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>O<sub>3</sub>ClN<sub>4</sub>S: C, 53.94; H, 3.27; N, 13.98. Found: C, 53.96; H, 3.30; N, 13.96 %.

#### 5H: (*E*)-*N'*-(2-(2-nitrobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3165 (N-H), 3051(C-H), 1657 (C=O), 1528 (Ar-NO<sub>2</sub>), 1092 (Ar-Cl), 832 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 401.29 (M+1)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.76 (s, 3H, CH<sub>3</sub>), 7.60 (d, 2H, Ar-H), 7.70 (dd, 1H, Ar-H), 7.89 (s, 1H, N=C-H), 8.02 (d, 2H, Ar-H) 8.11 (dd, 1H, Ar-H), 8.14 (d, 1H, Ar-H), 8.55 (s, 1H, N=C-H), 12.18 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>O<sub>3</sub>ClN<sub>4</sub>S: C, 53.94; H, 3.27; N, 13.98. Found: C, 53.97; H, 3.29; N, 13.95 %.

**Acknowledgement**

The authors are thankful to P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar and P.G. Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar, for providing chemicals and constant encouragement. The authors also thankful to the Management of Anekant Education Society, Baramati for providing necessary research facilities and to the Director, SAIF, Panjab University, Chandigarh, for providing spectral and elemental data.

**References**

- [1] S.V.H.S. Bhaskaruni, S. Maddila, W.V. Zyl and S.B. Jonnalagadda, *RSC Adv.*, 8, **2018**, 16336-16343.
- [2] N. Shabalala, S. Maddila and S.B. Jonnalagadda, *New J. Chem.*, 40, **2016**, 5107-5112.
- [3] A. K. Sinha, A. Sharma and B.P. Joshi, *Tetrahedron*, 63, **2007**, 960-965.
- [4] H. Fillion, J. L. Luche, in: J. L. Luche (Ed.), *Synthetic Organic Sonochemistry*, Plenum, New York, 1998.
- [5] T. Nasr, S. Bondock and S. Eid, *J. Enzym. Inhib. Med. Chem.*, 31, **2016**, 236-246.
- [6] P. Makam, R. Kankanala, A. Prakash and T. Kannan, *Eur. J. Med. Chem.*, 69, **2013**, 564-576.
- [7] H. He, X. Wang, L. Shi, W. Yin, Z. Yang, H. He and Y. Liang, *Bioorg. Med. Chem. Lett.*, 26, **2016**, 3263-3270.
- [8] M. H. M. Helal, M. A. Salem, M. S. A. El-Gaby and M. Aljahdali, *Eur. J. Med. Chem.*, 65, **2013**, 517-526.
- [9] G. Maass, U. Immendoerfer, B. Koenig, U. Leser, B. Mueller, R. Goody and B. Pfatt, *Antimicrob. Agents Chemother.*, 37, **1993**, 2612-2617.
- [10] M. H. Shih and K. F. Ying, *Bioorg. Med. Chem.*, 12, **2004**, 4633-4643.
- [11] K. M. Amin, A. D. E. Rahman and Y. A. Al-Eryani, *Bioorg. Med. Chem.*, 16, **2008**, 5377-5388.
- [12] S. M. Gomha, T. A. Salah, A. O. Abdelhamid, *Monatsh. Chem.*, 146, **2015**, 149-158.
- [13] M. M. Ali, M. Jesmin, M. K. Islam and M. A. K Azad, *Med. J. Isl. W. Acad. Sci.*, 21(3), **2013**, 47-104.
- [14] S. N. Pandeya, G. Nath and E. DeClecq, *Euro. J. Pharm.*, 9(1), **1999**, 25-31.
- [15] M. R. Islam, A. H. Mirza, Q. M. N. Huda and B. R. Khan, *J. Bang. Chem., Soc.*, 2, **1989**, 87-95.
- [16] G. A. A. Silva, L. M. M Costa, F. C. F. Brito, A. L. P. Miranda, E. J. Barreiroa, C. A. M. Fraga, *Bioorg. Med. Chem.*, 12, **2004**, 3149-3158.
- [17] S. Gemma, G. Kukreja, C. Fattorusso, M. Persico, M. P. Romano, M. Altarelli, L. Savini, G. Campiani, E. Fattorusso, N. Basilico, D. Taramelli, V. Yardleye and S. Butinia, *Bioorg. Med. Chem. Lett.*, 16, **2006**, 5384-5388.
- [18] P. Vicini, F. Zani, P. Cozzini and I. Doytchinova, *Eur. J. Med. Chem.*, 37, **2002**, 553-564.

□□□

## 10. Lokjagrutichi Chalwal Aani Muknayak

# महाराष्ट्र साहित्य पत्रिका

जानेवारी ते मार्च २०२१



आंतरराष्ट्रीय ख्यातीचे संशोधक आणि साहित्यिक

**डॉ. जयंत नारळीकर**यांची नाशिक येथे होणाऱ्या ९४ व्या अखिल भारतीय मराठी साहित्य संमेलनाच्या  
अध्यक्षपदी निवड झाल्याबद्दल अभिनंदन !





महाराष्ट्र साहित्य परिषदेचे त्रैमासिक मुखपत्र  
**महाराष्ट्र साहित्य पत्रिका**

अंक क्र. ३७३, जानेवारी ते मार्च २०२१

॥ संपादक ॥  
**डॉ. पुरुषोत्तम काळे**

॥ संपादन समिती ॥  
डॉ. मनोहर जाधव । डॉ. नीलिमा गुंडी  
डॉ. भास्कर ढोके । डॉ. रणधीर शिंदे  
डॉ. वर्षा तोडमल

॥ प्रकाशक ॥  
**प्रकाश पायगुडे**  
प्रमुख कार्यवाह

**महाराष्ट्र साहित्य परिषद, पुणे**  
टिळक रस्ता, पुणे ४११०३०.  
दूरभाष । ०२०-२४४७५९६३  
संकेतस्थळ । [www.masapapune.org](http://www.masapapune.org)  
ई-मेल । [masaparishad@gmail.com](mailto:masaparishad@gmail.com)

कार्यालयाची वेळ ।  
सकाळी ९.०० दुपारी १२.००  
दुपारी ४.३० ते रात्री ८.००





- मुद्रक-प्रकाशक  
**प्रकाश पायगुडे**  
प्रमुख कार्यवाह  
महाराष्ट्र साहित्य परिषद,  
टिळक रस्ता, पुणे ४११०३०
- जाहिरात व्यवस्थापक  
**वि. दा. पिंगळे**  
९८८९२३५०३३
- संपादकीय संयोजन  
**संदीप खाडे**
- अक्षरजुळणी व सजावट  
**लक कलाकल्य**
- मुखपृष्ठ  
**जयदीप कडू**
- मुद्रितशोधन  
**आरती देवगांवकर**
- मुद्रणस्थळ  
**एस. ए. प्रिंटर्स, एल. एल. पी.**  
फ्लॅट नं. ५, ३ रा मजला,  
सिद्धीविनायक अपा.,  
शिवदर्शन, पुणे ४११००९  
**मूल्य : १५ रुपये**
- प्रकाशन क्र. ३७३  
जानेवारी ते मार्च २०२१  
या अंकात व्यक्त झालेल्या  
विचारांशी संपादक, संपादन समिती,  
सत्तागार मंडळ तसेच प्रकाशक  
सहमत असतीलच असे नाही.

## अंतरंग

मसाप पत्रिका । जानेवारी ते मार्च २०२१ अंक

- ◆ संपादकीय । डॉ. पुरुषोत्तम काळे । ३
- ◆ जयंत नारळीकर: व्यक्ती आणि वाङ्मय।  
प्रा. चिन्मय मधू घैसास । ६
- ◆ नवोदितांचा मार्गदर्शक हरवला । डॉ. अशोक कौतिक कोळी । १२
- ◆ अष्टपैलू व्यक्तिमत्त्वाच्या डॉ. लीला गोविलकर ।  
डॉ. स्नेहल तावरे । १८
- ◆ मुळीचा झरा । प्रा. मिलिंद जोशी । २१
- ◆ जागतिकीकरण संस्कृति-संघर्ष करेल ।  
प्रा. डॉ. मिलिंद कसबे । २४
- ◆ उत्तर महाराष्ट्रातील उद्योग जगताचा इतिहास  
विडीची गोष्ट । प्रा. डॉ. प्रकाश शेवाळे । ३४
- ◆ लोकजागृतीची चळवळ आणि मूकनायक ।  
प्रा. डॉ. हरेण शेळके । ४०
- ◆ मराठी कादंबरी अभिरुची आणि राजकारण । गजानन भोसले । ४७
- ◆ प्रकाशन संस्था व साहित्य व्यवहार ।  
प्रा. नंदकुमार भाऊसाहेब उदार । ५८
- ◆ ड्रेन । नारायण लाळे । ६५
- ◆ लोकशाहीर द. ना. गव्हाणकर । सी. पूजा पराग सामंत । ७३
- ◆ पटेली- तथ्यात्वभावाचा शोध । भास्कर ढोके । ७७
- ◆ लाडी: कातकरी समाज जीवनाचे वास्तव चित्रण  
मांडणारी कादंबरी । प्रा. मिथुन शेळके । ८१
- ◆ एकनाथी भागवतातील शेती । डॉ. हंसराज जाधव । ८४
- ◆ वळीव: आदिम समाजव्यवस्थेचे संस्कृतीनिष्ठ आकलन ।  
डॉ. कैलास सलादे । ८९
- ◆ अस्वस्थ मनाचे बंड: आदिवासी साहित्य प्रवाहाला  
समृद्ध करणारी कविता । डॉ. सखाराम डाखोरे । ९५
- ◆ ओळ तुझ्या माझ्या स्वातंत्र्याची.. यत्नार बोलणारी  
कविता.. । दत्ता थोरे । १०२
- ◆ समाजभानाची प्रायोगिक जीवनकथा  
(मी गोष्टीत मावत नाही) । डॉ. सविता पटेल । १०५
- ◆ जागतिकीकरणातील शेतीधारित जगण्याची प्रत्ययकारी  
कविता: आगंतुकाची स्वगते । प्रा. डॉ. सुभाष निवृत्ती शेळके । १०८
- ◆ व्यापक जीवनाभूतीचे तळ ढवळणारे अधांतरीचे प्रश्न।  
डॉ. अरुण ठोके । ११५
- ◆ मुलूखमाती । बाळासाहेब कांबळे । १२२
- ◆ सृजन संवाद मुलाखतींच्या मैफिलीची अवीट मेजवानी।  
दीपक चैतन्य । १२४
- ◆ कार्यवृत्त । १२६



भारतरत्न डॉ. बाबासाहेब आंबेडकरांच्या 'मूकनायक' या पाक्षिकाला शंभर वर्षे पूर्ण होत आहेत. मूकनायकमधील डॉ. बाबासाहेब आंबेडकरांच्या विचारांचा आढावा घेणारा लेख.

## लोकजागृतीची चळवळ आणि मूकनायक

प्रा. डॉ. हरेश शेळके

**डॉ.** आंबेडकरांनी मूकनायक हे पाक्षिक ३१ जानेवारी १९२० रोजी सुरू केले. त्याला बरोबर आता शंभर वर्षे पूर्ण होत आहेत त्या निमित्ताने...

महाराष्ट्राला खूप मोठी उज्वल अशी वैचारिक परंपरा लाभलेली आहे. त्यातूनच महाराष्ट्राची उत्तम अशी जडणघडण झालेली आहे, म्हणूनच महाराष्ट्राची इतर राज्यांच्या पातळीवर नव्हे तर देशाच्या पातळीवर एक वेगळी ओळख आहे. ही महाराष्ट्राची ओळख बनविण्यात अनेक दिग्गजांनी, रथी - महार्थींनी प्रचंड मोठे योगदान दिलेले आहे. याच सर्व उंबरठ्यावर मागे बळून पाहिले, की लक्षात येते, जानेवारी १९२०मध्ये डॉ. बाबासाहेब आंबेडकरांनी 'मूकनायक' हे पाक्षिक सुरू केले होते. त्याला आता बरोबर शंभर वर्षे पूर्ण होत आहेत. या मूकनायकाच्या शताब्दी वर्षानिमित्त पुन्हा एकदा वाटले मूकनायकचे पुनरावलोकन करूयात. प्रत्येक कालखंडाचे मूल्यमापन आपण जेव्हा करतो तेव्हा त्या कालखंडात घडलेल्या महत्त्वाच्या घटनांचे, संदर्भांचे, विश्लेषण हे परिवर्तनाच्या प्रत्येक टप्प्यावर व्हायला पाहिजे असे वाटते.

मूकनायक आणि बहिष्कृत भारत याविषयी खूप विचारमंथन यापूर्वी अनेक अभ्यासकांनी केलेले आहे. तरीही या लेखात मूकनायकमध्ये त्या काळात

कोणकोणत्या बातम्या विशेष करून छापल्या जात होत्या, अस्पृश्य समाजाचे कोणते प्रश्न त्या वेळी मांडले जात होते, त्या काळातील महत्त्वाचे नेमके प्रश्न कोणते होते, सामाजिक प्रश्नांची तीव्रता कशी होती, मूकनायक या सर्व पार्श्वभूमीवर कशा पद्धतीने समाजाचे वैचारिक भरण-पोषण करत होते हे येथे आपण जाणून घेणार आहोत. वृत्तपत्र ही फक्त विचार देण्याचे काम करत नाहीत, तर समाजाला दिशा दाखवून समाजनिर्मितीचे महत्त्वाचे कार्य करत असतात. सुधारकांचा हेतू स्पष्ट करताना गोपाळ गणेश आगरकरांनी शंभर वर्षांपूर्वी जे लिहून ठेवले तेच आजही पत्रकारितेत लागू आहे. ते म्हणतात, 'स्वभूमीत, स्वलोकात, स्वधर्मात राहून अविचारी व अज्ञान देशबांधवांच्या निंदेस किंवा छळास न भिता त्यांच्याशी कधी भांडून, कधी युक्तिवाद करून, कधी लाडीगोडी लावून अथवा सामर्थ्य असल्यास कधी त्यांना दटावून त्यांची सुधारणा करणे यातच खरी देशप्रीती, खरी बंधुता खरा देशाभिमान, खरे शहाणपण व खरा पुरुषार्थ आहे.' समाज सुधारकांचे हे ब्रीद बाबासाहेब आंबेडकरांनीदेखील स्वीकारलेले होते. त्याकरिता वृत्तपत्र हे एक अमोघ अस्त्र आहे याची त्यांना जाणीव होती.

वरील आगरकरांच्या विश्लेषणावरून लक्षात येते की, पत्रकारिता म्हणजे केवळ विचार मांडणे, भूमिका स्पष्ट

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ४०

करणे, एवढेच नसून नव्या समाजनिर्मितीसाठी विचारांची पायाभरणी करण्याचे ते महत्त्वपूर्ण शस्त्र आहे. डॉ.आंबेडकरांची भूमिकाही याच धारणेची होती, म्हणूनच त्यांनी सुरुवातीला अस्पृश्य समाजामध्ये जाणीव जागृती घडवून आणण्यासाठीच नव्हे तर संपूर्ण हिंदू समाजातील जनतेला माणसाकडे आपण माणूस म्हणून कसे पाहिले पाहिजे, आपल्या पाहण्याला मानवतावादी दृष्टिकोनाचे अंग कसे असायला हवे यासाठी मूकनायक सुरू केले. ज्या वेळी बाबासाहेबांनी मूकनायक सुरू केले तेव्हा दलित समाजात साक्षरतेचे प्रमाण हजारी नऊदेखील नव्हते. त्या वेळी हे वृत्तपत्र काढले होते हे महत्त्वाचे आहे. यावरून असे लक्षात येते, की बाबासाहेबांनी मूकनायक सुरू करण्याचा विचार किती दूरदृष्टी ठेवून केलेला होता. मूलतः जेथे माणसाला माणसासारखे जगता येईल, जेथे स्वातंत्र्याला वाव राहिल, समानतेला, समान संधींना जिथे विशेष महत्त्व राहिल, उच्च-नीच भेदभाव राहणार नाही अशा विश्वात्मक समाजाचे स्वप्न डॉ.आंबेडकर पाहत होते, म्हणूनच त्यांच्या विचारांच्या केंद्रवर्ती कायम मानवता हे मूल्य दिसून येते.

बाबासाहेबांनी मूकनायक या वृत्तपत्राच्या पहिल्याच अंकात मूकनायक सुरू करण्याची भूमिका स्पष्ट करताना म्हटले होते की, 'आमच्या बहिष्कृत लोकांवर होत असलेल्या व पुढे होणाऱ्या अन्यायावर उपाययोजना सुचविण्यास तसेच त्यांची भावी उन्नती व तिचे मार्ग यांच्या खऱ्या स्वरूपाची चर्चा करण्यास वर्तमानपत्रासारखी अन्य भूमीच नाही म्हणून व स्वजनोद्धाराचे महत्कार्य करणारास योग्य पंथ दाखविण्यासाठी आपण मूकनायक पत्र सुरू करीत आहोत.' डॉ.आंबेडकरांच्या भूमिकेनुसार स्पष्टपणे जाणवते की, त्यांना तत्कालीन समाजात फक्त लोकजागृती घडवून आणणे एवढेच महत्त्वाचे ध्येय वाटत नव्हते, तर संपूर्ण हिंदू समाजात नव्या विचारांचे मंथन घडवून यावे, समाजाचे मानसिक, शारीरिक भरण-पोषण व्हावे असे त्यांना वारंवार वाटत होते, म्हणूनच डॉ. आंबेडकरांची विचारांची पेरणी करण्याच्या बाबतीतील तळमळ आपल्याला त्यांच्या प्रत्येक कृतीतून दिसून येते. त्यांच्या विचारांत सातत्याने आपल्याला तर्कशुद्ध खंडन, युक्तिवाद, डौलदार व आवेशपूर्ण भाषा, समर्पक सुभाषिते अशा प्रकारे विचारमंथन प्रकट झालेले दिसते.

डॉ.आंबेडकरांच्या चळवळीचे यथार्थ मूल्यमापन द्रष्टे विचारवंत करतील आणि काळ करील. सर्वसामान्य वाचकाने प्रथम त्यांचे विचार आज तटस्थ आणि विवेकशील वृत्तीने समजावून घेतले पाहिजेत. ते समजावून घेताना डॉ. आंबेडकरांचा काळ, परिस्थिती आणि त्यांचे विशिष्ट व्यक्तिमत्त्व यांचे भान ठेवले पाहिजे.

वरील विश्लेषणावरून लक्षात येते, की बाबासाहेबांनी केलेली प्रत्येक कृती ही विचारपूर्वक केलेली होती. त्या पाठीमागे त्यांचे द्रष्टेपण ठायी ठायी प्रकट होताना दिसते. त्यांचे मूकनायकमधील विचार, मूकनायकमध्ये प्रकाशित झालेले लेखन, बातम्या या सर्वांचा आपण घांडोळा घेणार आहोत. त्यातून आपणास लक्षात येईल की, मूकनायक वृत्तपत्राची भूमिका तत्कालीन कालखंडात कशी महत्त्वपूर्ण ठरलेली आहे.

मूकनायकाच्या सुरुवातीला डॉ.आंबेडकरांनी संत तुकारामांचा अभंग घेतलेला आहे. तो असा आहे, 'काय करू आता धरूनियां भीड निःशंक हे तोंड वाजविले। नव्हे जर्गी कोणी मुक्तीयांचा जाण सार्थक लाजून नव्हे हित।।'

या चरणातून डॉ. आंबेडकर स्पष्ट सांगू पाहतात, की आता भीड धरून उपयोगाचे नाही. मी विनाकारण हे माझे तोंड वाजवित आहे. खरोखर माझ्या असे लक्षात आले आहे की, या जगात मुक्या लोकांना कोणीच वाली नाही त्यामुळे आपल्याला हाती घेतलेल्या या वृत्तपत्रीय कामामध्ये लाजून चालणार नाही कारण त्यामधून कोणाचेही हित होणार नाही म्हणूनच हे व्रत मी आता स्वीकारले आहे.

मूकनायकाच्या पहिल्याच अंकात डॉ. आंबेडकर लिहितात, 'कोणतीही एखादी जात अवनत झाली, तर तिच्या अवनतीचा चट्टा इतर जातींस बसल्याशिवाय राहणार नाही. समाज ही एक नौकाच आहे व ज्याप्रमाणे आगबोटीत बसून प्रवास करणाऱ्या उतारूने जाणूनबुजून इतरांचे नुकसान करावे म्हणून किंवा आपल्या विनाशक स्वभावामुळे म्हणा, जर का इतरांच्या खोलीस छिद्र पाडले, तर सर्व बोटीबरोबर त्यालाही आधी नाही तरी मागाहून का होईना जलसमाधी ही घ्यावी लागणार आहे. त्याचप्रमाणे एका जातीचे नुकसान केल्याने, प्रत्यक्ष नव्हे, तरी अप्रत्यक्षपणे तरी नुकसान करणाऱ्या जातीचेही नुकसान होणार आहे, यात बिलकुल शंका नाही म्हणूनच

जानेवारी ते मार्च २०२१ | ४१

बाबासाहेबांनी मूकनायक या वृत्तपत्राच्या पहिल्याच अंकात मूकनायक सुरु करण्याची भूमिका स्पष्ट करताना म्हटले होते की, 'आमच्या बहिष्कृत लोकांवर होत असलेल्या व पुढे होणाऱ्या अन्यायावर उपाययोजना सुचविण्यास तसेच त्यांची भावी उन्नती व तिचे मार्ग यांच्या खऱ्या स्वरूपाची चर्चा करण्यास वर्तमानपत्रासारखी अन्य भूमीच नाही म्हणून व स्वजनोद्धाराचे महत्कार्य करणारास योग्य पंथ दाखविण्यासाठी आपण मूकनायक पत्र सुरु करीत आहोत.'

स्वहितसाधू पत्रांनी इतरांचे नुकसान करून आपले हित करण्याचे पढत मूर्खांचे लक्षण शिकू नये.

हा बुद्धिवाद कबूल आहे, अशी वर्तमानपत्रे निघाली आहेत हे सुदैवच म्हणायचे. दीनमित्र, जागरूक, डेक्कन रथ, विजयी मराठा, ज्ञानप्रकाश, सुबोध पत्रिका वगैरे पत्रांतून बहिष्कृत समाजाच्या प्रश्नांची चर्चा वारंवार होते; परंतु ब्राह्मणेतर या अवडंबर संज्ञेखाली मोडत असलेल्या अनेक जातींच्या प्रश्नांचा ज्यात खल होतो, त्यात बहिष्कृतांच्या प्रश्नांचा सांगोपांग ऊहापोह होण्यास पुरेशी जागा मिळणे शक्य नाही, हेही पण उघड आहे. त्यांच्या अतिबिकट स्थितीशी संलग्न असलेल्या प्रश्नांची वाटाघाट करण्यास एक स्वतंत्र पत्र पाहिजे हे कोणीही कबूल करील. ही उणीव भरून काढण्यासाठी या पत्राचा जन्म आहे.'

वरील सविस्तर विवेचन याचसाठी दिले की, कोणत्या पार्श्वभूमीवर डॉ. आंबेडकरांनी मूकनायक सुरु केले. त्यांना मूकनायक सुरु करण्याची तीव्रता कशी जाणवली, विचार करण्यासारखी बाब आहे. आपला समाज जर डोळ्यादेखत बुडत असेल, त्याच्याकडे जाणीवपूर्वक दुर्लक्ष केले जात असेल, त्याला तुच्छतेची वागणूक दिली जात आहे, त्यांच्यातील माणूसपणावरच प्रश्न उपस्थित केले जात असतील, त्यांचा स्वाभिमान मारला जात असेल, आत्मसन्मानाचे जगणेच त्यांच्या वाट्याला येत नसेल, असा भलामोठा निरक्षर, दुर्लक्षित समाज आपल्या अवतीभोवती असताना एका विचारी माणसाला झोपसुद्धा येऊ शकत नाही, इतकं हे सत्य आहे.

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ४२

आजसुद्धा आपण जेव्हा हे वाचतो तेव्हा आपल्या अंगावर शहारे आल्यासारखे होते. भल्यामोठ्या हिंदू समाजात तेथील वर्तमानपत्रांत बहिष्कृत समाजाकडे अगदी जाणीवपूर्वक दुर्लक्ष व्हावे तो समाजही हिंदू समाजाचाच एक भाग असतानाही केवळ खालच्या जातीचे, अस्पृश्य, घाणेरडे अशी बिरुदे लावून एखाद्या समाजावर आक्षेप घेणे म्हणजे महापाप करण्यासारखे होते. त्या वेळी काही दिगज नामवंत वृत्तपत्र चालवत होते. वाणीने प्रकांड पंडित होते; परंतु त्यांच्या लेखणीत आणि वाणीत जमीन-अस्मानाचे अंतर होते. हे अंतर फक्त त्या वेळी एकाच माणसाला मोजता येत होते ते म्हणजे डॉ. आंबेडकर. या अंतरातील सीमारेषा पुसून कशी टाकता येईल यासाठी डॉ. आंबेडकरांनी मूकनायक सुरु केले असे म्हणावे लागेल. समाजातील जातीयता इतक्या टोकाची, तीव्र पातळीची असावी हा विचारही आजसुद्धा आपण करू शकत नाही. त्या वेळची परिस्थिती तर अशी होती की, हिंदू समाजात अस्पृश्य जातीत जन्माला येणे म्हणजे एखाद्याने महापाप करणे असे समजले जाई. या सर्व पार्श्वभूमीवर अतिशय गांभीर्याने विचार केल्यावर जाणवते की, मूकनायकची तत्कालीन काळातील भूमिका ही खूप महत्त्वाची राहिलेली आहे कारण मूकनायकच्या अग्रलेखांतून परिवर्तनाची मुहूर्तमेढ रोवली जात होतीच, झोपलेल्यांना, झोपेचे सोंग घेतलेल्यांना जागे तर केलेच जात होते; परंतु ज्यांना दृष्टी असूनही जे जाणीवपूर्वक आपल्या डोळ्यांवर गांधारीसारखी पट्टी बांधून बाबरातात त्यांना विचारप्रवृत्त करण्याचे मोठे कार्य मूकनायकने केलेले आहे. मूकनायक मधून जे प्रश्न उपस्थित केले गेले, विचार प्रकट केले गेले ते फक्त बहिष्कृत समाजाच्या हितसंबंधांबाबत, केवळ बहिष्कृत समाजावर होणाऱ्या अन्यायाला वाचा फोडण्यासाठी, बहिष्कृत समाजात जागृती घडवून आणण्यासाठीच होते असे नाही, तर हिंदू समाजात जे जातीपातीच्या नावाखाली ढोंग चालले आहे, एकूणच हिंदू समाज जर असाच वागत राहिला, तर एकूणच समाज उन्नतीमध्ये आपण कसे मागे राहू समाजाच्या सर्वांगीण विकासासाठी काय आवश्यक आहे, सर्वांचे कल्याण नेमके कशात आहे अशा सर्व बाजूंवर चहू बाजूंनी विचार करून मूकनायकमध्ये विचार प्रकट केले जात होते.

'विविध विचार' या सदरातील अनेक मथळे डॉ.



आंबेडकरांच्या विचारांचे द्रष्टेपण आपल्याला दाखवतात. मधळ्यांची शीर्षकेच किती दूरगामी विचार करून दिलेली जाणवतात. उदा. स्वराज्याचे मातापिता, बुजतील म्हणून!, मुसलमान ब्राह्मण झाले! या मधळ्यांतून डॉ. आंबेडकर स्पष्टपणे प्रश्न उपस्थित करतात की, मुसलमान ब्राह्मणांच्या पंक्तीस बसले म्हणून वाईट वाटण्याइतके धर्मवेड आमच्यांत आहे; पण ते पाहून पोट दुखण्याइतकी माणुसकी मात्र आमच्यात आहे, आणि म्हणूनच घरच्यास सोडून बाहेरच्यास मिठी मारण्याचे आम्हांस आश्चर्य वाटते. हिंदू गणलेल्या सहा कोटी बहिष्कृत समाजाशी सहभोजन न करता ब्राह्मणांनी बिनबोभाट परधर्मीयांच्या पंक्तीस बसावे हा केवढा अधमपणा? येथे डॉ.आंबेडकरांची भूमिका किती स्पष्ट आणि सरळ असलेली दिसून येते. सहजपणे आपल्याला विचार करायलाही भाग पाडते. म्हणजे जाणीवपूर्वक बहिष्कृत वर्गाला त्रास देण्याचे कार्य हिंदू समाजात सुरू होते. या अशा वातावरणात कोणत्याही प्रकारे अकांडतांडव न करता वैचारिक विचारमंथनाने लढत राहणे ही सोपी गोष्ट नव्हते; परंतु डॉ.आंबेडकरांनी मात्र आपले वैचारिक शहाणपण, वैचारिक समंजस भूमिका, वैचारिक सम्यक विचार कायम सातत्याने प्रगट केलेला आहे. हेच त्यांच्या लेखनशैलीचे खास वैशिष्ट्य आहे.

विशेष म्हणजे मूकनायकमध्ये बहिष्कृतेतर समाजाच्या हिताचे, गौरवाचे, कल्याणाचे, एका अर्थाने समाज, देश, व्यक्ती या सर्वांच्या प्रगतीसाठी परिवर्तनासाठी कोणताही भेदभाव न करता बातम्या छापल्या जात असत. उदा. मानपत्र समारंभ ही बातमी १४ फेब्रुवारी १९२० सालच्या मूकनायकाच्या अंकात सविस्तर छापलेली आहे. यामध्ये रोहिदास समाजासारख्या मागासलेल्या समाजातील अत्यंत गरीब सुप्रसिद्ध क्रिकेटपटू श्री. बाळू बाबाची पालवणकर आणि त्यांचे बंधू यांना रोहिदास विद्यावर्धक समाजाच्या विद्यमाने मानपत्र देण्याचा समारंभ मुंबई येथे आयोजित केला होता. त्याची मानपत्रासहित अगदी पालवणकर यांच्या मनोगतासहित बातमी सविस्तर छापलेली आहे यावरून असे लक्षात येते की, मूकनायकाची भूमिका ही सर्वसमावेशक, राष्ट्रीय, देशहिताचीच राहिलेली आहे.

टोणगे पानहवतील काय? या लेखात डॉ. आंबेडकरांनी प्राथमिक शिक्षण सक्तीचे करण्यासाठी १९१० साली कायदे कौन्सिलांत जे बिल आणले आहे त्याबद्दल सर्वसमावेशक असे विचार प्रकट केले आहेत. 'लोकलज्जेस्तव केसरीकरांनी आपल्या ब्राह्मणी घोरणांत सुधारणा केली आहे. त्यांच्या हल्लीच्या मते फक्त मुलांना सक्तीचे शिक्षण द्यावे मुलींना पुढे पाहू! याचे कारण

जानेवारी ते मार्च २०२१ | ४३

पैशाची तूट! ज्या राष्ट्रीय भक्तांनी स्त्रियांचे शिक्षण मागाहून देऊ म्हणावे यांत दिसून येत असलेली विसंगतता व विचारशून्यता राष्ट्रीय भक्तांशिवाय अन्यत्र सापडेल असे दिसत नाही. येथे आपणास स्पष्टपणे जाणवते की, मुलींना, मागासलेल्या व बहिष्कृत वर्गातील लोकांना शिक्षण मिळाले पाहिजे या अतिशय महत्त्वाच्या विषयापेक्षा केसरीकरांना दुसरे प्रश्न महत्त्वाचे वाटतात. 'येथे स्पष्टपणे दिसून येते की, डॉ. आंबेडकर फक्त टीका करायची म्हणून नाही तर शिक्षण हा प्रश्न केवळ बहिष्कृत वर्गासाठी नव्हे तर संपूर्ण समाजासाठी किती महत्त्वाचा आहे हे या सविस्तर लेखातून स्पष्ट करतात. इतकी स्पष्ट आणि सविस्तर भूमिका त्या काळी फक्त डॉ. आंबेडकरच मांडू शकत असतील कारण त्यांचे अभ्यासपूर्ण चिंतन, संदर्भ देण्याची पद्धत, विश्लेषणाची पद्धत ही कोणाही सामान्यातील सामान्य वाचकाला सहज भावेल अशीच होती म्हणून तर मूकनायक हे सामान्य माणसाच्या, बहिष्कृत समाजाच्या मनाचा, आतील आवाजाचा एक प्रकारे हुंकार होता.

मूकनायकमधील पत्रव्यवहार पाहिल्यावर लक्षात येते की, २७ मार्च १९२० च्या अंकात चौकशी झाली पाहिजे असे एक पत्र आहे. त्यामध्ये लिहिले आहे, निराश्रित साहाय्यकारी संस्था स्थापन होऊन आज तेरा वर्षे झाली. बहिष्कृतांना शिक्षण देऊन त्यांच्यांत जागृती उत्पन्न करणे हे मिशनचे ध्येय आहे. या कामी लोक आणि सरकार यांजकडून मिशनला हजारो रुपये मिळत आहेत; परंतु त्या मानाने मिशनचा उद्देश कितपत सिद्धीस गेला याची आम्हांस मोठीच शंका आहे. एवढेच नव्हे तर मिशनच्या कार्यावरून तिच्या हेतूविषयीही बहिष्कृत वर्गात अविश्वास उत्पन्न झाला आहे, असो. ज्या अर्थी बहिष्कृत वर्गाच्या नावावर मिळणाऱ्या हजार रुपयांचा मिशन चुराडा उडवीत आहे त्या अर्थी काहीही म्हणोत, हे पैसे आपल्या पदरात पडतात की नाही हे पाहणे बहिष्कृत वर्गाचे कर्तव्य आहे. अतएव मिशनच्या कामाची चौकशी करण्याकरिता एक कमिटी नेमणे अत्यंत आवश्यक आहे. वरील पत्रावरून लक्षात येते की, मूकनायक स्वतःवर झालेल्या टीकेलाही तितकेच पारदर्शक महत्त्व देताना दिसून येते. याचा अर्थ स्पष्ट आहे की, डॉ. आंबेडकर यांची पत्रकारिता किती वस्तुनिष्ठ, पारदर्शी आणि दिशादर्शक अशी होती. यावरून असे लक्षात येते की, मूकनायक हे केवळ लोकजागृतीची भूमिका पार पाडत नव्हते तर तत्कालीन

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ । ४४

कालखंडात समाजनिर्मितीची पायाभरणी सत्याच्या मूल्यांवर आधारित करित होते म्हणूनच आजही मूकनायकाकडे मागे वळून पाहिल्यावर लक्षात येते की, इतर वर्तमानपत्रांच्या तुलनेत मूकनायक एक पाऊल पुढे होते. मूकनायकमध्ये नेहमी देशहिताचा, समाजहिताचा व्यापक दृष्टिकोन ठायी ठायी प्रत्ययाला दिसून येतो. उदा. 'कुशल प्रश्न' या सदरातील आधुनिक काळात हिंदुस्थानचा सामाजिक दर्जा या लेखात लेखक मु. ना. खंडकर लिहितात, 'हल्लीच्या काळात पृथ्वीवरील इतर राष्ट्रांमध्ये प्रगती फार झपाट्याने चालली आहे आणि ती दूर गेल्यावर हा देश अतिशय मागे राहिल आणि हिंदुस्थानची स्थिती जगापुढे अगदी हीन दीन पशुवत अशी दिसेल. सध्याच्या प्रगतीमध्ये इतर राष्ट्रांपेक्षा हिंदुस्थान पाच हजार मैल मागे पडेल. हिंदुस्थानची स्थिती आपल्या पुढे थोडक्यात ठेविली आहे. याचा ज्याला आपल्या मातृभूमीची उन्नती व्हावी असे वाटत असेल त्याने विचार करणे हे बरे.' वरील उतान्यावरून लक्षात येते की, किती तळमळ आपल्या देशाविषयी व्यक्त करण्यात आली आहे. देश पुढे जायला हवा, समाजाची प्रगती व्हावी असा सर्वांगीण हिताचा विचार, तत्कालीन काळात अतिशय तळमळीने, व्यक्त करणारे विचारवंत हेच खरे देशभक्त म्हणावे लागतील कारण जातीपातीची एवढी गुंतागुंत जगाच्या पाठीवर कोणत्याही देशात नाही म्हणून तर जातीमुळे, भेदभावामुळे आपले नुकसान होऊ नये यासाठी देशहिताच्या दृष्टीने जे विचार अतिशय महत्त्वाचे आहेत यावर मूकनायकमधून विचारमंथन घडलेले दिसून येते.

मूकनायकमध्ये छापल्या गेलेल्या प्रश्नांची शीर्षके हीसुद्धा बहिष्कृत समाजाचं नव्हे तर संपूर्ण समाजाच्या प्रगतीची द्योतके आहेत. उदा. अस्मृश्य बंधू आपल्या पायावर उभे राहतील काय? काठीचे सपाटे, आमची जखम, भावी सुधारणेचा ओनामा, पुढाऱ्यांचे लक्ष जाईल काय? आमची हालचाल!, दायीपेक्षा आईचेच दूध श्रेष्ठ! इ. अशा अनेक शीर्षकांमधून आपणास प्रगतीचा दूरदृष्टिकोन प्रत्ययाला येताना दिसतो.

मूकनायकमधील अग्रलेख, विविध विचार, क्षेम समाचार, कुशल प्रश्न, शेलापागोटे!, आमची जखम, कळावे की, जाहिराती इ. सर्व सदर लेखन हे विचारपूर्वक निवडलेले दिसून येते. या कोणत्याही सदरात व्यक्तिगत, विशिष्ट समाजाचीच बाजू रेटलेली नाही किंवा त्यांच्यावर

मूकनायकमध्ये छापल्या गेलेल्या प्रश्नांची शीर्षके हीसुद्धा बहिष्कृत समाजाचं नव्हे तर संपूर्ण समाजाच्या प्रगतीची द्योतके आहेत. उदा. अस्पृश्य बंधू आपल्या पायावर उभे राहतील काय? काठीचे सपाटे, आमची जखम, भावी सुधारणेचा ओनामा, पुढाऱ्यांचे लक्ष जाईल काय? आमची हालचाल!, दायीपेक्षा आईचेच दूध श्रेष्ठ! इ. अशा शीर्षकांमधून आपणास प्रगतीचा दूरदृष्टिकोन प्रत्ययाला येताना दिसतो.

होणाऱ्या अन्यायाची कीव केलेली नाही तर देशहित, समाजहित लक्षात घेऊन विचार प्रगट केलेले आहेत, त्यामुळे मूकनायकमध्ये लिहिणारे लोक हे सर्वव्यापी दिसून येतात.

एकूणच डॉ. आंबेडकर विचार प्रकट करताना अस्पृश्य हा घटक जरी केंद्रवर्ती ठेवत असले तरी एकूणच विशाल मानव सृष्टीचे स्वरूप कसे असावे या संदर्भातच ते आपले चिंतन अधोरेखित करतात. समाजातील सर्व घटकांना केंद्रवर्ती ठेवून, सर्वांना समजेल, रुचेल, पचेल, लक्षात येईल अशा साध्या, सोप्या भाषेत कधी म्हणी, वाक्यप्रचार, संत तुकारामांचे अभंग, कबीरांचे दोहे, दृष्टांत, प्रतिमा, बोधकथा इ. सर्व गोष्टींचा उपयोग डॉ. आंबेडकर आपल्या लेखनात करताना दिसतात. डॉ. आंबेडकर आपल्या लेखनात कधी कधी आशयगर्भ आणि मूलभूत चिंतनाची मांडणी करताना पल्लेदार वाक्यांचा उपयोग करताना दिसतात. त्यामुळे ही पल्लेदार वाक्ये समाजमनावर सहज प्रभाव टाकताना दिसतात. डॉ. आंबेडकरांच्या लेखनात, भाषणांमध्ये अनेक वेळा ज्या वेगवेगळ्या प्रतिमा येताना दिसतात त्या प्रतिमा इतक्या समर्पक आणि यथार्थपणे उपयोगात आणलेल्या आहेत की, त्यातून विषयाचे वैविध्य तर लक्षात येतेच; पण त्याचबरोबर प्रतिमांतील अर्थाचे गांभीर्यही तितकेच भावताना दिसते.

बाबासाहेबांच्या झुंजार लेखणीबद्दल डॉ. गंगाधर पानतावणे लिहितात, मानवी स्वातंत्र्याच्या इतिहासात वृत्तपत्रीय कर्तृत्वाला महत्त्वाचे स्थान आहे. डॉ. बाबासाहेबांची पत्रकारिता या दृष्टीने विचारात घ्यावी

लागते. त्यांची पत्रे ही प्रयोजनपत्रे होती. ती धूमकेतूसारखी होती. ते विख्यात अर्थशास्त्रज्ञ होते; परंतु त्यांना आपल्या वृत्तपत्रांचे अर्थशास्त्र कधीच जुळवता आले नाही. वृत्तपत्र जगविण्यासाठी त्यांच्याकडे अर्थओघ नव्हता आणि अद्ययावत व पुरेशी यंत्रणाही नव्हती. मात्र आपल्या पत्रातून चोवीस चोवीस रकाने लिहिणारे बाबासाहेबांचे हात, दलितांच्या नवसृष्टीचे रचनाकार होते.

ज्येष्ठ विचारवंत गंगाधर पानतावणे यांनी डॉ. आंबेडकरांबद्दल जे उद्गार काढले आहेत ते अगदी त्यांच्या व्यक्तिमत्त्वाला, त्यांच्या लेखनशैलीला चपखल बसणारे आहेत. 'मुळामध्ये मूकनायकमधून प्रगट होणारे सर्व लेखन हे तत्कालीन काळातील धर्ममार्तंडाचे, जातिवाद्यांचे, प्रतिगाम्यांचे डोळे उघडे करणारे होतेच त्याचबरोबर देशाचा, समाजाचा वर्तमान आणि भविष्य कसा असायला हवा याविषयी दिशादर्शन करणारेही होते म्हणूनच त्या काळातील अनेक पुढारलेले, परिवर्तनाच्या चळवळीशी नाते सांगणारे लोकही डॉ. आंबेडकरांच्या वृत्तपत्रात लेखन करत होते. डॉ. आंबेडकरांना वृत्तपत्राचे आर्थिक गणित बसवताना मात्र खूप संकटांना सामोरे जावे लागले; परंतु या अस्वस्थतेचा कोणताही परिणाम त्यांनी आपल्या लेखनावर होऊ दिला नाही. एकनिष्ठ बांधिलकी काय असते ती खरोखर डॉ. आंबेडकरांकडून शिकायला हवी. बाबासाहेबांचे मराठी वृत्तपत्रीय लेखन आत्मप्रत्ययी होते. लेखनक्रीडा हा त्यांच्या लेखणीचा धर्म नव्हता. त्यांच्या लेखनात टिळकांप्रमाणेच जोश व आवेश आहे; परंतु आक्रमकता आणि तीव्रता टिळकांपेक्षा काकणभर अधिकच. कदाचित परकीयांशी आणि स्वकीयांशी लढण्यातील फरकाचा हा भाग असावा. बाबासाहेबांची लेखणी स्वयंभू आणि स्वयंसिद्ध होती. चक्रत्व आणि प्रवाहीत्व ही त्यांच्या लेखनशैलीची वैशिष्ट्ये आहेत. अमोघ युक्तिवाद हा तर त्यांचा ठळक लेखन विषय होय. हा युक्तिवाद भावनेपेक्षा बुद्धीला आणि कल्पना विलासापेक्षा तर्कशक्तीला आवाहन करतो. त्यांनी तत्कालीन विरोधी व जातिवादी पत्रांच्या व पत्रकारांच्या वृत्तीचा व अहंकाराचा दंभस्फोट वेगवेगळ्या उदाहरणांनी योग्य त्या वेळी केला आहे. वर वर प्रतिपक्षाचे बिनतोड वाटणारे मुद्दे कुशलतेने खोडून काढताना मार्मिक युक्तिवाद आणि मर्मभेदी इतिहास यांचे दर्शन घडविले आहे.'

पानतावणे सरांच्या वरील विश्लेषणावरून लक्षात

जानेवारी ते मार्च २०२१ | ४५



येते की, डॉ. आंबेडकरांची लेखणी ही कोणत्याही प्रश्नाचे, समस्येचे मूळ शोधून त्याचे विविध कंगोरे वाचकांपुढे आणणारी अशी होती. केसरीकारांवर तर त्यांनी खूप टीका केली; परंतु कधीही ती टीका आपणास व्यक्तिवादी किंवा फक्त वादासाठी होती अशी वाटत नाही, तर मूळ प्रश्न किती गंभीर आहे, त्याची तीव्रता किती आहे हे पारखून घेऊन त्या समस्येच्या, प्रश्नांच्या विविध बाजूंनी विचार करून अभ्यासपूर्ण अशा प्रकारे केलेले ते विश्लेषण आहे असे वाटे. इंग्रज सरकार असो, कौन्सिल, कायदे असे कोणीही असो डॉ. आंबेडकरांनी त्या त्या वेळी आपल्या लेखणीतून गांभीर्याने उत्तरे दिलेली आहेत म्हणून तर शंभरी पार केल्यानंतरही मूकनायक, बहिष्कृत भारत या मधील अग्रलेख आजही वाचनीय अग्रलेख वाटतात. किंबहुना त्या लेखनातील म्हणी, वाक्यप्रचार, संदर्भ, दृष्टांत आजही लागू पडतात. या सर्वापाठीमागे डॉ. आंबेडकरांचे इतिहास, समाजशास्त्र, अर्थशास्त्र, संस्कृती या विषयांचे असणारे सखोल चिंतन आहे म्हणूनच त्यांच्या लेखनातून जे विचार प्रगट झाले आहेत त्या विचारांची, लेखनाची भाषाशैली आपण पाहिली, तर त्यामध्ये आपणाला परिपक्वता, प्रौढता, लोकांना सहज समजेल अशा पद्धतीने सहज संवाद, सर्वसामान्यांच्या जगण्याशी समरस होणारी, एक प्रकारची व्यापकपण असणारी, सर्वसमावेशकता असणारी, गंभीर वास्तवाचे आणि वस्तुस्थितीचे भान जागृत करणारी, वाचकांच्या, जनतेच्या मनावर सहजपणे ठसणारी इ. ठळक वैशिष्ट्ये दिसून येतात.

मूकनायक आरंभले तेव्हा लोकमान्य टिळक हयात होते आणि त्यांचा केसरी घराघरात स्वराज्याचा विचार नेत होता. अन्य अनेक पत्रे स्वराज्याची बांधिलकी मानून आपला प्रवास करीत होती. ब्राह्मणेतरांचीही पत्रे वाटचाल करीत होती, आणि त्यातच बाबासाहेब मुक्त समाजाचे नायकत्व स्वीकारून बहिष्कृत समाजाच्या उत्थानासाठी सिद्ध झाले होते. मूकनायकातील त्यांचे सर्व अग्रलेख समाजकारणाबरोबरच धर्म आणि राजकारणाशी निगडित होते. तत्कालीन स्वराज्याच्या प्रश्नांसंबंधी विचार मांडताना स्वराज्यापेक्षाही सुराज्याची आम्हाला गरज आहे असे एका अग्रलेखात त्यांनी प्रतिपादन केले होते.

पानतावणे सर म्हणतात, त्याप्रमाणे डॉ. आंबेडकरांचे लेखन त्या काळी ब्राह्मणी वृत्तपत्रसृष्टीतही ठळकपणे समाजाचे प्रबोधन करत होते. कोणत्याही

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ४६

प्रकारचे दडपण न घेता, कोणाच्याही टीकेची भीती न बाळगता डॉ. आंबेडकर बहिष्कृत वर्गाबरोबरच संपूर्ण समाजाच्या प्रगतीचा, भविष्याचा विचार मूकनायकमधून प्रकट करत होते म्हणून मूकनायकची भूमिका, प्रारंभ हा नव्या विचारांची झालेली एक प्रकारची मुहूर्तमेढसुद्धा आहे. समाजाचे प्रबोधन होण्यासाठी, मोठ्या प्रमाणात लोकजागृती घडून येण्यासाठी वृत्तपत्रे ही आजही आणि त्या काळीही महत्त्वाची भूमिका बजावत आले आहेत. मूकनायकने मात्र समाजात अनेक सामान्य माणसांमधील नायक तयार केले. बोलता येत आहे; परंतु दबलेल्या, समाजाने वाळीत टाकलेल्या, ज्यांना स्वाभिमानाने जीवन जगता येत नाही अशा सर्व नायकांना, बहिष्कृत वर्गाला, समाजातील वंचित, बहुजन घटकांना नवा विचार दिला नव्हे या सर्वांमधील अनेक नायक उभे करण्याचे काम केले.

#### संदर्भसूची

- १) मून वसंत, नरके हरी, डॉ. बाबासाहेब आंबेडकर यांचे बहिष्कृत भारत आणि मूकनायक (प्रस्तावना) डॉ. बाबासाहेब आंबेडकर, महात्मा फुले आणि राजर्षी शाहू चरित्र साधने प्रकाशन समिती, उच्च व तंत्रशिक्षण विभाग, महाराष्ट्र शासन, मंत्रालय, मुंबई, द्वितीय आवृत्ती. २००८
- २) तत्रैव (प्रस्तावना)
- ३) तत्रैव (संपादकीय)
- ४) तत्रैव (संपादकीय)
- ५) तत्रैव पृष्ठ क्र. ३४५
- ६) तत्रैव पृष्ठ क्र. ३४७
- ७) तत्रैव पृष्ठ क्र. ३५२
- ८) तत्रैव पृष्ठ क्र. ३६१
- ९) तत्रैव पृष्ठ क्र. ३७१
- १०) तत्रैव पृष्ठ क्र. ४०५
- ११) पानतावणे गंगाधर, मन्वंतर घडवणारी पत्रकारिता लोकराज्य, एप्रिल २०१६, माहिती व जनसंपर्क महासंचालनालय, नवीन प्रशासन भवन, १७ वा मजला, मंत्रालयासमोर, हुतात्मा राजगुरु चौक, मुंबई, पृष्ठ क्रमांक. ३७
- १२) तत्रैव पृष्ठ क्र. ३७
- १३) पानतावणे गंगाधर, डॉ. बाबासाहेब आंबेडकर यांची पत्रकारिता धम्मचक्र प्रवर्तन सुवर्ण महोत्सव विशेषांक, लोकराज्य, ऑक्टोबर २००६, माहिती व जनसंपर्क महासंचालनालय, नवीन प्रशासन भवन, १७ वा मजला मंत्रालयासमोर, हुतात्मा राजगुरु चौक, मुंबई, पृष्ठ क्रमांक. ४६

#### प्रा. डॉ. हरीश शेळके

मराठी विभागप्रमुख, न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज पारनेर, ता. पारनेर, जि. अहमदनगर- ४१४३०२  
चलभाष: ९७६७१७६६५१ | hareshelke@gmail.com



## 11. Prakashan Sansthava Sahitya Vyavhar

# महाराष्ट्र साहित्य पत्रिका

जानेवारी ते मार्च २०२१



आंतरराष्ट्रीय ख्यातीचे संशोधक आणि साहित्यिक

**डॉ. जयंत नारलीकर**यांची नाशिक येथे होणाऱ्या ९४ व्या अखिल भारतीय मराठी साहित्य संमेलनाच्या  
अध्यक्षपदी निवड झाल्याबद्दल अभिनंदन !

© जयदीप कडू



महाराष्ट्र साहित्य परिषदेचे त्रैमासिक मुखपत्र  
**महाराष्ट्र साहित्य पत्रिका**

अंक क्र. ३७३, जानेवारी ते मार्च २०२१

॥ संपादक ॥  
**डॉ. पुरुषोत्तम काळे**

॥ संपादन समिती ॥  
डॉ. मनोहर जाधव । डॉ. नीलिमा गुंडी  
डॉ. भास्कर ढोके । डॉ. रणधीर शिंदे  
डॉ. वर्षा तोडमल

॥ प्रकाशक ॥  
**प्रकाश पायगुडे**  
प्रमुख कार्यवाह

**महाराष्ट्र साहित्य परिषद, पुणे**  
टिळक रस्ता, पुणे ४११०३०.  
दूरभाष । ०२०-२४४७५९६३  
संकेतस्थळ । [www.masapapune.org](http://www.masapapune.org)  
ई-मेल । [masaparishad@gmail.com](mailto:masaparishad@gmail.com)

कार्यालयाची वेळ ।  
सकाळी ९.०० दुपारी १२.००  
दुपारी ४.३० ते रात्री ८.००





महाराष्ट्र  
साहित्य  
परिषद

- मुद्रक-प्रकाशक  
**प्रकाश पायगुडे**  
प्रमुख कार्यवाह  
महाराष्ट्र साहित्य परिषद,  
टिळक रस्ता, पुणे ४११०३०
- जाहिरात व्यवस्थापक  
**वि. दा. पिंगळे**  
९८८९२३५०३३
- संपादकीय संयोजन  
**संदीप खाडे**
- अक्षरजुळणी व सजावट  
**लक कलाकल्य**
- मुखपृष्ठ  
**जयदीप कडू**
- मुद्रितशोधन  
**आरती देवगांवकर**
- मुद्रणस्थळ  
**एस. ए. प्रिंटर्स, एल. एल. पी.**  
फ्लॅट नं. ५, ३ रा मजला,  
सिद्धीविनायक अपा.,  
शिवदर्शन, पुणे ४११००९  
**मूल्य : १५ रुपये**
- प्रकाशन क्र. ३७३  
जानेवारी ते मार्च २०२१  
या अंकात व्यक्त झालेल्या  
विचारांशी संपादक, संपादन समिती,  
सत्तागार मंडळ तसेच प्रकाशक  
सहमत असतीलच असे नाही.

## अंतरंग

मसाप पत्रिका । जानेवारी ते मार्च २०२१ अंक

- ◆ संपादकीय । डॉ. पुरुषोत्तम काळे । ३
- ◆ जयंत नारळीकर: व्यक्ती आणि वाङ्मय।  
प्रा. चिन्मय मधू घैसास । ६
- ◆ नवोदितांचा मार्गदर्शक हरवला । डॉ. अशोक कौतिक कोळी । १२
- ◆ अष्टपैलू व्यक्तिमत्त्वाच्या डॉ. लीला गोविलकर ।  
डॉ. स्नेहल तावरे । १८
- ◆ मुळीचा झरा । प्रा. मिलिंद जोशी । २१
- ◆ जागतिकीकरण संस्कृति-संघर्ष करेल ।  
प्रा. डॉ. मिलिंद कसबे । २४
- ◆ उत्तर महाराष्ट्रातील उद्योग जगताचा इतिहास  
विडीची गोष्ट । प्रा. डॉ. प्रकाश शेवाळे । ३४
- ◆ लोकजागृतीची चळवळ आणि मूकनायक ।  
प्रा. डॉ. हरीश शेळके । ४०
- ◆ मराठी कादंबरी अभिरुची आणि राजकारण । गजानन भोसले । ४७
- ◆ प्रकाशन संस्था व साहित्य व्यवहार ।  
प्रा. नंदकुमार भाऊसाहेब उदार । ५८
- ◆ ड्रेन । नारायण लाळे । ६५
- ◆ लोकशाहीर द. ना. गव्हाणकर । सी. पूजा पराग सामंत । ७३
- ◆ पटेली- तथ्यात्मिकाचा शोध । भास्कर ढोके । ७७
- ◆ लाडी: कातकरी समाज जीवनाचे वास्तव चित्रण  
मांडणारी कादंबरी । प्रा. मिथुन शेळके । ८१
- ◆ एकनाथी भागवतातील शेती । डॉ. हंसराज जाधव । ८४
- ◆ वळीव: आदिम समाजव्यवस्थेचे संस्कृतीनिष्ठ आकलन ।  
डॉ. कैलास सलादे । ८९
- ◆ अस्वस्थ मनाचे बंड: आदिवासी साहित्य प्रवाहाला  
समृद्ध करणारी कविता । डॉ. सखाराम डाखोरे । ९५
- ◆ ओळ तुझ्या माझ्या स्वातंत्र्याची.. यत्नार बोलणारी  
कविता.. । दत्ता थोरे । १०२
- ◆ समाजभानाची प्रायोगिक जीवनकथा  
(मी गोष्टीत मावत नाही) । डॉ. सविता पटेल । १०५
- ◆ जागतिकीकरणातील शेतीधारित जगण्याची प्रत्ययकारी  
कविता: आगंतुकाची स्वगत । प्रा. डॉ. सुभाष निवृत्ती शेळके । १०८
- ◆ व्यापक जीवनाभूतीचे तळ ढवळणारे अधांतरीचे प्रश्न।  
डॉ. अरुण ठोके । ११५
- ◆ मुलूखमाती । बाळासाहेब कांबळे । १२२
- ◆ सृजन संवाद मुलाखतींच्या मैफिलीची अवीट मेजवानी।  
दीपक चैतन्य । १२४
- ◆ कार्यवृत्त । १२६



मराठी साहित्य विश्वातील  
प्रकाशन संस्था व साहित्य  
व्यवहारावर भाष्य  
करणारा लेख.

## प्रकाशन संस्था व साहित्य व्यवहार

प्रा. नंदकुमार भाऊसाहेब उदार

वाचक हा साहित्यव्यवहारातील महत्त्वाचा घटक असला तरीसुद्धा वाचक, लेखक व पुस्तक यामध्ये अनेक घटक असतात. त्यातीलच एक महत्त्वाचा घटक म्हणजे प्रकाशक हा होय. हा प्रकाशकही शेवटी समाजाचाच घटक असतो. समाज व संस्कृतीचे त्याच्याही व्यक्तिमत्त्वावर बरेवाईट परिणाम झालेले असतात, त्यामुळे त्याचा पुस्तक, लेखक यांच्या निवडीवर परिणाम होऊ शकतो, हे गृहीत धरून एक गोष्ट निश्चितपणे सांगता येते, ती म्हणजे प्रकाशक पुस्तकाची निर्मिती करतो. लेखकाकडून तो हस्तलिखित घेतो आणि पुस्तक निर्माण करतो. हे करताना प्रकाशक अनेक घटकांची मदत घेत असतो, त्यासाठी प्रकाशक काही रक्कम या व्यवहारांत गुंतवित असतो. म्हणजेच लेखकाकडून साहित्यकृतीचे हस्तलिखित घेऊन तो मुद्रणालयापासून ते चित्रकारापर्यंत अनेकांशी संपर्क साधतो व पुस्तकाची निर्मिती करतो. या पुस्तकनिर्मितीत त्याने काही आर्थिक गुंतवणूक केलेली असते. म्हणजेच वाचकाला प्रथमदर्शनीच त्या पुस्तकाने प्रभावित केले पाहिजे अशा तऱ्हेने प्रकाशकाने पुस्तक तयार केलेले असते. साहित्यव्यवहारात लेखकाने निर्माण केलेली साहित्यकृती वाचकांपर्यंत पोहोचविण्यासाठी प्रकाशक महत्त्वाची भूमिका बजावत असतो.

लेखक हा त्याच्या जीवनानुभवाच्या आधारे

वास्तव व कल्पिताचा मेळ घालून साहित्यकृतीची निर्मिती करत असतो. साहित्याची निर्मितीप्रक्रिया पूर्ण झाल्यावर ती कलाकृती वाचकांपर्यंत पोहोचवी, वाचकांनी तिला प्रतिसाद द्यावा अशी त्याची मनोमन इच्छा असते. त्यामुळे सदर कलाकृती प्रकाशित करण्यासाठी लेखक प्रकाशकाची मदत घेतो. यासंदर्भात डॉ. नागनाथ कोतापळे म्हणतात, 'जेव्हा एखादे हस्तलिखित मुद्रित होऊन वाचकांपर्यंत जाते, तेव्हाही अनेक गोष्टी घडत असतात. एकतर मुद्रणव्यवस्था हवीच असते, दुसरे म्हणजे प्रकाशक नावाची एक व्यक्ती किंवा संस्था अस्तित्वात येते. प्रकाशक हा लेखक व वाचक यांचा मध्यस्थ असतो. म्हणजे तो ते पुस्तक लेखकांकडून घेऊन (स्वामित्व धन देऊन किंवा न देताच) मुद्रणालयातून छापून घेऊन बाजारात पाठवित असतो तेव्हा स्वाभाविकपणेच प्रकाशक या सगळ्या व्यवहारात पैसे गुंतवित असतो.' (कधीकधी लेखकही गुंतवितात किंवा स्वतःच प्रकाशक होतात.) त्यामुळे ते पैसे कसे वसूल होतील याची चिंताही त्याला असतेच. त्यासाठी बाजारावर, विक्रेत्यांवर अवलंबून राहावे लागते. आता पुस्तक नावाची गोष्ट बाजारातील वस्तू झालेली असते. म्हणजे सरस्वतीच्या दरबारात वावरणाऱ्यांना लक्ष्मीच्या दारात फेऱ्या माराव्या लागतात. शिवाय वाचकांच्या खिशात पैसे असले तरच

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ५८

पुस्तक घेता येईल, तत्तः वाचता येण्याची परिस्थिती निर्माण झालेली असूनसुद्धा अर्थकारणामुळे त्यावर मर्यादा येऊ शकतात. म्हणजेच लेखकाने निव्वळ साहित्यकृतीची निर्मिती करून भागत नाही, तर ती कलाकृती प्रकाशित करण्यासाठी लेखक-प्रकाशकाने पैसे गुंतवलेले असतात. त्या गुंतवलेल्या पैशांची वेळेत वसुली व्हावी, त्यातून काही नफा मिळावा अशीही प्रकाशकाची अपेक्षा असते. त्यासाठी तो सदर पुस्तक अधिकाधिक आकर्षक कसे होईल हे पाहतो. वाचकाच्या पसंतीस उतरण्यासाठी जे जे करणे आवश्यक असते त्या सर्व गोष्टी प्रकाशक करत असतो. नव्या काळात नुसते पुस्तक प्रकाशित करून चालत नाही. त्यासाठी ते बाजारात उठून विसेल अशा पद्धतीने प्रकाशित करावे लागते. म्हणजे मुळात ते पुस्तक चांगले आहे, विकले जाईल अशी खात्री प्रकाशकाला वाटली पाहिजे. त्या दृष्टीने तो पुस्तकांची निवड करतो. आता ते पुस्तक चांगले आहे, महत्त्वाचे आहे, असे त्याचे मत असते. (कधी कधी त्या प्रकाशकांसाठी काम करणाऱ्या संपादकांचे) गमतीची गोष्ट म्हणजे पुस्तक कोणत्या प्रकाशकाने प्रकाशित केलेले आहे, याला महत्त्व प्राप्त होत जाते. कधी कधी त्या प्रकाशनामागे असणाऱ्या संपादकाचाच अधिक दबदबा असतो. वाचक म्हणायला लागतात, अमूक एका प्रकाशनसंस्थेने पुस्तक प्रकाशित केलेले आहे, तेथे तमूक तमूक तज्ज्ञ आहेत, तेव्हा ते पुस्तक चांगलेच असले पाहिजे. म्हणजे त्या पुस्तकाने अर्धी लढाई जिंकलेली असते. याचा आणखी एक परिणाम म्हणजे फारसे नाव माहीत नसलेल्या प्रकाशकाने पुस्तक प्रकाशित केलेले असेल, तर मग ते कितीही महत्त्वाचे असो, त्याकडे वाचक वळत नाही. ते पुस्तक वाचले जावे, यासाठी खूप काळ जावा लागतो. तरीही बाजारपेठेत आपल्या प्रकाशनसंस्थेने प्रकाशित केलेले पुस्तक उठून दिसण्यासाठी सारेच प्रकाशक धडपडत असतात. मजकूर चांगला आहे याची त्यांना खात्री असते. मग उत्तम मुखपृष्ठ, नीटनेटकी मांडणी, पुस्तकात नेमके काय आहे हे सांगणारे ब्लर्ब, उत्तम छपाई, चांगला कागद अशा सगळ्या जामानिम्यासह पुस्तक बाजारपेठेत आले पाहिजे अशी काळजी सध्या सगळेच प्रकाशक घेत आहेत. अत्याधुनिक तंत्रज्ञान अगदी छोट्या गावांपर्यंत पोहोचल्यामुळेही साऱ्या प्रकाशकांना हे शक्य होत आहे

किंवा बहुतेक सारे प्रकाशक उत्तम मुद्रणालयाची निवड करतात. म्हणजेच अमूक एक प्रकाशनसंस्था गुणवत्तापूर्ण दर्जेदार पुस्तके प्रकाशित करते अशी धारणा वाचकाची असते. म्हणजे अमूक एक प्रकाशनसंस्था दर्जेदार आहे, असा वाचकाचा दृष्टिकोन असतो. अशा प्रकाशनसंस्थेने एखादे पुस्तक प्रकाशित करण्यास लेखकाला होकार दिला की, लेखक त्याच्या पुस्तक प्रसिद्धीची अर्धी लढाई जिंकलेला असतो. म्हणजेच वाचकाच्या दृष्टीने निश्चित झालेला प्रकाशनसंस्थेचा दर्जा साहित्यव्यवहारावर परिणाम करत असतो. वाचक (आणि समीक्षकही) प्रकाशकांमध्ये काही क्रमवारी मनोमन लावतो. त्यासाठी त्याच्याकडे काही शास्त्रीय आधार असतो असे नाही पण तो क्रमवारी लावतो हे मात्र खरे. प्रतिष्ठित, उच्च प्रतीची पुस्तके प्रकाशित करणारे, मध्यम प्रतीची पुस्तके प्रकाशित करणारे, विकाऊ पुस्तके प्रकाशित करणारे अशी एक प्रतवारी केली जाते. पुस्तकांच्या बाजारपेठेत जेव्हा आपण फिरायला लागतो, तेव्हा ही क्रमवारी कुठेतरी विक्रेत्यांच्या, वाचकांच्या मनात आहे असे जाणवते. यावर मात करण्यासाठी प्रकाशक काही मार्ग अवलंबितात. म्हणजे पोस्टर छापून पुस्तक-विक्रीच्या ठिकाणी लावणे, वर्तमानपत्रामधून जाहिराती देणे (ज्या अतिशय खर्चिक असतात. ज्या प्रकाशकाची आर्थिक परिस्थिती बरी नाही ते वर्तमानपत्रांना जाहिराती देण्याचा विचारही करू शकत नाहीत.) ग्रंथव्यवहारासाठी जी नियतकालिके असतात (जी तुलनेने कमी पैसे घेतात) तेथे जाहिराती देणे, मित्र मंडळींना सांगून ग्रंथालयातून पुस्तके विकली जातील असे पाहणे असे काही मार्ग प्रकाशक मंडळी हाताळीत असतात, काही फिरते विक्रेते ठेवतात. काही प्रकाशकांनी त्यांच्या प्रकाशनसंस्थेची मुखपत्रे सुरू केलेली असतात. हे सगळेच मार्ग तसे अवघड असल्यामुळे नव्या प्रकाशकांना ते चोखाळणे शक्य होत नाही. परिणामी या प्रकाशकांनी कितीही महत्त्वाची पुस्तके काढलेली असली तरी त्यांची चर्चा फारशी होत नाही. एक प्रकारे या प्रकाशकांकडून जी पुस्तके प्रकाशित केली जातात मग ती कितीही महत्त्वाची, प्रायोगिक असोत त्यांची चर्चा होईलच असे नाही. पुस्तकांच्या बाजारातही ही पुस्तके खपणे, खपवणे अतिशय अवघड जाते. प्रकाशनसंस्था पुस्तक प्रकाशित करते तेव्हा ते पुस्तक

जानेवारी ते मार्च २०२१ | ५९

बाजारपेठेत आपल्या प्रकाशनसंस्थेने प्रकाशित केलेले पुस्तक उठून दिसण्यासाठी सारेच प्रकाशक धडपडत असतात. मजकूर चांगला आहे याची त्यांना खात्री असते. मग उत्तम मुखपृष्ठ, नीटनेटकी मांडणी, पुस्तकात नेमके काय आहे हे सांगणारे ब्लर्व, उत्तम छपाई, चांगला कागद अशा सगळ्या जामानिम्ब्यासह पुस्तक बाजारपेठेत आले पाहिजे अशी काळजी सध्या सगळेच प्रकाशक घेत आहेत. अत्याधुनिक तंत्रज्ञान अगदी छोट्या गावांपर्यंत पोहोचल्यामुळेही सान्या प्रकाशकांना हे शक्य होत आहे किंवा बहुतेक सारे प्रकाशक उत्तम मुद्रणालयाची निवड करतात.

वाचकांपर्यंत पोहोचविण्यासाठी पोस्टर छापणे, वृत्तपत्रांतून जाहिराती देणे, वाड्मयीन नियतकालिकांत जाहिराती देणे या माध्यमांतून पुस्तकाची प्रसिद्धी काही प्रस्थापित करत असतात; पण ज्या प्रकाशनसंस्था नव्याने सुरू झालेल्या असतात त्यांना या सर्व बाबी करणे शक्य नसते, त्यामुळे नव्याने प्रकाशन व्यवसायात आलेल्या प्रकाशनसंस्थांना पुस्तक प्रसिद्धीचे उपक्रम राबविणे शक्य नसते. परिणामी एखादे पुस्तक कितीही महत्त्वाचे असले तरीही ते दुर्लक्षिले जाण्याची शक्यता निर्माण होते.

समाजात जितके लोक राहात असतात त्या प्रत्येकाचे विचार, आवडी-निवडी भिन्न असतात तसेच समाजाकडे पाहण्याचा दृष्टिकोनही वेगळा असतो. याप्रकारे अनेक प्रकाशनसंस्था वेगवेगळ्या विषयांवरती पुस्तके प्रकाशित करत असतात. त्या सर्व विषयांच्या पुस्तकांना मागणी असतेच असे नाही. त्यातील काही पुस्तकांचा लक्षणीय खप होतो; पण काही पुस्तके दर्जेदार असूनही दुर्लक्षित राहण्याची शक्यता असते. प्रकाशक आणि पुस्तक विक्रेते यांच्या म्हणण्याप्रमाणे जीवनोपयोगी पुस्तकांचा खप वाढला आहे (ते स्वाभाविकच म्हणायला हवे कारण लोकांना वेगवेगळ्या कारणांसाठी अशी पुस्तके हवी असतात.) वेगवेगळ्या कारणांसाठी अनुवादित

पुस्तकेही विकत घेतली जातात. मराठी ललित लेखकांनी विचार करावा, आत्मपरीक्षण करावे असा हा मुद्दा आहे. चरित्र, आत्मचरित्र, प्रवासवर्णने या साहित्याच्या सीमारेषांवर वावरणाऱ्या पुस्तकांचाही खप पुष्कळच आहे. खरा प्रश्न मराठीतील ललित वाड्मयासंबंधीचा आहे, असेही प्रकाशक आणि पुस्तक विक्रेते सांगतात, ही चिंता वाटावी अशी गोष्ट आहे. कोणतेही ललित वाड्मय त्या त्या भाषिक समाजाच्या प्रश्नांचे दर्शन घडविणारे असते. जर त्या त्या समाजाचे स्वरूप समजावून घ्यायचे असेल, तर ललित साहित्य वाचणे आवश्यक असते. या साहित्यातून लेखकाची निर्मितीशीलता, सामाजिक भान प्रकट होत जातेच. त्यामुळे निर्मितीशीलतेच्या दृष्टीने ललित साहित्य वाचले जाणे महत्त्वाचे असते; परंतु ललित साहित्याचा खप इतर पुस्तकांच्या तुलनेने खूपच कमी असल्याचे निरीक्षण प्रकाशक नोंदवतात. मराठीतील ललित साहित्य किती वाचले जाते हा खरा महत्त्वाचा प्रश्न आहे. ते कमी वाचले जाते, असे अनुमान करता येऊ शकते. आपण म्हणतो की, पूर्वीच्या वाचकांच्या संख्येपेक्षा आजची वाचकांची संख्या अधिक वाढली आहे. या दोन बाबींचा ताळमेळ कसा घालायचा हा महत्त्वाचा प्रश्न आहे, आणि त्याचे थोडक्यात उत्तर द्यायचे तर असे म्हणता येईल की, पूर्वीच्या तुलनेत वाचकांचे प्रमाण वाढले; पण उच्च शिक्षणाचा, साक्षरतेचा जेवढा प्रसार झाला, त्या तुलनेत वाचकांचे प्रमाण मात्र नगण्यच आहे असे म्हणावे लागते. तर्क लावून विचार करायचा किंवा अंदाज बांधायचा, तर असे म्हणता येईल की, वाचकांच्या टक्केवारीत फार वाढ झाली नाही. आता हे जे कोणी थोडेसे वाचक आहेत, ते प्रामुख्याने ऐतिहासिक, पौराणिक स्वरूपाचे ललित साहित्य वाचतात. आजसुद्धा स्वामी, ययाती, मृत्युंजय, मंत्रावेगळा अशा कादंबऱ्या खपत असतील, तर या वाचनाबद्दलही चिंता करावी अशी परिस्थिती आहे. भालचंद्र नेमाडे यांच्या कोसलाच्याही आवृत्त्या निघत आहेत, ही त्यातल्या त्यात चांगली गोष्ट आहे; परंतु धग, माणूस, चक्र, या कादंबऱ्याही महत्त्वाच्या आहेत. इतरही अनेक महत्त्वाच्या कलाकृतींचा निर्देश करता येईल. या पुस्तकांचे नेमके किती वाचक आहेत, हे कळायला मार्ग नाही. अर्थात एक गोष्ट लक्षात ठेवली पाहिजे की, काही कालावधीत नवे लेखक आणि नव्या

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ६०

साहित्यकृती येत असतात. त्यामुळे आधी प्रकाशित झालेली काही पुस्तके बाजूला पडणे गृहीतच असते म्हणून दुसरी आवृत्ती काढायला प्रकाशक फारसे तयार नसतात, ते यामुळेच. नाहीतरी सध्यासुद्धा हजार प्रतींची आवृत्ती संपायला पूर्वीप्रमाणेच पाचेक वर्षे लागतातच. इ. स. १९७५ पूर्वी जितकी वाचकांची संख्या होती त्या तुलनेत आज वाचकांची संख्या वरवर पाहता वाढलेली दिसत असली तरीसुद्धा इ. स. १९७५ नंतर शिक्षणाचा जितका विस्तार झाला त्या तुलनेत वाचक वाढल्याचे दिसत नाहीत. तसेच आजही पौराणिक स्वरूपाचे ललित साहित्य वाचनाच्या वाचकांची संख्या जास्त आहे. त्या तुलनेत समाजाचे व माणसांचे प्रश्न मांडणारे ललित साहित्य कमी वाचले जाते. अशा पुस्तकांचा खप व्हावा, यासाठी प्रकाशक विविध योजना राबवत असतो. पुस्तकांचा खप व्हावा यासाठी कधी कधी लेखकाला पुस्तकांच्या दुकानात (स्वतःच्या किंवा इतरांच्या) बसवतो. अमूक दिवशी पुस्तक घेतल्यास लेखकाची स्वाक्षरी मिळेल असे प्रलोभन वाचकांना-ग्राहकांना दाखविण्यात येते. पुष्कळ वाचकांच्या मनात लेखकाविषयी प्रेमभाव, आदरभाव क्वचित भक्तिभाव असल्यामुळे तो त्या दिवशी लेखकाच्या स्वाक्षरीसह पुस्तक घेतो, (अर्थात अशा योजनेत क्वचितच वैचारिक किंवा समीक्षेची पुस्तके घेतली जातात.) क्वचित होणाऱ्या प्रकाशन समारंभात प्रकाशक संवत्तीच्या दरात पुस्तक देण्याची घोषणा करतात. तेथे काही पुस्तकांची विक्री होते, होऊ शकते. असे काही प्रसंग सोडले, तर लेखक आणि बाजारपेठ यांचा संबंध येत नाही; पण अशा प्रसंगांतून लेखकाचा दबदबा वाढण्यास मदत होते आणि त्याचा वाचकांच्या मनावर परिणाम होऊन पुस्तक-विक्री वाढू शकते. लेखक हा कलावंत असतो. तो आपल्या प्रतिभाशक्तीच्या व कल्पनाशक्तीच्या सामर्थ्याने साहित्यकृतीची निर्मिती करत असतो. वाचकालाही लेखकाच्या व्यक्तिमत्त्वाबद्दल कुतूहल असते. प्रत्यक्षात लेखकाला भेटावे, त्याच्याशी संवाद साधावा, साहित्यकृतीच्या निर्मितीप्रक्रियेबद्दल जाणून घ्यावे अशी वाचकांची इच्छा असते. जेव्हा प्रकाशक प्रकाशनसंस्थेत लेखकभेटीची योजना राबवतो तेव्हा वाचक त्या निमित्ताने प्रकाशन संस्थेला भेट देऊन लेखकाशी संवाद साधतो व त्याच्या वाङ्मयीन भूमिकेबद्दल जाणून घेतो व पुस्तक

खरेदीही करतो.

लेखक जेव्हा साहित्यकृतीची निर्मिती करतो तेव्हा ती साहित्यकृती प्रकाशित व्हावी, ती वाचकांपर्यंत पोहोचावी, वाचकांनी तिला प्रतिसाद द्यावा अशी लेखकाची इच्छा असते. विशेषतः नवोदित लेखकाला प्रकाशनव्यवहाराबद्दल जर विशेष माहिती नसेल, तर तो प्रकाशन संस्थेचे साहित्यव्यवहारात काय स्थान आहे हे जाणून न घेता आपले पुस्तक त्या प्रकाशनसंस्थेकडे प्रकाशित करण्यासाठी देतो. काही लेखक मात्र प्रकाशक कोण आहे, त्याची बाजारातील प्रतिमा काय आहे, याचा विचार न करता आपली पुस्तके कोणत्याही प्रकाशकास देतात. परिणामी एकूण ग्रंथव्यवहारात त्यांच्या पुस्तकाची चर्चा होण्याची शक्यता कमी असते. एवढेच काय, त्यांच्या लेखकपणाबद्दलही शंका घेतली जाते. त्याचे कारण त्या लेखकाची पुस्तके बाजारात मिळत नाहीत, खरे म्हणजे पुस्तक कोणत्या प्रकाशकाने काढले आहे, यापेक्षा ते कसे आहे, ते वाचून वाचकाने, समीक्षकाने ठरविले पाहिजे; परंतु मराठी साहित्य जगतासाठी तरी तो दिवस खूप दूर आहे, असे म्हणावे लागते! एखादी प्रकाशनसंस्था नव्याने प्रकाशन व्यवसायात आली असेल, तर तिच्याबद्दल वाचकांच्या मनात अनेक प्रश्न असतात. तसेच त्या प्रकाशनसंस्थेच्या पुस्तक वितरण व प्रसिद्धीच्या मर्यादा असतील, तर अशी पुस्तके कितीही श्रेष्ठ दर्जाची असली तरीसुद्धा दुर्लक्षित राहण्याची शक्यता अधिक आहे. वाचकही प्रकाशनसंस्थेच्या नावाचा विचार करून लेखक व त्याच्या साहित्यकृतीचे (न वाचताच) मूल्यमापन करत असेल, तर असा लेखक व साहित्यकृती साहित्यव्यवहारात दुर्लक्षित राहतात.

कोणत्या पुस्तकांना वाचकांचा प्रतिसाद चांगला असतो याची कल्पना प्रकाशकांना असते. विशेषतः मराठी वाचक पौराणिक व ऐतिहासिक साहित्य अधिक वाचताना दिसतात. प्रकाशकाचा आणि बाजारपेठेचा रोजचाच संबंध असतो. कोणती पुस्तके वाचली जातात, कोणती पुस्तके वाचली जाऊ शकतात याचा काही अंदाज प्रकाशकांना येत असतो. विशेषतः मराठी वाचक प्रामुख्याने पौराणिक, ऐतिहासिक साहित्य वाचतो. त्यातही त्याला काही नवा दृष्टिकोन नको असतो. प्राचीन काळापासून चालत आलेला दृष्टिकोन असेल, तर अधिक

जानेवारी ते मार्च २०२१ | ६१



बरे असा विचार करणारा असतो. अशा वाचकांसाठी जुनी व नवी अशी बरीच पुस्तके बाजारात असतात. यापेक्षा काही नवे प्रकाशित करावे असा विचार करणारे प्रकाशकही असतात. वेगळा दृष्टिकोन असणारी पुस्तके कमी वाचली जातात असाही अनुभव सांगितला जातो. रणांगण आणि कोसला या दोन कादंबऱ्या पहिली दहा-बारा वर्षे फारशा खपल्याच नाहीत असे सांगितले जाते. वाचक हासुद्धा समाजात राहतो. समाजातील परंपरा, चालीरीती, संस्कृती यांचा त्याच्या व्यक्तिमत्त्वावर बरा-वाईट परिणाम होत असतो. ज्या सामाजिक परंपरांच्या संस्कारातून वाचकाच्या व्यक्तिमत्त्वाची जडण-घडण झालेली असते. त्याच विचारांचे साहित्य वाचकाला वाचावेसे वाटते, त्यामुळे पौराणिक व ऐतिहासिक साहित्य वाचण्यास वाचक प्राधान्य देतो. जे साहित्य सामाजिक प्रश्नांना हात घालते, वाचकांना नवा दृष्टिकोन देऊ पाहते अशा साहित्याकडे वाचक दुर्लक्ष करतात. म्हणजेच सामाजिक संस्कारांचा प्रभाव वाचकाच्या व्यक्तिमत्त्वावर पडल्यामुळे वाचक पारंपरिक साहित्य वाचनालाच प्रतिसाद देताना दिसतात. त्यामुळे नव्या दृष्टिकोनाचे साहित्य कितीही दर्जेदार असले तरी वाचक अशा साहित्याला प्रतिसाद देत नाहीत. तेव्हा प्रकाशकही असे साहित्य प्रकाशित करण्यास फारसे उत्सुक नसतात. तेव्हा लेखक किंवा लेखकाचे कुटुंबीय त्याची पुस्तके स्वतः प्रकाशित करून थेट वाचकांपर्यंत पोहोचवण्याचा प्रयत्न करत असतात. कधी कधी एखाद्या लेखकाचे कुटुंबीय त्यांची पुस्तके प्रकाशित करत असतात. रा. ना. चव्हाण हे महाराष्ट्रातील एक महत्त्वाचे परिवर्तनवादी विचारवंत. त्यांनी आयुष्यभर प्रबोधनात्मक लेखन केले. वाई येथे असणाऱ्या रा. ना. चव्हाण यांनी आयुष्यभर एकच ध्यास घेतला होता. तो म्हणजे शोषितांची मुक्ती. जवळजवळ ६० वर्षे ते लिहीत होते; परंतु त्यांच्या हयातीत त्यांचे केवळ एक पुस्तक प्रकाशित होऊ शकले. त्यांच्या निधनानंतर त्यांचे चिरंजीव श्री. रमेश चव्हाण आणि त्यांच्या पत्नी वैशाली रमेश चव्हाण हे एखादे व्रत घेतल्यासारखे रा. ना. चव्हाण यांचे लेखन ग्रंथरूपाने प्रकाशित करित आहेत. आतापर्यंत त्यांनी रा. ना. चव्हाण यांची ३५ पुस्तके प्रकाशित केली आहेत. अशी उदाहरणे दुर्मिळच असतात. असा सगळा मराठी प्रकाशनाचा व्याप आहे. त्यात

महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ६२

आजही पौराणिक स्वरूपाचे ललित साहित्य वाचणाऱ्या वाचकांची संख्या जास्त आहे. त्या तुलनेत समाजाचे व माणसांचे प्रश्न मांडणारे ललित साहित्य कमी वाचले जाते. अशा पुस्तकांचा खप व्हावा, यासाठी प्रकाशक विविध योजना राबवत असतो. पुस्तकांचा खप व्हावा यासाठी कधी कधी लेखकाला पुस्तकांच्या दुकानात (स्वतःच्या किंवा इतरांच्या) बसवतो. अमूक दिवशी पुस्तक घेतल्यास लेखकाची स्वाक्षरी मिळेल असे प्रलोभन वाचकांना-ग्राहकांना दाखविण्यात येते. पुष्कळ वाचकांच्या मनात लेखकाविषयी प्रेमभाव, आदरभाव क्वचित भक्तिभाव असल्यामुळे तो त्या दिवशी लेखकाच्या स्वाक्षरीसह पुस्तक घेतो,

वैयक्तिक पुस्तके प्रकाशित करणारे असतातच. वैचारिक साहित्य हे वाचकांच्या विचारांना थेट चालना देत असते. अशा साहित्यातून व्यक्त होणारे विचार तर्काधिष्ठित असतात. अशा साहित्याला वाचकांचा पुरेसा प्रतिसाद मिळत नसल्यामुळे प्रकाशनसंस्था अशी पुस्तके प्रकाशित करण्यास उत्सुक नसतात. त्यामुळे लेखक व त्याचे कुटुंबीयच स्वतः पुढाकार घेऊन पुस्तक प्रकाशित करतात तसेच वितरणही स्वतः करून वाचकांपर्यंत पोहोचवत असतात. अलीकडे महाराष्ट्र शासनाच्या वतीने वैचारिक व शास्त्रीय व विषयांवरील पुस्तके प्रकाशित होताना दिसतात.

एकेकाळी पुणे आणि मुंबई येथेच प्रकाशनाचा व्यवसाय करणाऱ्या प्रकाशनसंस्था होत्या; परंतु अलीकडे प्रकाशनसंस्थांची संख्याही खूप वाढली आहे. राज्याच्या जवळजवळ प्रत्येक जिल्ह्यांत प्रकाशनसंस्था असल्याचे दिसून येते. एकेकाळी फक्त पुणे आणि मुंबई येथेच प्रकाशनाचा व्यवसाय करणाऱ्या प्रकाशनसंस्था होत्या. त्यांची संख्याही अगदीच हाताच्या बोटावर मोजता येईल एवढीच होती. आज उत्तमातील उत्तम आणि दर्जेदार पुस्तके प्रकाशित करणाऱ्या प्रकाशकांची संख्या खूप

वाढली आहे. ज्या पुणे आणि मुंबईत मर्यादित प्रकाशक होते, (कारण लेखक आणि वाचकही मर्यादित होते.) महाराष्ट्राच्या सर्व भागांमध्ये दर्जेदार पुस्तके प्रकाशित करणाऱ्या प्रकाशनसंस्था निर्माण झाल्या आहेत. औरंगाबाद, नाशिक, नागपूर, अमरावती, नांदेड, कोल्हापूर, सातारा अशा शहरांमधून पुस्तके प्रकाशित होत आहेत. याशिवाय विशिष्ट हेतूने निर्माण झालेल्या प्रकाशनसंस्था असतात. उदा. अंधश्रद्धा निर्मूलनाचे काम करणाऱ्या पुस्तकांचे प्रकाशन करणारी एक स्वतंत्र प्रकाशनसंस्था आहे. वेगवेगळ्या प्रकारचे कोश प्रकाशित करणे त्या त्या भाषेसाठी आवश्यक असते; परंतु असे कोश प्रकाशित करण्यास प्रकाशक फारसे उत्सुक नसतात. तेव्हा त्यांच्या प्रकाशनासाठी कोशकर्त्यांनाच पुढाकार घ्यावा लागतो. अशा प्रकारचे ज्ञानकोश (श्री. व्यं. केतकर), संस्कृतिकोश (पं. महादेवशास्त्री जोशी), चरित्रकोश (चित्रावशास्त्री), समाजविज्ञान कोश (स. मा. गर्गे), कृषिविज्ञान कोश (जोशी) हे आणि यांसारखे इतर कोश प्रकाशित करण्यासाठी त्या त्या मान्यवरांनी पुढाकार घेत स्वतःच्याच प्रकाशनसंस्था सुरू केल्या. याशिवाय काही मान्यवर लेखक केवळ स्वतःची पुस्तके प्रकाशित करण्यासाठी स्वतंत्र प्रकाशनसंस्था काढतात आणि ते स्वतंत्रपणे विक्री करतात. पूर्णवेळ प्रकाशक जसे आहेत, त्याप्रमाणे इतर व्यवसाय करणाऱ्या काही मान्यवरांनी प्रकाशनसंस्था सुरू केल्या आहेत. याशिवाय काही वर्तमानपत्रांच्याही प्रकाशन संस्था आहेत. म्हणजेच प्रारंभीच्या काळात ग्रंथव्यवहार हा मर्यादित स्वरूपात होता. त्यामुळे पुणे, मुंबईसारख्या शहरांमध्येच प्रकाशनसंस्था कार्यरत होत्या; परंतु जसजसे शिक्षणाचे प्रमाण वाढत गेले तसतसा साहित्यव्यवहारही विस्तारल्याचे दिसते. शिक्षणामुळे ग्रामीण भागात हळूहळू वाचकवर्ग निर्माण होत आहे, वाढतो आहे. म्हणजे पुस्तकांची बाजारपेठ विस्तारत विस्तारत ती आता छोट्या छोट्या गावांपर्यंत गेली आहे. या विस्तारलेल्या बाजारपेठेशी प्रकाशक कसा संवाद करणार आहेत हा आजचा महत्त्वाचा प्रश्न आहे. अशा सगळ्या गोष्टींची चर्चा केल्यानंतर एक गोष्ट मात्र स्पष्ट होते, ती अशी की, पुस्तकांची बाजारपेठ ही अत्यंत महत्त्वाची गोष्ट आहे. तिच्यावर ताबा मिळविणे, निदान तिच्याशी संवादी राहणे

मात्र लेखक-प्रकाशकांच्या दृष्टीने आवश्यक आहे. आज मात्र पुस्तकांच्या बाजारपेठेवर वरचष्मा असतो तो प्रतिष्ठित मान्यवर प्रकाशकांचा हे मात्र कबूल करावे लागेल. अर्थात एखाद दुसरे अपवादात्मक पुस्तक जे नव्या किंवा अपरिचित प्रकाशकाने प्रकाशित केले आहे त्याची विक्री होते त्याची दखल घेतली जाते, चर्चा होते. लेखकाने साहित्यकृती निर्माण केली तरी लेखक म्हणून जी मान्यता प्राप्त होते ती प्रकाशकामुळे; कारण प्रकाशक ती साहित्यकृती वाचकांपर्यंत पोहोचवत असतो. आजच्या स्थितीत साहित्यव्यवहाराच्या क्षेत्राचा मोठ्या प्रमाणात विस्तार झालेला आहे. दररोज शेकडो पुस्तके विविध प्रकाशनसंस्था प्रकाशित करत असतात. महाराष्ट्र शासन, विविध विद्यापीठे, साहित्यसंस्था आणि काही वैयक्तिक प्रकाशने सोडली तरीही आज महाराष्ट्रात किमान चारशे ते पाचशे प्रकाशक प्रकाशन व्यवसायात कार्यरत असावेत. महाराष्ट्रात खेड्यापाड्यात उच्च शिक्षणापर्यंतचा शिक्षणप्रसार झाल्यामुळे मराठीतील ग्रंथव्यवहार (वर्षापूर्वीच्या तुलनेत) खूप वाढल्याचे दिसते. दर महिन्याला विविध प्रकाशनसंस्थांच्या माध्यमातून किमान तीन-चारशे पुस्तके बाजारात येतात. यातील किती पुस्तकांची दखल घेतली जाते? त्यांची साहित्यव्यवहारात चर्चा होते का? असे अनेक प्रश्नही निर्माण होतात; परंतु ज्या प्रस्थापित, प्रतिष्ठित प्रकाशनसंस्था आहेत त्यांच्याकडे मोठा वाचकवर्ग विश्वासाने पाहत असतो. अशा प्रकाशनसंस्थांनी प्रकाशित केलेल्या पुस्तकांची साहित्यव्यवहारात चर्चा होते. नागपूर-चंद्रपूरसारख्या शहरांमधून प्रकाशित झालेली पुस्तके पुण्या-मुंबईच्या बाजारपेठांमध्ये क्वचितच दिसतात. हाच प्रकार इतर शहरांबाबतही आहे. एकतर ही पुस्तके त्या त्या प्रदेशात विकली जात असणार अगर महाराष्ट्रपर पोहोचायला कितीतरी वर्षे जात असणार म्हणून एलकुंचवार, मनोहर, ग्रेस, राजन गवस यांच्यासारखे लेखक आपली पुस्तके पुणे किंवा मुंबईच्या मान्यवर प्रकाशकांना प्रसिद्धीसाठी देत असतात; पण वेगवेगळ्या ठिकाणांहून प्रकाशित झालेली पुस्तके चांगली, दर्जेदार नसतातच असे म्हणता येणार नाही कारण वाचल्याशिवाय ती कशी आहेत, हे कसे ठरविता येणार? पण एवढे परिश्रम तरी सध्या कोण घेतो? मराठीत असे कुठलेही नियतकालिक नाही की जे आलेल्या नव्या

जानेवारी ते मार्च २०२१ | ६३

पुस्तकांवर किमान अर्ध्या पानाची तरी समीक्षा देईल. प्रकाशनसंस्थेने पुस्तक प्रकाशित केले तरी त्या पुस्तकावर चर्चा झाल्याशिवाय, प्रकाश-स्रोतात आल्याशिवाय साहित्यव्यवहारात स्थान मिळत नाही, त्यामुळे अनेक प्रसिद्ध लेखक आपली साहित्यकृती पुणे-मुंबई येथील प्रतिष्ठित व प्रस्थापित प्रकाशनसंस्थांमध्ये प्रकाशित करताना दिसतात. म्हणजेच लेखकाला लेखक म्हणून व्यापक स्वरूपात मान्यता मिळवायची असेल, तर प्रतिष्ठित साहित्यसंस्थेकडून पुस्तक प्रकाशित करावे लागते.

बरील विवेचनावरून असे दिसून येते की, प्रकाशक हा लेखक व वाचक यांच्यातील मध्यस्थाची भूमिका बजावत असतो. पुस्तक प्रसिद्धीसाठी लेखक प्रकाशकाने जे पैसे गुंतवलेले असतात त्याची वेळेत नफ्यासह वसुली व्हावी अशी प्रकाशकाची अपेक्षा असते. त्यासाठी वाचकाच्या पसंतीस सदर पुस्तक उतरावे म्हणून पुस्तकाचे मुखपृष्ठ-मलपृष्ठ आकर्षक करण्याचा प्रयत्न करतो. साहित्यव्यवहारात वाचकांचा काही विशिष्ट प्रकाशन संस्थांवर विश्वास असतो; नव्हे त्यांच्या दृष्टीने प्रकाशनसंस्था ह्या (Brand) आहेत. ज्या प्रकाशन संस्थेचे प्रकाशन व्यवसायात विशेष नाव नाही अशा प्रकाशन संस्थेने प्रकाशित केलेले पुस्तक कितीही दर्जेदार असले तरीही वाचक बहुधा दुर्लक्ष करताना दिसतात. ज्या प्रकाशनसंस्थांकडे वाचक विश्वासाने पाहतात अशा प्रकाशनसंस्थेने लेखकाला पुस्तक प्रकाशित करण्याची मान्यता दिली की, लेखक पुस्तक प्रसिद्धीची अर्धी लढाई जिंकलेला असतो. म्हणजेच प्रकाशनसंस्थेचा दर्जा साहित्यव्यवहारावर परिणाम करत असतो. पुस्तक प्रसिद्धीसाठी व साहित्यव्यवहारात पुस्तकाची चर्चा घडवून आणण्यासाठी प्रकाशक पोस्टर छापून पुस्तक-विक्रीच्या ठिकाणी लावणे, वर्तमानपत्रातून जाहिरात देणे, ग्रंथ व्यवहारासाठीच्या नियतकालिकांमध्ये जाहिरात देणे, एका विशिष्ट दिवशी पुस्तक खरेदी केल्यास लेखकाशी संवाद साधता येईल व पुस्तकावर स्वाक्षरी मिळेल असे विविध उपक्रम राबवत असतात, तर ज्या प्रकाशनसंस्था नव्याने सुरू झालेल्या असतात त्यांना पुस्तक प्रसिद्धीसाठीचे असे उपक्रम राबविणे शक्य नसते. परिणामी एखादे पुस्तक कितीही महत्त्वाचे असले तरी ते

दुर्लक्षित राहण्याची शक्यता असते. आजही पौराणिक स्वरूपाचे ललित साहित्य वाचणाऱ्या वाचकांची संख्या जास्त आहे, त्या तुलनेत समाजाचे व माणसांचे प्रश्न मांडणारे ललित साहित्य कमी वाचले जाते असे निरीक्षण प्रकाशक नोंदवतात. काही लेखक व त्यांचे कुटुंबीय स्वतःच स्वतंत्रपणे पुस्तक प्रकाशित करून वाचकांपर्यंत पोहोचवताना दिसतात. एके काळी पुणे आणि मुंबई येथेच प्रकाशनाचा व्यवसाय करणाऱ्या प्रकाशनसंस्था होत्या; परंतु अलीकडे प्रत्येक जिल्ह्यात प्रकाशनसंस्था सुरू झालेल्या दिसून येतात. उच्च शिक्षणाचा ग्रामीण भागात प्रसार झाला त्यामुळे साहित्यव्यवहाराचे क्षेत्रही काही प्रमाणात विस्तारल्याचे दिसते. लेखकाने साहित्यकृतीची निर्मिती केली तरी त्याला लेखक म्हणून समाजमान्यता मिळवून देण्यात काही प्रमाणात प्रकाशकाचेही योगदान असते.

#### संदर्भसूची

- १) कोतापळे नागनाथ, 'साहित्यव्यवहाराचा प्रमुख आधार; वाचक', अंतर्भूत: कोठावळे केशवराव, (संपा.) 'ललित' (मासिक) फेब्रु २०१८ पृ. १४.
- २) कोतापळे नागनाथ, 'वाचक, वाचन आणि वाचनप्रक्रिया पुस्तकांची बाजारपेठ', अंतर्भूत: कोठावळे केशवराव, (संपा.) 'ललित' (मासिक) ऑक्टो २०१८ पृ. ३४ व ३५.
- ३) तत्रैव पृ. ३५.
- ४) कोतापळे नागनाथ, 'जागतिकीकरण आणि वाचन', अंतर्भूत: कोठावळे केशवराव (संपा.) 'ललित' (मासिक) जुलै २०१८ पृ. २२.
- ५) तत्रैव पृ. २२.
- ६) कोतापळे नागनाथ, 'वाचक, वाचन आणि वाचनप्रक्रिया पुस्तकांची बाजारपेठ, अंतर्भूत: कोठावळे केशवराव (संपा.) 'ललित' (मासिक) ऑक्टो २०१८ पृ. ३४.
- ७) तत्रैव पृ. ३५. ८) तत्रैव पृ. ३४.
- ९) तत्रैव पृ. ३६. १०) तत्रैव पृ. ३६.
- ११) तत्रैव पृ. ३८. १२) तत्रैव पृ. ३७.

प्रा. नंदकुमार भाऊसाहेब उदार

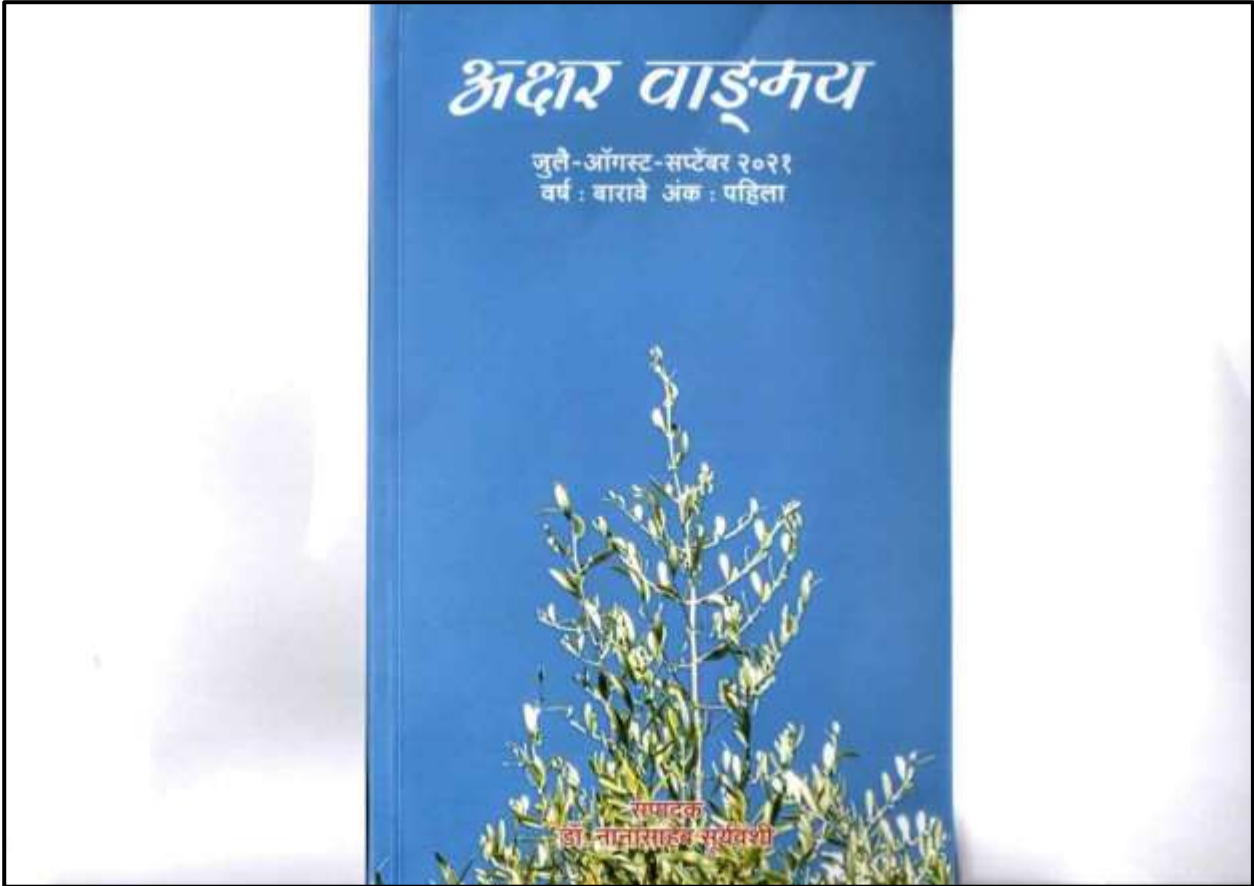
चलभाष: ९८२२७४८७७२


udarnandkumar@gmail.com



महाराष्ट्र साहित्य पत्रिका क्र. ३७३ | ६४

12. Marathitil Prayogik Natak



<p>R. N. I. FOR INDIA New Delhi R. No. - MAHMAR-5629-2010</p>  <p>ISSN - 2229-4929 UGC Approved and Peer Reviewed Journal</p> <p><b>AKSHAR WANGMAY</b></p> <p>Year : 12 Volume : 1 July-August-September 2021</p> <p>Editor-in-Chief <b>Dr. Nanasaheb Suryawanshi</b></p> <p>Executive Editor <b>Dr. Shivajirao Deshmukh</b></p> <p>Advisor <b>Dr. Arun Prabhune</b></p> <p>Editorial Board</p> <p><b>Dr. Balasaheb Labde</b>                      <b>Dr. Deepak Chiddarwar</b> <b>Dr. Ratnakar Bledge</b>                   <b>Dr. Sandeep Sangle</b> Coordinator                                      Coordinator</p> <p><b>Mr. Ramesh Deshpande (USA)</b>      <b>Sonali Jambhekar (USA)</b></p> <p>Publisher : Smt. Bakhari Nanasaheb Suryawanshi, Pratik Prakashan, "Pratik", Bakre Nagar, Thadga Road, Ahmednagar 435315 Printer : Pratikoff, 1543, "Chakar Corner" Navi Peth, Pune 411 039</p> <p>Address for sending articles and fees : Dr. Nanasaheb Suryawanshi "Pratik", Bakre Nagar, Thadga Road, Ahmednagar 435315 District : Latour Mobile phone : 9423655641 E-mail : suryawanshinanasaheb67@gmail.com</p> <p>Subscription Rates Yearly : Rs. 500/-                      Five Years : Rs. 2000/- Two years : Rs. 900/-    Current Volume : Rs. 125/-</p> <p>* Maharashtra State Literary and Cultural Board has granted funds for the Publication of this Journal. But Maharashtra State Literary and Cultural Board has not been responsible for writers' opinion in this Journal. * The content and opinions expressed in the articles are the views of the authors and do not necessarily reflect the views and opinions of the periodical's Editorial Board, publisher or the advisor. The authors are solely responsible for the facts and accuracy of the content of the articles.</p>	<p style="text-align: center;"><b>अनुक्रम</b> (पृष्ठ)</p> <table border="0"> <tr> <td>१) संपादकीय</td> <td>४</td> </tr> <tr> <td>२) मूल्यांकनविषयी</td> <td>७</td> </tr> <tr> <td>३) बदलते सामाजिक मूल्ये व वाङ्मयाचे अध्ययन</td> <td>३५</td> </tr> <tr> <td>४) या, मनीष बडवे</td> <td></td> </tr> <tr> <td>५) आदिवासींचे धंदवे : उमर आणि विकास</td> <td>४७</td> </tr> <tr> <td>६) डॉ. अंजली सफरोन्कर</td> <td></td> </tr> <tr> <td>७) महादीर्घीत प्रायोगिक नाटक</td> <td>५६</td> </tr> <tr> <td>८) डॉ. शशांक</td> <td></td> </tr> <tr> <td>९) महादीर्घीत स्त्रीवादी साहित्य</td> <td>६२</td> </tr> <tr> <td>१०) डॉ. उदय जाधव</td> <td></td> </tr> <tr> <td>११) दिवा अमरदुलकान गजिवर</td> <td>७०</td> </tr> <tr> <td>१२) डॉ. उर्मिला चाकूरकर</td> <td></td> </tr> <tr> <td>१३) दिवा धर्मा</td> <td>८२</td> </tr> <tr> <td>१४) अमोनी जोशी</td> <td></td> </tr> <tr> <td>१५) Turning Point July 12, 1961</td> <td>८७</td> </tr> <tr> <td>१६) रंजना वीक्षित जोशीकर</td> <td></td> </tr> <tr> <td>१७) "बदलत असलेल्या" : कालांतरातील टिकाव, जाणकारकथा</td> <td>९४</td> </tr> <tr> <td>१८) डॉ. नानासाहेब जाधव</td> <td></td> </tr> <tr> <td>१९) अणुस्फोटक सारे बांध्या साहित्यातील वैचारिकता</td> <td>९६</td> </tr> <tr> <td>२०) डॉ. पुनराज मानकर</td> <td></td> </tr> <tr> <td>२१) "विचाराचा गंध" : विचक विचार</td> <td>१०६</td> </tr> <tr> <td>२२) डॉ. उमेश मिसराट</td> <td></td> </tr> <tr> <td>२३) "स्व"चा शोध घेण्याची वैशिष्ट्यपूर्ण कारंभरी : धारणसा</td> <td>११५</td> </tr> <tr> <td>२४) डॉ. प्रि. डा. चामराकर</td> <td></td> </tr> <tr> <td>२५) सांस्कृतिक वाङ्मय जीवनाने बनविलेले विज्ञान : "नोडलरपुस्तक"</td> <td>१२३</td> </tr> <tr> <td>२६) डॉ. नानासाहेब कुर्पेकर</td> <td></td> </tr> <tr> <td>२७) बंधित</td> <td>१३३</td> </tr> <tr> <td>२८) के. बळीराम शी, धनीषा पाटील</td> <td></td> </tr> <tr> <td>२९) "अक्षर वाङ्मय" चे कृत्य व कृतीकरण बनविलेले कर्तरीदार</td> <td>१३५</td> </tr> <tr> <td>३०) संपादक बडवे</td> <td>१३६</td> </tr> </table>	१) संपादकीय	४	२) मूल्यांकनविषयी	७	३) बदलते सामाजिक मूल्ये व वाङ्मयाचे अध्ययन	३५	४) या, मनीष बडवे		५) आदिवासींचे धंदवे : उमर आणि विकास	४७	६) डॉ. अंजली सफरोन्कर		७) महादीर्घीत प्रायोगिक नाटक	५६	८) डॉ. शशांक		९) महादीर्घीत स्त्रीवादी साहित्य	६२	१०) डॉ. उदय जाधव		११) दिवा अमरदुलकान गजिवर	७०	१२) डॉ. उर्मिला चाकूरकर		१३) दिवा धर्मा	८२	१४) अमोनी जोशी		१५) Turning Point July 12, 1961	८७	१६) रंजना वीक्षित जोशीकर		१७) "बदलत असलेल्या" : कालांतरातील टिकाव, जाणकारकथा	९४	१८) डॉ. नानासाहेब जाधव		१९) अणुस्फोटक सारे बांध्या साहित्यातील वैचारिकता	९६	२०) डॉ. पुनराज मानकर		२१) "विचाराचा गंध" : विचक विचार	१०६	२२) डॉ. उमेश मिसराट		२३) "स्व"चा शोध घेण्याची वैशिष्ट्यपूर्ण कारंभरी : धारणसा	११५	२४) डॉ. प्रि. डा. चामराकर		२५) सांस्कृतिक वाङ्मय जीवनाने बनविलेले विज्ञान : "नोडलरपुस्तक"	१२३	२६) डॉ. नानासाहेब कुर्पेकर		२७) बंधित	१३३	२८) के. बळीराम शी, धनीषा पाटील		२९) "अक्षर वाङ्मय" चे कृत्य व कृतीकरण बनविलेले कर्तरीदार	१३५	३०) संपादक बडवे	१३६
१) संपादकीय	४																																																												
२) मूल्यांकनविषयी	७																																																												
३) बदलते सामाजिक मूल्ये व वाङ्मयाचे अध्ययन	३५																																																												
४) या, मनीष बडवे																																																													
५) आदिवासींचे धंदवे : उमर आणि विकास	४७																																																												
६) डॉ. अंजली सफरोन्कर																																																													
७) महादीर्घीत प्रायोगिक नाटक	५६																																																												
८) डॉ. शशांक																																																													
९) महादीर्घीत स्त्रीवादी साहित्य	६२																																																												
१०) डॉ. उदय जाधव																																																													
११) दिवा अमरदुलकान गजिवर	७०																																																												
१२) डॉ. उर्मिला चाकूरकर																																																													
१३) दिवा धर्मा	८२																																																												
१४) अमोनी जोशी																																																													
१५) Turning Point July 12, 1961	८७																																																												
१६) रंजना वीक्षित जोशीकर																																																													
१७) "बदलत असलेल्या" : कालांतरातील टिकाव, जाणकारकथा	९४																																																												
१८) डॉ. नानासाहेब जाधव																																																													
१९) अणुस्फोटक सारे बांध्या साहित्यातील वैचारिकता	९६																																																												
२०) डॉ. पुनराज मानकर																																																													
२१) "विचाराचा गंध" : विचक विचार	१०६																																																												
२२) डॉ. उमेश मिसराट																																																													
२३) "स्व"चा शोध घेण्याची वैशिष्ट्यपूर्ण कारंभरी : धारणसा	११५																																																												
२४) डॉ. प्रि. डा. चामराकर																																																													
२५) सांस्कृतिक वाङ्मय जीवनाने बनविलेले विज्ञान : "नोडलरपुस्तक"	१२३																																																												
२६) डॉ. नानासाहेब कुर्पेकर																																																													
२७) बंधित	१३३																																																												
२८) के. बळीराम शी, धनीषा पाटील																																																													
२९) "अक्षर वाङ्मय" चे कृत्य व कृतीकरण बनविलेले कर्तरीदार	१३५																																																												
३०) संपादक बडवे	१३६																																																												

मराठीतील प्रायोगिक नाटक

- डॉ. हरेज गेंडके

प्रस्तावना :

न्या रंगभूमीवर आजच-अधिवक्तीचे प्रयोग होताना ती प्रायोगिक रंगभूमी असे आपल्याला म्हणता येईल. पण ही विश्लेषक व्यक्तीच झाली. तर प्रायोगिक रंगभूमी वा संपूर्ण मुक्ति होणा-चा सर्व अर्थचट्टा जाणवण्याच्या असल्या तर त्याच सोबतच त्या संज्ञाही असलेले तिचे साधन विद्यार्थ्यांचे संबंध आपल्याला पाहावला हवेत. नाटकाने कवीकरण आजच स्वकीय असू शकते, असे काही इतर गोष्टींमधूनही होऊ शकते. स्वातंत्र्याक-होती, मुल्यधारा, संपादनधारा, साकेत-प्रायोगिक अशा तीन विविध कवीकरण नाटकाने आपल्याला संकेतसाहाय्य दिसते. स्वातंत्र्याक रंगभूमीचा असा आणव विचार केला तर आपल्याला असे दिसून येते की, नाटककार, दिग्दर्शक, च-रित्र, संज्ञा निर्माता हे सारे जण जातीयविषये साधन म्हणून नाटक करताना दिसून येतात. नाटक करणे हा त्यांचा व्यवसाय असतो. याच त्यांचे अधीन असलेले असते. नाटक हा सदा करणाचा चंद्र असतो, कधी गरजूही असते, वाढीवत्या लोकांनी एकाच वेळाने बसवलेली परंपरासमाप्तीला नाटक, शाळा-कॉलेजमधील स्टुडेंटची नाटके, तसेच सामाजिक रंगभूमीवरील बहुतेक नाटके हीही लोकरीय सादर केलेली असतात. मुख्य धारा रंगभूमी ही प्रेक्षकासुखी रंगभूमी आहे. स्वा-तंत्र्याच्या काळातून वेगळे प्रेक्षकांना घुलून काढण्याचा, विद्रव्यवादा, त्यांचा अनुकरण करणाचा प्रयत्न असतो. त्यांना स्वयंसेवा नाही, परंपरा नाही असे काही कारणांचा उद्भव सादर उद्भवत नाही. ही नाटके प्रायुक्ताने स्वातंत्र्याक रंगभूमीवर होतात.

अशा पण प्रायोगिक रंगभूमीचा अर्थोत्थ प्रायोगिक नाटकांचा विचार करूयात प्रायोगिक नाटक म्हणजे की तेथे प्रायुक्ताने नाटकाने काही उल्लेख संकेत असतातच पण उल्लेख संकेतांमध्ये मूलतः घालण्याचा प्रयत्न हवे असतो.

198 | अज्ञ वाङ्मय | जुलै-ऑगस्ट-सप्टेंबर 2021 |

काही गोष्टी नव्या संकेतांखेरीज व्यक्तच होणार नाहीत अशी तिची धारणा असते. ती नव्या संकेतांना जन्म देऊ पाहत असते. अज्ञान आणि अधिवक्ती दोन्हीत सतत काहीही जन्म करून पाहणे, सोपणे हेच प्रायोगिक नाटकाने ध्येय असलेले आपल्याला जाणवते.

प्रायोगिक नाटक म्हणजे काय ? :

१. प्रायोगिक नाटक म्हणजे सातत आपल्या घाबरून काही विंगडे करून पाहणे, माणसाच्या स्वभावा सोपणे, अज्ञानातून अधिवक्ती करणाचा प्रयत्न करणे वातून कलांमध्ये खुन्या अर्थाने प्रायोगिकता अज्ञान होत असते. ती एका अर्थाने अज्ञान प्रदेशातील वाटचाल असते.

२. प्रायोगिक नाटक हे नाटककाराचे व्यवसाय म्हणून न पाहता कला म्हणून पाहणे अधिष्ठित करते.

३. प्रायोगिक नाटकांमध्ये नाटका अभिनय, वेगळ, प्रकाशयोजना, संगीत, दिग्दर्शन आणि वाद्यसंगीत अशा विविध अंगांनी प्रायोगिकता व्यक्त होत असते. रंगभूमी हाच अर्थ रंगभूमी वा विविध अंगालाच मर्यादांचा सोप घेत असतो.

४. प्रायोगिक नाटकांमध्ये उल्लेख संकेत घालून सतत पण घालण्याचा प्रयत्न असतो. तसेच काही गोष्टी या नव्या संकेतांखेरीज व्यक्तच होणार नाहीत अशी धारणा वेग असते. त्यामुळे नवनीत संकेतांना जन्म प्रायोगिक नाटकांमध्ये दिला आपल्याला दिसून येतो. अज्ञान आणि अधिवक्ती दोन्हीत सतत काही तरी जन्म करून पाहण्याचा प्रयोग वेग घडवता दिसून येतो. त्यामुळे नाटकांचा हेच तिचे ध्येय असलेले आपल्याला दिसून येते.

प्रायोगिक नाटक प्रारंभ आणि विविध संस्थांचे योगदान :

जेथे नाटककार आणि साहित्यिक प्रेरणेत रावी काही प्रायोगिक नाटककारांना खुन्या अर्थाने महात्मा फुले यांच्या 'तृतीय रत्न' या नाटककारासुद्धा प्रारंभ झाला असे म्हटले जाते. १९९९ पासून मुंबईत अज्ञानाच भेदे हे दिग्दर्शन आणि माधव बरोड हे नाटककार काही तसे प्रयोग करू लागले होते. इंडियन नेशनल थिएटर, भारतीय विद्या भवन कलाभेदे, भेदे यांची कलाकार नाटकसंस्था अशा

198 | अज्ञ वाङ्मय | जुलै-ऑगस्ट-सप्टेंबर 2021 |

नाटकाने प्रयोग करीत होत्या. त्याबरोबरच १९९० च्या दशकात इब्राहिम अल्बकडी हे प्रतिभाकेंद्र दिग्दर्शन जयसिंग पट्टनायक नाटकाने प्रयोग सुद्धा करत होते. १९९०-९१ च्या आसपास भारतीय विद्या भवन वा संस्थेने महाविद्यालयीन स्तरावरील एकाधिकार संपूर्ण सुरू केले. रंगभूमीच्या क्षेत्रात नवे काही काळ इंडियन नॅट, नाटककार, दिग्दर्शन वा संपादनधारा घडत होते. त्यामध्ये प्रायुक्ताने आपल्याला काही तसे सांगता येतील विजय तेंडुलकर, रत्नाकर महादवी, बसंत भावे, बबन प्रभू, हे नाटककारा दामू केकरे, विजया मेहता, नंदकुमार रावते, अरविंद देशपांडे, कलाकार प्रांग, सुलभा देशपांडे, माधव नाटके इत्यादी दिग्दर्शन आणि अधिवक्ती वा संपादकी संस्था होत. वा स्वाधिनधील कलाकारांमध्ये नवी नाटके देण्यासाठी जल्दवी काही महत्वाच्या संस्थांचा पार सोसाचा वाटा राहिला आहे. त्यामध्ये प्रायुक्ताने आपल्याला ललित कला केड, रंगमंच, इंडियन अँकॅडमी ऑफ थिएट्रिक आर्ट्स, वा संस्था निघात्या. पुण्यात महाराष्ट्रीय कलामासक आणि प्रोग्रेसिव्ह थिएट्रिक असोसिएशन वा संस्था याच प्रकारचे कार्य करीत होत्या. नव्या नाटकाने, नव्या साधनांच्या प्रयोगांचे एक वातावरण मुंबई-पुण्यात तयार होऊ लागले होते. पाझराच्या दासकर गो.वी. दंडिक, विजय तेंडुलकर, बसंत कानेटकर, अ.गो.साठे, सीता पदवी, बबन प्रभू, रत्नाकर महादवी वा नाटककारांची प्रायोगिक स्वसंस्थांनी नाटके रंगभूमीवर आलेली दिसून येतात. माणूस साधने भेट (विजय तेंडुलकर १९९६), वेड्यांचा पार उडणार (बसंत कानेटकर १९९७) हीही गेलेला जाण झाला ( बबन प्रभू १९९८) ही वा काळातील महत्वाची नाटके आलेली दिसून येतात. एका अर्थाने प्रायोगिक नाटकाला खुलू घालण्या गतीने प्रारंभ झालेला दिसून येतो. म्हणूनच प्रेक्षकांना एका वेगळ्या आसनाची, विषयाची मुल्यापेक्ष विचारांची जाणीव करून देण्याचे काम वा प्रायोगिक नाटककारांच्या रंगमंचावरून झालेले आपल्याला दिसून येते.

प्रायोगिक नाटक वाटचाल :

१९६० साली प्रायोगिकतेच्या संदर्भातील दोन महत्वाच्या गोष्टी आपल्याकडे घडलेल्या दिसून येतात. त्यामध्ये एक म्हणजे पुणेलाय दासकर यांचे 'चंद्र नवीन काळात' हे स्वातंत्र्यातील नाटक रंगभूमीवर आले आणि दुसरी गोष्ट म्हणजे

198 | अज्ञ वाङ्मय | जुलै-ऑगस्ट-सप्टेंबर 2021 |

विजया मेहता यांनी रंगमंच ही नाटकसंस्था स्थापन केली. याच नाटक संपूर्ण ही विचारी गोष्ट देखील याच दृष्टीने महत्वाची ठरली. संपूर्णचा निमित्ताने नवी नाटके लिहिली गेली. नवे दिग्दर्शन आले. महाराष्ट्राला रंगभूमीत आणायली कला प्रज्ञाती कारणांची बार्थिक संधीय यानिमित्ताने उल्लेख झाली. १९६० च्या दशकात रंगमंच, भारतीय विद्या भवन, मुंबई मराठी साहित्य संघ इत्यादी संस्थांनी लेखन आणि निर्मिती वा दोन्ही दृष्टींनी अनेक प्रायोगिक नाटके सादर केलेली दिसून येतात. भाषा (सीता पदवी), एक नृत्य बाजीराव (धि. जं. खानोलकर), सातळा कोर्टे पालू आहे (विजय तेंडुलकर) नाटककारांच्या सांगण सदा यांचे (शिष्टे लो, अनुवाद : माधव नाटके) ही याच काळातील काही महत्वाच्या नाटकांची निर्मिती होय.

'एक नृत्य बाजीराव' आणि 'सातळा कोर्टे पालू आहे' ही सातळा दारातील महत्वाची प्रायोगिक नाटके म्हणता येतील. प्रयोग आणि संज्ञा वा दोन्ही दृष्टींनी ही नाटके प्रायोगिक अशीच होती. वा दोन्ही नाटकांमध्ये रंगभूमीची धाड्या बदललेली आहे. नाटककाराने लिहिलेल्या नाटकाने रंगमंचावर प्रयोग करणे वा स्व-सजुडीतून नाटक ही गोष्ट अनेक पातळ्या असलेली असते का, लिहिलेल्या नाटकाला वाचन आणि त्या नाटककारांचे वाचन त्यांच्याला सांभर करत असतो, वा संदर्भात काही मूलभूत प्रश्न वा नाटकांमध्ये विचारले आहेत. एका दृष्टीने सांस्कृतिक परिस्थितीचा अज्ञान विचार केला तर त्या काळातील ही दोन्ही नाटके आपल्याला समकालीन संदर्भात अनेक महत्वाचे प्रश्न उपस्थित कालाना दिसून येतात. समाज जीवनामध्ये न्या पद्धतीने बदल होताना, त्या बदलांना, अनुभवांना सामोरे जाऊन न्या पद्धतीने साहित्य, कला, सांस्कृती या सर्वामध्ये त्याचे प्रतिबिंब उघडते. त्या सर्वोचा विचार केव्हाच असे जाणवते की समाजाने त्या न्या काळात होणा-चा परिवर्तनाचा केव्हाही देणू या नाटकांनी लक्षावरील काळाबाहेर एक महत्वाची भूमिका घेतलेली दिसून येते.

१९७० च्या दशकात अनेक प्रायोगिक नाटके आलेली आपल्याला दिसून येतात. त्यामध्ये प्रायुक्ताने तिघांचे (विजय तेंडुलकर १९७०) अज्ञय (खानोलकर १९७१), सहाय्य बाईर आणि भारतीय कोलाज (विजय तेंडुलकर १९७२),

198 | अज्ञ वाङ्मय | जुलै-ऑगस्ट-सप्टेंबर 2021 |

संस्था एलफुंजवारा १९७२), वासनासोड (एलफुंजवारा १९७४), उजवत घर्मशाळा (गो.पु.देहापडे १९७४), महाविद्यालय (सलील आजेंकर १९७४), सोकनका (रायकर मायकी १९७८), अजयरा हाकू (पुरुषोत्तम भेंडे १९७८) घोटभार पाणी (प्रमानंद गजवी १९७९), विज (वासन तांबडे १९७९) ही स्वातंत्र्य काळी उद्देगशील नाटके सांगता येतील. याशिवाय छबिलटाय रायवाकर भारतीय भाषावरील महत्त्वाच्या नाटकांच्या अनुवादपेची अनेक प्रयोग झालेले दिसून येतात. त्यामध्ये निरीश कर्नाड यांचे प्रथमदर्श, बादल सक्कार यांचे जुनुम, शबन शेष यांचे आणखी एक टोपायाची ही स्वातंत्र्य काळी महत्त्वाची नाटके होत. वेदुलकरांची या दहाकाळील गिधाडे, महाशय भाईदा अणि घाशीराम कोलकात ही तीवरी नाटके प्रायोगिक स्वरूपाची आहेत. सांज्यामध्ये एका स्तरावर पुष्पकेटी मयाशानी खीनिचक घाला ज्वक होते, तर दुसऱ्या स्तरावर मायनाल दटुन असलेली शिखात प्रकट होते. गिधाडे, महाशय अणि घाशीरामपुत्र या हिमनेचा विविध रुपांचा आविष्कार ते करताना दिसून येतात. याची अतिशयांत घेऊन असलेल्या विविध प्रज्ञाचा येष एलफुंजवारांनी घेतलेला आहे. याचोमध्ये मायवी प्रयत्नांची, अशा आकांक्षांची विकलता व्यक्त झालेली आहे. वासनासोड मध्ये जुद्ध वासना अणि तिच्छटविषयीचा मयाज-वैलिक दुकिबोन- कलावंतांची मुकुन्दीलता अणि तिला प्रायशः संवेदनशीलता वाच्यशील दुंदुबांची अधिष्ठाती झालेली आहे. बोलण - भाषाशील लेखिक भावनेचे प्रवेश हाही एक स्तर या नाटकाच्या कथेत असल्याने ते बाकोरीबाहेरचे ठरते. घाटी या नाटकान मयमवन्दीय- उच्च मयमवन्दीय शक्तिने मूल्यहीन जगणे विविध शब्दांच्या वागण्या-बोलण्यातून महत्त्वाचे व्यक्त झालेले आहे. गो.पु. देहापडे यांच्या 'उद्वयल घर्मशाळा' या नाटकान चौकशी हे रूप वासलेले आहे. स्वातंत्र्योत्तर भारतीयतील तीव्र संवेदशीलतेचा अणि दुहेरपणाचा परंपराची सीमांता या नाटकान केलेली आहे.

१९८० च्या दहाकाळील मयाय मरीशर यांची सकूल (१९८१) अणि इदव (१९८४) ही नाटके स्वातंत्र्योत्तर भारतीय मुकुन्दीलती तीव्र चिकित्सा करणारी आहेत. त्यांच्या प्रेमाची गोष्ट (१९९७) या नाटकान स्वातंत्र्याच्या काळात बादलेल्या पिढीतील आंगरिक दुंदुबाचा आविष्कार झाला आहे. राजीव नाईक,मकरंद साठे, अजित दळवी, जयंत पवार, दत्ता भागत, मुंगस चिखले,

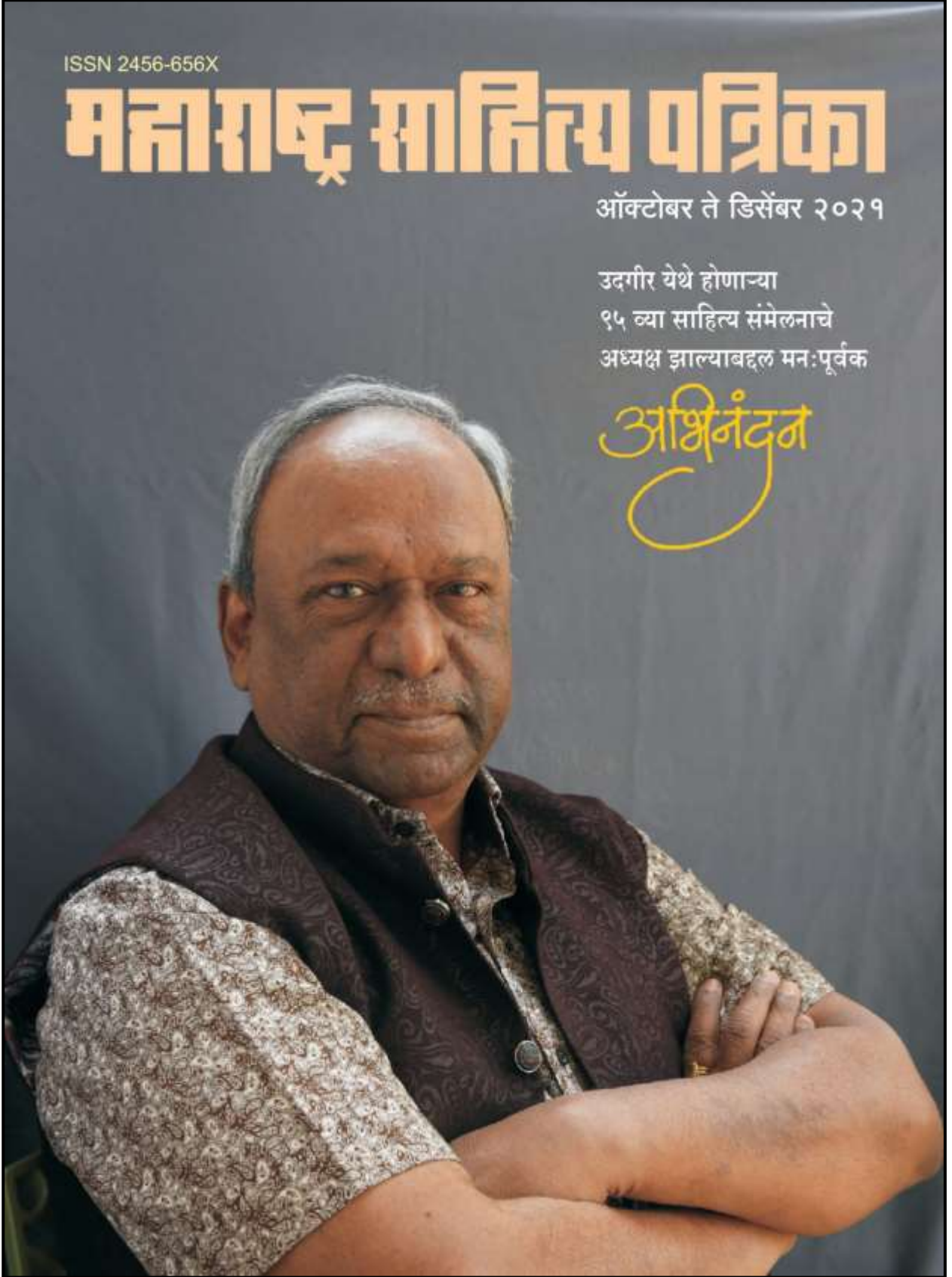
१९० | अजय वाङ्मय | जुलै-ऑक्टोबर-मार्च २०२१ |

प्रशांत दळवी, तुषार भडे, संजय पवार, चंद्रोत्तर प्रथमदर्शक इत्यादी नाटककार यांच काळात उदयाला आलेले दिसून येतात. दत्ता भागत यांचे वाटापजवळाट (१९८७) हे नाटक अधिष्ठातीच्या दृष्टीने पारंपरिक सामाजिक नाटककारांमध्ये आहे. चांगू लेवे घटना-प्रसंग यांच्याऐवजी विचारांना, विचारांतील संघर्षांना अधोर्धित केलेले दिसून येते. डॉ.अश्वेदकर यांच्या कांडट्टां शक्तिमत्त्वाचे घातबोलना तीव्र पिढ्यांच्या विचारांचे चित्रण या नाटकान झालेले दिसून येते. १९९० च्या दहाकाळ प्रायोगिक रंगभूमी अणि व्यावसायिक रंगभूमी वाच्यमधील येष मुसली गेलेली दिसून येते. अनेक रुपा नाटककारांची प्रायोगिक गुणधर्म असलेली नाटके व्यावसायिक रायवाकर झालेली दिसून येतात व ती कवी अधिष्ठा प्रयागात वासवी झालेली दिसतात. चारवीधी (प्रशांत दळवी), मूर्ध पाहिलेला मयूम (मकरंद साठे), यांची विकट गांधी (अजित दळवी), अघोत (जयंत पवार), शोभावासा (राधाअत-खान), बोल-गाणे (चंद्रकांत प्रकाश टेलपडे) अशी काही नाटके होत. अघोत खान यांची चिचाराची प्रतिमा वाच्यन सयकालीन राजकीय गिरीवाचये प्राय करणारे नाटक निर्हिले. टोलतायेमध्ये आजच्या सामान्य श्वर्तितर होणाऱ्या विविध आक्रमणांच्या पुढे या कालाती होताना,अणित झालेला आहे हे दाखवले आहे. गांधी विकट गांधी मध्ये महात्मा गांधी अणि होलाल गांधी या चिचारांमधील वैचरीक संघर्षां उभयटपणे चित्रित केलेला आहे. चारवीधी मध्ये आजच्या काळात विचार संवेगिमाी निर्माण होणाऱ्या विविध प्रज्ञांची गुंतागुंत सांडली आहे.अशा प्रकारे आजच्यात प्रायोगिक रंगभूमीची एकूण घटनात सांगत येईल.

डॉ. होश सोडके, घाटी विभाग,  
 न्यू आर्ट्स कॉमर्स अँड सायन्स कॉलेज, पारनेर,  
 ता. पारनेर, जि. अहमदनगर  
 प्रमाणवती- ९७७७७७९९९९



13. Lekhak Va Sahitya Vyavhar





महाराष्ट्र साहित्य परिषदेचे त्रैमासिक मुखपत्र

## महाराष्ट्र साहित्य पत्रिका

अंक क्र. ३७६, ऑक्टोबर ते डिसेंबर २०२१

संपादक । डॉ. पुरुषोत्तम काले

प्रकाशक । प्रकाश पायगुडे प्रमुख कार्यवाह

महाराष्ट्र साहित्य परिषद, पुणे

४९६ सदाशिव पेठ, टिळक रस्ता, पुणे ४११०३०.

दूरभाष । ०२०-२४४७५९६३

संकेतस्थळ । [www.masapapune.org](http://www.masapapune.org)

ई-मेल । [masaparishad@gmail.com](mailto:masaparishad@gmail.com)

कार्यालयाची वेळ ।

सकाळी ९.०० दुपारी १२.००

दुपारी ४.३० ते रात्री ८.००





मसाप पत्रिका  
ऑक्टोबर ते  
डिसेंबर २०२१  
अंक ३७६

- मुद्रक-प्रकाशक  
प्रकाश पायगुडे  
प्रमुख कार्यवाह  
महाराष्ट्र साहित्य परिषद,  
टिळक रस्ता, पुणे ४११०३०
- संपादकीय संयोजन  
संदीप खाडे
- अक्षरजुळणी व सजावट  
लक कलाकल्य
- मुखपृष्ठ  
जयदीप कडू
- मुद्रितशोधन  
आरती देवगांवकर
- मुद्रणस्थळ  
एस. ए. प्रिंटर्स, एल. एल. पी.  
प्लॉट नं. ५, ३ रा मजला,  
सिद्धीविनायक अपा.,  
शिवदर्शन, पुणे ४११००९
- मूल्य : १५ रुपये  
या अंकाला व्यक्त झालेल्या  
विचारांशी संपादक, संपादन समिती,  
सह्यागार मंडळ तसेच प्रकाशक  
सहमत असतीलच असे नाही.

# अंतरंग

मसाप पत्रिका । ऑक्टोबर ते डिसेंबर २०२१

- ❖ भारतरत्न लता मंगेशकर यांचे निधन : निरागस दैवी सूर हरपला ! । डॉ. पुरुषोत्तम काळे । ६
- ❖ भारत सासणे : एक सव्यसाची लेखक । डॉ. चंद्रकांत भोंजाळ । ८
- ❖ मातीगारी : उत्तरवसाहतवादाचे पुनर्वाचन । डॉ. दीपक बोरगावे । १५
- ❖ सुफीवादाच्या उत्पत्तीसंबंधी काही विचार । अमोगसिद्ध शिवाजी चेंडके । २४
- ❖ मराठवाड्यातील मराठी वाङ्मयाचा इतिहास । डॉ. सूर्यनारायण रणसुभे । ३३
- ❖ त्रिपर्ण : जीवनाच्या शोधात निघालेल्या प्रगल्भ कथा । डॉ. नीलकंठ कदम । ३६
- ❖ डॉ. अनिल अवचट : व्यक्ती आणि वाङ्मय । डॉ. सदाशिव पाटील । ४७
- ❖ अंधश्रद्धा निर्मूलनाची चतुःसूत्रीच चळवळीचा भक्कम पाया । भिकचंद सखाहरी लांडे । ५१
- ❖ संत साहित्यातील सामाजिकता । एकनाथ पगार । ५७
- ❖ आदिवासी नियतकालिके आत्मोद्धाराची नांदी । डॉ. तुकाराम रोंगटे । ६२
- ❖ लेखक व साहित्यव्यवहार । डॉ. नंदकुमार उदार । ६८
- ❖ आटपाट देशातल्या गोष्टी : भारतीय समाजव्यवस्थेची अन्वयार्थ कहाणी । डॉ. दत्ता घोळप । ७४
- ❖ वर्तमानात गांधींचा पराभव आणि विजय जोखणारा ग्रंथ । डॉ. नवनाथ तुपे । ८०
- ❖ जागतिकीकरण आणि मराठी स्त्रीवादी कादंबरी । विलास सुर्वे । ८४
- ❖ त्यागराज भगवान गौतमबुद्ध कादंबरीतील बुद्धप्रतिमा : एक आकलन । विराज मोरे । ८९
- ❖ अण्णा भाऊ साठे यांचे साहित्य क्षेत्रातील योगदान । शिल्पा कुंभार । १०६
- ❖ डॉ. संजय ढोले यांची विज्ञानकथा । ज्योत्स्ना शिवाजी खंडागळे । ११०
- ❖ ऋतुचक्र उलगडणारे-पत्नीपुराण । प्रा. डॉ. राजाभाऊ विनायक भैलुमे । ११४
- ❖ कलात्मक आविष्काराची दमदार कथा: रस्ता आणि इतर कथा । प्रा. प्रशांत चौधरी । ११८
- ❖ संघर्षासाठी सिद्ध कविता । अंजली कुलकर्णी । १२२
- ❖ कामगार कवितेतील विज्ञानविषयक जाणिवांचे स्वरूप । डॉ. दिलीप पुंडलिक पवार । १२५
- ❖ साठोत्तरी मराठी कविता । अरुण कोळेकर । १३३
- ❖ कृषिजीवनाच्या प्रक्षोभक विद्रोहाची कविता : संसदच एकदा नांगरावी म्हणतो । डॉ. किसन माने । १४३
- ❖ डार्क हॉर्स : मृगजळामागील दाहक वास्तव । डॉ. स्वाती गणेश माने । १५०
- ❖ संविधानाच्या स्वप्नातील गाव: गावखेड्यातील विषमतेचे समग्र चिंतन मांडणारी कविता । डॉ. आबासाहेब सरवदे । १५३
- ❖ शिक्षण, अर्थार्जन आणि स्थैर्यासाठी झालेली आयुष्याची 'भुईभिंगरी' । दयासागर बन्ने । १५९
- ❖ शाखा कार्यवृत्त । १६४

ऑक्टोबर ते डिसेंबर २०२१ । ५

लेखक व साहित्यव्यवहारासंबंधी  
मूलभूत चर्चा करणारा  
संशोधनलेख

लेखक व  
साहित्यव्यवहार

डॉ. नंदकुमार भाऊसाहेब उदार

**म**नुष्य हा समाजशील प्राणी आहे. समाजात अनेक समाजस्तर असतात. त्या प्रत्येक समाजस्तराची परंपरा, सण-उत्सव, रितीरिवाज हे वेगवेगळे असतात. या सर्व बाबींचा मनुष्यावर कळत-नकळत बरा-वाईट परिणाम होत असतो व त्यातूनच त्याचा समाजाकडे पाहण्याचा एक विवक्षित दृष्टिकोनही तयार होत असतो. लेखकही याच समाजाचा एक घटक असल्याने त्याच्या व्यक्तिमत्त्वावरही समाजातील या सर्व परंपरांचा कळत-नकळत परिणाम होत असतो व यातूनच त्याच्या व्यक्तिमत्त्वाची जडणघडण होत असते. या सर्व बाबींचा प्रभाव त्याच्या साहित्यनिर्मितीवर पडत असतो कारण साहित्यनिर्मिती ही लेखकाची, भोवतालच्या वास्तवाविषयीची प्रतिक्रिया होय. भोवतालच्या सामाजिक वातावरणातून आणि व्यक्ती वैशिष्ट्यानुसार समाजाचे लेखकाच्या व्यक्तिमत्त्वावर जे संस्कार झालेले असतात, त्या आधारे त्याला भोवतालच्या वास्तवाचा, वास्तवातील घटनांचा जो अर्थ लागत असतो तोच त्याच्या लेखनातून व्यक्त होत असतो. साहजिकच या प्रतिक्रियांमार्गे लेखकाच्या मानवी जीवनाविषयीच्या व पर्यायाने समाजाविषयीच्या जाणिवा प्रकट होणे स्वाभाविक ठरते. साहित्य, साहित्यिक व

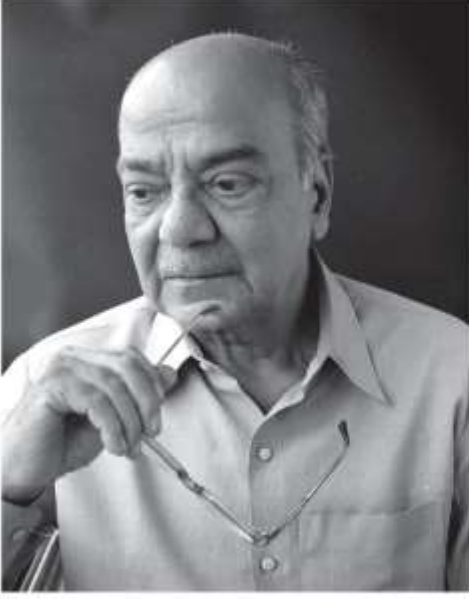
समाज यांचे नाते लक्षात घेतले की, साहित्यात लेखकाची सामाजिक जाणीव व्यक्त होणे हे स्वाभाविकच असते. काही साहित्यकृतीत ही जाणीव स्पष्टपणे व्यक्त होत असते. या संदर्भात दिगंबर पाध्ये म्हणतात, 'लेखक ज्या समाजात जन्माला येतो त्या समाजाच्या काही परंपरा असतात. त्या समाजातील धर्मकल्पना, रूढी, तत्त्वप्रणाली, आचार-विचार, संकेत, शिष्टाचार इत्यादी सर्वांमधून समाजाची जीवन जगण्याची पद्धती निश्चित झालेली असते. पुन्हा ही पद्धती एकाच स्वरूपाची असते, असेही नाही. कोणत्याही समाजात समाजांतर्गत समाजगट असतात आणि एकाच समाजातील विविध समाजगटांत एक सूत्र असूनही जीवनपद्धतीत समाजगटांनुसार विविधता असू शकते. उदाहरणार्थ, भारतीय समाज म्हणून आपण विचार करू लागलो, तर भारतीय जीवनपद्धती म्हणून काही विशेष सांगता आले तरी भारतातील भाषिक गट, आर्थिक स्तर व जाती-जमाती यांनुसार या जीवनपद्धतीत विविधता आहे. एका समाजातील वेगवेगळे समाजगट पूर्णपणे विभक्त नसतात. समाजाशी त्यांचा परस्परसंबंध येत असतो. आधुनिक काळात तर शिक्षण, साहित्य, वृत्तपत्रे, आकाशवाणी, दूरदर्शन यांसारखी प्रसारमाध्यमे यांच्याद्वारेही हे समाजगट व त्यांच्या जीवनपद्धती यांचा

महाराष्ट्र साहित्य पत्रिका क्र. ३७६। ६८

परिचय होऊ शकतो, म्हणूनच लेखकाच्या जडणघडणीत या विविध घटकांनी किती आणि कसा हातभार लावला आहे, हे लक्षात घेऊनच लेखकाच्या व्यक्तिमत्त्वातील सामाजिक अंगाचा शोध घेणे शक्य असते. लेखकाने वास्तव व कल्पिताचा मेळ घालून साहित्यकृती निर्माण केलेली असली तरीसुद्धा सामाजिक परंपरांनी संस्कारित झालेल्या लेखकाच्या व्यक्तिमत्त्वाचा प्रभाव साहित्यकृतीवर असतोच' यासंदर्भात प्रा. रा. ग. जाधव म्हणतात, 'लेखक समाजात जन्मतो, जगतो व मरतो. त्यामुळे जन्मापासून तो एका अखंड सामाजिकीकरणाच्या प्रक्रियेने संस्कारित होत असतो. त्याच्या लौकिक जिण्याचे क्षेत्र समाजातच असते व लेखक म्हणून तो करीत असलेली वाङ्मयनिर्मिती समाजातच होते. ती समाजासाठी असते व समाजातून त्याने घेतलेल्या जीवनविषयक अनुभवांचे अन्वयार्थ लावणारी असते; पण एवढेच नाही, माणूस ज्या समाजात जन्मतो, त्या समाजाची सगळी पूर्वपरंपरा, रूढी यांचा वारसा त्याला नकळतच प्राप्त होत असतो. माणूस काहीही न आणता जन्मतो हे तितकेसे खरे नाही. समाजाच्या सगळ्या इतिहास-परंपरेचे ओझे माथ्यावर घेऊनच व्यक्ती जन्मास येते. हे कोणालाही कधीही टाळता येत नाही. लेखकही यास अपवाद नसतो. संस्कारांचे प्रचंड ओझे समाज लेखकावर लादत असतो. जगात अ-सामाजिक अशा काही गोष्टी असतीलही; पण व्यक्ती ही कदापिही अ-सामाजिक असू शकत नाही. लेखक-कलावंत आपल्या अमूर्त अशा प्रतिभाशक्तीला साकार करतो, समूर्त करतो; तो सामाजिक संस्कारांच्या अनुभवांच्या कल्पनांच्या माध्यमातूनच! आत्मा हा ज्या प्रमाणे देहाच्या रूपाने व्यक्त होतो, तसेच साहित्यिकाची सृजनशक्ती ही सामाजिक घटना कल्पनांच्या रूपाने व्यक्त होते म्हणून, सामाजिकता व सृजनशक्ती यांच्या विधायक मिश्रणातूनच साहित्यिकाची साहित्यिकता सिद्ध होते. सामाजिकतेशिवाय साहित्य व साहित्यिक हे संभवतच नाही म्हणून तत्त्वतः साहित्यिकाची सामाजिकता ही त्याच्या निर्मितीचे समर्थनही असते व साधनही असते. समाजाविरुद्ध बंड करणाऱ्या, समाजनियम धुडकावून लावणाऱ्या समाजात आमूलाग्र परिवर्तन करू पाहणाऱ्या लेखकालाही समाज हवाच असतो. लेखक ज्या समाजस्तराचे प्रतिनिधित्व करत असतो त्या समाजस्तराचा

जीवनानुभव त्याला प्राप्त असतो. त्यामुळे त्याच्या लेखनात त्या समाजस्तराचे प्रतिबिंब उमटणे हे स्वाभाविक असते. लेखकाकडून वाचकांच्या काही अपेक्षा असतात त्यांची पूर्तता लेखकाने करावी असे समाजाला म्हणजेच एका अर्थाने वाचकाला वाटत असते.' यासंदर्भात डॉ. नागनाथ कोतापळे म्हणतात, 'लेखक हा जसा समाजात राहतो, त्याप्रमाणेच वाचकही समाजातच राहत असतो. म्हणजे त्याची कुठेतरी जात असते, कुठलातरी धर्म असतो, त्याचे कुटुंब असते आणि या सगळ्या गोष्टींचे संस्कार त्यावर होत असतात. शिवाय कुठल्यातरी विचारसरणीचा परिणाम त्यावर झालेला असू शकतो. तो कुठल्या चळवळीत असू शकतो किंवा चळवळीपासून दूरही असू शकतो. अशा सगळ्या गोष्टींमधून त्याचे व्यक्तिमत्त्व तयार झालेले असते. असे स्वतःचे व्यक्तिमत्त्व घेऊन तो साहित्याला सामोरा जातो. आपल्या व्यक्तिमत्त्वाप्रमाणे साहित्यकृतीचा अन्वयार्थ लावत असतो. समाजातील विविध सण उत्सव, परंपरा, चालीरीती या सर्वांचा लेखकाच्या व्यक्तिमत्त्वावर परिणाम होत असतो. त्यातून समाजाकडे पाहण्याचा त्याचा एक विशिष्ट दृष्टिकोन तयार झालेला असतो. त्यातूनच त्याच्या काही विचारधारा निश्चित झालेल्या असतात. लेखकाच्या व्यक्तिमत्त्वावर जसा समाजाच्या सर्व बाबींचा प्रभाव असतो, तसा तो वाचकाच्या व्यक्तिमत्त्वावरही होत असतो कारण वाचकही त्याच समाजाचा घटक असतो. समाजातील या सर्व गोष्टींचा लेखकाच्या व्यक्तिमत्त्वावरही परिणाम झालेला असतो व त्यातूनच लेखक व वाचक याची विचारधारा ठरत असते. त्यामुळे वाचक लेखकाकडून संबंधित विचारधारेची सुसंगत लेखनाची अपेक्षा ठेवत असतो.' यासंदर्भात दिगंबर पाध्ये म्हणतात, 'लेखकाच्या व्यक्तिमत्त्वाची जडणघडण, त्याची साहित्यविषयक भूमिका व त्याची निर्मिती समाजसापेक्ष असतात. याशिवाय लेखकाला समाजात मिळणारी मान्यता वा त्याची होणारी उपेक्षा, त्याला प्राप्त होणारे मानमरातब वा त्याची होणारी अवहेलना या सान्यांचा सामाजिकतेशीच संबंध असतो. साहित्यात येणारे विषय, मानवी जीवनविषयक प्रश्न, मानवी जीवनाविषयीच्या श्रेय कल्पना, नीतिमूल्य ही सर्व त्या संदर्भक्षेत्राशी, म्हणजे त्या समाजाच्या जीवन पद्धतीशीच निगडित असतात.

ऑक्टोबर ते डिसेंबर २०२१ | ६९



प्रा. रा. ग. जाधव

लेखकांची जशी सामाजिक जडणघडण झालेली असते तसे लेखकाचे साहित्य हे समाजसापेक्ष असते. म्हणजेच समाजाने लेखकाकडून ज्या लेखनविषयक अपेक्षा ठेवलेल्या असतात त्या अपेक्षांची पूर्तता लेखक कशी करतो, यावर त्याला समाजात मानसन्मान अथवा अवहेलना प्राप्त होत असते; पण लेखकाने समाज व शासनव्यवस्था यांच्या अपेक्षेप्रमाणे साहित्यनिर्मिती केलीच पाहिजे असे नव्हे. यासंदर्भात रा. ग. जाधव म्हणतात, 'साहित्यिकाचे व्यक्तिमत्त्व समाजात घडते व भाषा ही सामाजिक संकेतांची असते, यावरून साहित्यिकाने सामाजिक बांधिलकी पत्करलीच पाहिजे; याचा अर्थ शासनसंस्थेने पुरस्कृत केलेल्या विशिष्ट मतप्रणालीचा पुरस्कार त्याने केलाच पाहिजे असा नाही. साहित्यिक व त्यांची निर्मिती यांना समाजाबाहेर अस्तित्व व इतिकर्तव्य नसते हे खरे; पण यासाठी विशिष्ट मतप्रणालीचा पुरस्कार अटळ नसतो. सामाजिक वास्तवाच्या नाना अंगांना आपल्या अभिज्ञतेनुसार आकार देण्याचे स्वातंत्र्य साहित्यिकाला असले पाहिजे.' सामाजिक संस्कृतीमुळे लेखकाच्या व्यक्तिमत्त्वाची

महाराष्ट्र साहित्य पत्रिका क्र. ३७६। ७०

जडणघडण झालेली असली, लेखकाचा समाजाकडे पाहण्याचा विशिष्ट दृष्टिकोन निश्चित झालेला असला, विशिष्ट विचारसरणीचा स्वीकार केलेला असला तरीसुद्धा त्याची साहित्यनिर्मिती उत्स्फूर्त असते. म्हणजे लेखकाने एकांगी स्वरूपाचे लेखन न करता समतोल भूमिका घेतली पाहिजे कारण लेखक हा समाजातील जबाबदार घटक आहे. लेखकाकडे एक शहाणा माणूस, साक्षेपी माणूस, समाजाचा हितकर्ता म्हणून समाज सामान्यपणे बघत असतो, साहित्यिकाला सामाजिक प्रतिष्ठाही असते, समाजाला अभिमानास्पद वाटणाऱ्या अनेक बाबी असतात; त्यात साहित्यिकृतीचाही अंतर्भाव असतो. कवी-लेखक समाजात निर्माण झाले नसते, तर समाजाच्या सांस्कृतिक परंपरेची शब्दरूप धनसंपदा कुणी निर्माण केली असती? समाज केवळ भाकरीवर जगत नाही, तर भाषिक निर्मितीवरही जगत असतो. लेखकाच्या सामाजिकतेने संपन्न व सांस्कृतिक परंपरा निर्माण केल्या आहेत आणि त्या अखंडपणे जतनही केल्या आहेत म्हणून, समाज हा साहित्यिकाचे ऋणही मानतो व फेडण्याचा नाना परीने प्रयत्नही करतो. समाजातील विविध परंपरांचा व संस्कृतींचा लेखकाच्या व्यक्तिमत्त्वावर प्रभाव पडलेला असतो. त्यातून त्याचा समाजाकडे पाहण्याचा एक विशिष्ट दृष्टिकोन तयार झालेला असतो. त्यातून त्याची एखादी विशिष्ट विचारधाराही विकसित झालेली असते. असे असले तरीसुद्धा लेखक साहित्यिकृतीची निर्मिती वास्तव आणि कल्पिताचा मेळ घालून करत असतो. समाजातील विविध प्रश्नांना याचा फोडण्याचे व समाजाला दिशा देण्याचे काम हे साहित्यिक करत असतो. त्यामुळे साहित्यिकाकडे एक जबाबदार व्यक्ती म्हणून समाज पाहत असतो. म्हणजेच समाजाला विधायक दिशा देण्याचे, समाजातील विविध सांस्कृतिक मूल्यांची जपणूक करण्याचे काम साहित्यिक आपल्या साहित्यातून करत असतो. त्यामुळे साहित्यिकाला सामाजिक प्रतिष्ठा प्राप्त होत असते. त्यामुळे लेखकाची समाजात एक वेगळी ओळख निर्माण होत असते. कोणतीही मतप्रणाली माणसाच्या माणूस म्हणून असणाऱ्या सुख-दुःखाशी, आशा-आकांक्षेशी, स्वप्नांशी निगडित असते. ललित साहित्याचा संबंध या मानवी जाणिव्यांशी असतो; मतप्रणालीच्या उच्च तत्त्वांशी, ध्येयांशी नसतोच.

मानव्याचे नाट्य अनुभवणे व व्यक्त करणे हेच त्याचे उद्दिष्ट असते, आणि मानव्याचे नाट्य हे मतप्रणालीच्या अमूर्त प्रबंधापेक्षा अधिक खरे, अधिक जिवंत, अधिक जिवाळ्याचे व अधिक मूलभूत असते. मानव्याचा बळी देऊन या जगात काही अधिक उच्च साधता येते यावर स्वतंत्र साहित्यिकाचा विश्वास नसतो. मानव्य हे कशाचेच साधन नाही, ते एक स्वयंभू मूल्य आहे अशी त्याची श्रद्धा असते. म्हणूनच मानवाच्या उद्धारासाठी निर्माण झालेली समाज व संस्कृती त्या मानव्याची बूज कितपत राखते, हे शोधण्याचा ललित साहित्यिकाचा प्रयत्न असतो. समाजात जे विविध समाजस्तर असतात त्या प्रत्येक समाजस्तराचा सामाजिक दृष्टिकोन हा वेगळा असतो. त्यानुसार त्या त्या समाजस्तरातील लोकसमूहाची एक विचारसरणी असते. ती विचारसरणी त्या त्या समाजाच्या हितसंबंधांना पूरक असते; पण ललित साहित्यात माणसाच्या भावभावनांचे चित्रण केलेले असते. ते मानवी जाणीव व्यक्त करत असते. ललित साहित्य हे थेट विचारधारेचा पुरस्कार करत नाही. म्हणजेच लेखक सामाजिक बांधिलकी जपत असतो. मराठीतील संतकवी हे जर भक्तिमार्गाचे बांधील होते असे मानले, तर त्यांची ही बांधिलकी स्वेच्छ होती, असे म्हणावे लागेल. ब्रिटिश राजवटीत राष्ट्रीय स्वातंत्र्याच्या प्रेरणेने भारावलेले साहित्य हे देखील स्वेच्छ बांधिलकीचे म्हणता येईल. उलट रशियन समाजासारख्या साम्यवादी समाजात लेखकांनी काय लिहावे, कसे लिहावे, यासंबंधी शासनसंस्थेकडून किंवा त्यांच्या अखत्यारीतील वाङ्मयीन संस्थेकडून काही निर्णय लादले जातात. अर्थात असे लादले जाणारे निर्णय सर्वच साहित्यिकांना जाचक ठरतातच, असे नाही. तथापि काही लेखकांना ते तसे जाचक वाटले, तरी ते झुगारून देण्याचे त्यांना स्वातंत्र्य नसते. मध्ययुगीन कालखंडामध्ये जे साहित्य निर्माण झाले ते भक्ती साहित्य होते. हे साहित्य निर्माण होण्याचे मुख्य कारण म्हणजे त्या काळातील समाजाची ती मागणी होती. इंग्रजांच्या आगमनानंतर एतद्देशीयांमध्ये राष्ट्रीय स्वातंत्र्याची भावना निर्माण झाली. म्हणजेच या कालखंडातील साहित्य हे राष्ट्रीय स्वातंत्र्याच्या प्रेरणेने भारावलेले दिसते; परंतु रशियासारख्या युरोपियन राष्ट्रात लेखकांच्या अभिव्यक्ती स्वातंत्र्यावर तेथील शासनसंस्थेकडून बंधने घातली गेलेली

लेखकाला साहित्यनिर्मिती करताना, देश व सामाजिक परिस्थितीनुसार स्वातंत्र्य प्राप्त होते किंवा त्यावर शासनसंस्थेची बंधने येतात. या सर्व परिस्थितीतून वाङ्मयनिर्मिती करताना त्या त्या भाषिक प्रदेशातील वाचकांना काय आवडते. त्यांच्या एकूण अभिरुचीचे स्वरूप कसे आहे, याचा विचार करून साहित्याची निर्मिती केली जाते. त्या त्या काळातील त्या त्या भाषिक प्रदेशातील वाचकांना काय आवडते, याचा शोध घेणे म्हणजे अभिरुचीचा विचार होय.

दिसून येतात; परंतु ही बंधने झुगारून देण्याचे स्वातंत्र्य तेथील लेखकांना नाही. याचा अर्थ देश व परिस्थितीनुसार लेखकाला भरपूर स्वातंत्र्य प्राप्त होते अथवा शासनसंस्थेच्या बंधनामुळे लेखकांच्या साहित्यनिर्मितीवर मर्यादा आल्याचे दिसून येते. लेखकाला साहित्यनिर्मिती करताना, देश व सामाजिक परिस्थितीनुसार स्वातंत्र्य प्राप्त होते किंवा त्यावर शासनसंस्थेची बंधने येतात. या सर्व परिस्थितीतून वाङ्मयनिर्मिती करताना त्या त्या भाषिक प्रदेशातील वाचकांना काय आवडते. त्यांच्या एकूण अभिरुचीचे स्वरूप कसे आहे, याचा विचार करून साहित्याची निर्मिती केली जाते. त्या त्या काळातील त्या त्या भाषिक प्रदेशातील वाचकांना काय आवडते, याचा शोध घेणे म्हणजे अभिरुचीचा विचार होय. अर्थात काळाप्रमाणे समाजाची अभिरुची बदलत जाते; परंतु त्या त्या काळातील अभिरुचीचा संबंध साहित्य आणि इतर कलांच्या आस्वादापासून मूल्यमापनापर्यंत सर्वच बाबींशी येतो. एवढेच नाही तर एखाद्या लेखकाकडे किंवा कलाकृतीकडे किंवा एखाद्या प्रवाहाकडे दुर्लक्ष होण्याचे कारणही तत्कालीन अभिरुची हे असू शकते. कुठल्याही समाजाची अभिरुची ही कधीच एकसंध अशी असत नाही. ती तुकड्या तुकड्यांमध्ये विभागलेली असू शकते-

ऑक्टोबर ते डिसेंबर २०२१ | ७१

असते. म्हणजे कामगार रंगमंचावर होणारी नाटके उच्चभूंना कमी दर्जाची वाटतात. उलट कामगार रंगमंचावरील नाटके पाहणाऱ्यांना प्रायोगिक नाटकांत रस असेलच असे नाही. लोकनाट्यामध्ये, तमाशामध्ये रस असणाऱ्यांना संगीत नाटके मचूळ वाटतील. या उलट संगीत नाटके पाहणाऱ्यांना तमाशे हीन अभिरुचीचे निदर्शक वाटत असत. नाटकाबद्दल हे जसे आहे, तसेच वेगवेगळ्या साहित्यप्रकारांबद्दलही म्हणता येते. म्हणजेच समाजातील प्रत्येक व्यक्तीची अभिरुची ही भिन्न असते. एखाद्या लेखकाने उच्च दर्जाचे साहित्य निर्माण केले; पण ते वाचकांच्या पसंतीस उतरले नाही तर ती साहित्यकृती उपेक्षित राहते. म्हणजेच साहित्यव्यवहारात वाचकाची अभिरुची व दृष्टिकोन महत्त्वाचा असतो कारण लेखकाची कलाकृती वाचकाच्या हातात जाते तेव्हा वाचक विविध दृष्टिकोनातून लेखक व साहित्यकृतीबद्दल विचार करतो. लेखकाची साहित्यकृती जेव्हा वाचकापर्यंत येते, तेव्हा ती अनेक अवतरणे घेऊन येते. ते कुणाचं लेखन आहे, सदर लेखक ओळखीचा आहे का, तो समकालीन आहे की मागचा आहे, त्याची प्रसिद्धी आणि वलय, त्याच्यावर लिहिली गेलेली समीक्षा आणि त्याला मिळालेले पुरस्कार इ. कितीतरी गोष्टींसह ती कलाकृती वाचकांपर्यंत येते. या सगळ्या गोष्टींचा दबाव वाचकांवर पडू शकतो, असेच येथे ते सूचित करीत आहेत. तसेच तेथे वाचकाचा 'स्व' असतो हेही सांगत आहेत. हा 'स्व' म्हणजे कोण? तर त्याचे स्वतःचे व्यक्तिमत्त्व. म्हणजेच वाचकाच्या हातात जेव्हा साहित्यकृती पडते, तेव्हा सदर साहित्यकृती श्रेष्ठ दर्जाची आहे का? लेखकाला समाजमान्यता प्राप्त झालेली आहे का? त्या साहित्यकृतीवर समीक्षालेखन कितपत झाले आहे? लेखकाला किती पुरस्कारांनी सन्मानित केलेले आहे? या सर्व बाबींचा विचार वाचक करत असतो. लेखकाने निर्माण केलेल्या साहित्यकृतीला वाचकांनी प्रतिसाद द्यावा, अशी लेखकाची अपेक्षा असते. लेखकाची लेखनकृती वाचून ती कशी वाटली, त्या लेखनकृतीतून त्याला काय जाणवले हे लेखकापर्यंत पोहोचविण्यात वाचकाला जेवढा आनंद मिळतो तेवढाच आनंद आणि त्याचबरोबर निर्मितीचे अतीव समाधानही लेखकाला वाचकाच्या या पत्रांतून मिळत असते. तसा कुठलाच लेखक हा वाचक डोळ्यांसमोर ठेऊन लिहीत

महाराष्ट्र साहित्य पत्रिका क्र. ३७६। ७२



नागनाथ कोत्तापल्ले

नसला तरी आपले लेखन लिहून तो ते स्वतःपाशीही ठेवत नाही. ते प्रकाशित करून वाचकांपर्यंत पोहोचावे, अशी त्याची आकांक्षा असतेच. एकतर लेखक निर्मिती करताना जसा स्वतःशी बांधलेला असतो, तसा तो समाजाशीही बांधलेला असतो कारण त्याने लेखनद्रव्य समाजातून मिळवलेले असते. हा समाज माणसांचा असतो. माणसांचे आयुष्य, त्यांचे प्रश्न, त्यांच्या व्यथा, त्यांचे नातेबंध यापाशी लेखकाचे लेखन, अर्थातच सर्जनशील लेखन येऊन भिडत असते आणि जगलेल्या, भोगलेल्या पाहिलेल्या वास्तवातून एक काल्पनिक वास्तव उभे करून लेखक ते वाचकांसमोर ठेवत असतो. म्हणूनच या नव्या वास्तवाशी वाचकाची नाळ पटकन जुळून जाते. त्यात त्याच्या आयुष्याची स्पष्ट-अस्पष्ट प्रतिबिंबे त्याला दिसतात. वाचक-लेखक यांच्यातले नाते जितके संवादी, तितकेच ते सर्जनशील म्हणून परस्परपूरक असते. लेखकाचे माध्यम जसे शब्द तसे वाचकाचे माध्यमही शब्दच असतात. लेखक आपल्या निर्मितीच्या पातळीवरून व्यक्त होत असतो, तर वाचक आस्वादाच्या पातळीवरून. अर्थात वाचकाची सर्व मते, प्रतिक्रिया लेखकाला पटतील वा साहाय्यभूत ठरतील असे नसते. कधी लेखकाला त्याच्या कलाकृतीतून जे सांगायचे,

पोहोचवायचे असते ते तसेच्या तसे वाचकांपर्यंत पोहोचतेच असे नाही. कधी एखाद्या जाणकार वाचकाला, लेखकाला म्हणायचे आहे त्या पलीकडचेही जाणवू शकते. म्हणूनच एका मर्यादित अर्थाने लेखक वाचकाची दृष्टी वाढवू शकतो, तसा वाचकही लेखकाची त्याच्याच निर्मितीकडे पाहण्याची नजर विस्तारू शकतो. लेखक हा त्याच्या कल्पनाशक्ती व प्रतिभाशक्तीच्या सामर्थ्याने साहित्यकृतीची निर्मिती करत असतो. साहित्यकृतीची निर्मिती पूर्ण झाल्यावर सदर साहित्यकृती लेखकाची न राहता सर्व समाजाची होऊन जाते. लेखकाने साहित्यकृती निर्माण केल्यावर तो ती स्वतःजवळ न ठेवता वाचकांसाठी उपलब्ध करून देत असतो. वाचकांनीही साहित्यकृतीला प्रतिसाद द्यावा, साहित्यकृतीवर चर्चा करावी अशी सुप्त अपेक्षा लेखकाची असते. स्वतःची लेखननिर्मिती करताना लेखक या निर्मितीत पूर्णपणे गुंतलेला असतो; पण ती निर्मिती पूर्ण झाल्यावर मात्र तो अलिप्त होऊन जातो आणि ही त्याची निर्मिती मग वाचकाला गुंतवून ठेवते. एका अर्थाने ती वाचकाची होऊन जाते. वाचक या निर्मितीत गुंतत असताना त्याच्यातला सुप्त लेखक कळत-नकळत जागा होत असतो. कधी अजाणतेपणी त्यांच्यातला समीक्षकही सावध होत बारकाईने त्या निर्मितीला भिडत त्याच्यातल्या आस्वादकाची जागा घेतो. १९९० नंतर जागतिकीकरण आले. यामध्ये इंग्रजी भाषेला वाढलेले अवास्तव महत्त्व, प्रसारमाध्यमे, फेसबुक, गुगल, ब्लॉग या तंत्रज्ञानाची प्रचंड प्रगती झाली. यामुळे वाचकवर्ग मोठ्या प्रमाणात कमीकमी झाल्याचे दिसते. वाचनसंस्कृतीवर काळानुसार आक्रमणे वाढतच आहेत. सुरुवातीला इंग्रजीचे वाढते स्तोम, प्रसारमाध्यमे, जागतिकीकरण, फेसबुक, नेट, गुगल, ब्लॉग ही अचाट तंत्रज्ञानाची प्रगती... या सगळ्यातून जाताना मराठी लेखकाचे, त्यांच्या पुस्तकांचे अस्तित्व पणाला लावले जात आहे. यामुळेच एक हजार प्रतींची आवृत्ती संपायला लेखकाला कित्येक वर्षे वाट पाहावी लागते. याचाच अर्थ लेखकाला लाभणारा जाणकार, प्रगल्भ वाचक किती असतो? अलीकडच्या काळात तंत्रज्ञान मोबाईलच्या माध्यमातून प्रत्येकाच्या हाताला आले आहे. यामुळे आजच्या युवा वर्गाचा कल पुस्तकांकडे कमी झालेला आहे. त्यामुळे साहित्याचा जाणकार व प्रगल्भ वर्ग कमी

झाला असल्याचे दिसून येते.

#### संदर्भ ग्रंथ

१. पाध्ये दिगंबर, 'साहित्य, समाज आणि संस्कृती', लोकवाङ्मयग्रह प्रकाशन, मुंबई, चौथी आवृत्ती फेब्रु २०११ पृ. ३ व ४.
२. जाधव रा. ग. 'साहित्य आणि सामाजिक संदर्भ, कॉन्टिनेन्टल प्रकाशन, पुणे, तृतीयावृत्ती, २००३ पृ. ७६ व ७७.
३. कोतापळे नागनाथ, 'साहित्याचे पर्यावरण,' अंतर्भूत: सप्रणी कुमार (संपा.) 'सत्याग्रही विचारधारा' (मासिक) जुलै २००८ पृ. २३.
४. पाध्ये दिगंबर उ. नि. पृ. ५ व ६.
५. जाधव रा. ग. उ. नि. पृ. २६.
६. तत्रैव पृ. ७७.
७. तत्रैव पृ. २६ व २७.
८. तत्रैव पृ. २४.
९. कोतापळे नागनाथ, 'वाचन आणि अभिरुची', अंतर्भूत: कोटावळे केशवराव (संपा.) 'ललित' (मासिक) मे, २००८ पृ. ३१.
१०. तत्रैव पृ. ४२.
११. गजेंद्रगडकर मोनिका, 'लेखक-वाचक नातेबंध,' अंतर्भूत: कोटावळे केशवराव (संपा.) 'ललित' (मासिक) जाने, २०१३ पृ. ५७ व ५८.
१२. तत्रैव पृ. ५८.
१३. तत्रैव पृ. ५८.

डॉ. नंदकुमार भाऊसाहेब उदार

प्ल: ९८२२७४८७३२

udarnandkumar@gmail.com

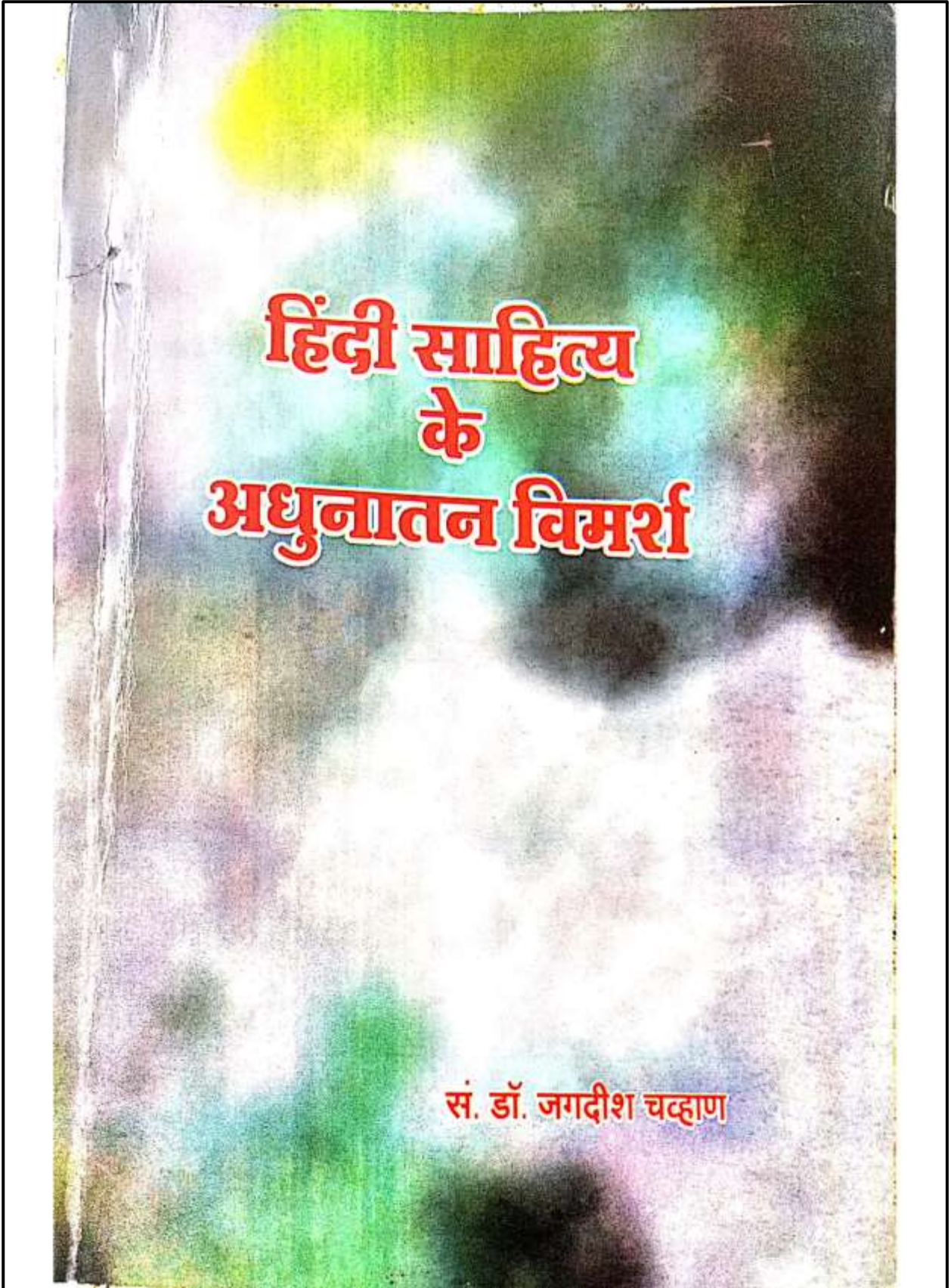
\*\*



ऑक्टोबर ते डिसेंबर २०२१ | ७३



14. दलितो का सामाजिक जीवन-अनारो उपन्यास के संदर्भ में



ISBN- 978-81-950705-3-4

पुस्तक	:- हिंदी साहित्य के अधुनातन विमर्श
संपादक	:- सं.डॉ. जगदीश चव्हाण
प्रकाशक	:- अक्षरा पब्लिकेशन, डोंगर कठोरा, जि. जलगाँव, 425201 (महाराष्ट्र)
संस्मरण	:- प्रथम, 2021
मुद्रक	:- अक्षरा प्रिंटर्स, भुसावल
किंमत	:- 400 /-

**सूचना-** प्रस्तुत संपादकीय पुस्तक में प्रकाशित आलेखों में व्यक्त विचार लेखकों के अपने निजी विचार हैं। संपादक तथा प्रकाशक का सहमत होना आवश्यक नहीं है। इस ग्रंथ की कोई भी सामग्री किसी भी रूप में या माध्यम में पुनःप्रकाशित अथवा संग्रहीत करने के पूर्व संपादन तथा प्रकाशक की लिखित पूर्वानुमति लेना बंधनकारक होगा।

## अनुक्रम

संपादकीय ...	
1. 'यमदीप' उपन्यास में किन्नर विमर्श-	11
	डॉ. जगदीश चव्हाण
2. नारी विमर्श	17
	- यस. इरफान बाशा
3. निर्मला पुतुल की कविताओं में चित्रित आदिवासी जीवन	21
	-डॉ. नंदिता दत्त
4. हिंदी की लेखिकाओं के उपन्यसासों में चित्रित स्त्री-विमर्श	28
	डॉ. पोपट भावराव बिरारी
5. आदिवासी विमर्श	34
	-डॉ. सूरजभान सागर
6. हिंदी साहित्य में नारी विमर्श	44
	-डॉ. विजया शर्मा ठक्कर
7. "धूल पौधों पर" उपन्यास में नारी विमर्श	53
	-रेखा साह
8. भूमंडलीकरण का दुष्परिणाम : किसानों की बढ़ती आत्महत्याएँ	63
	-डॉ. वसंत माळी
9. समकालीन हिंदी उपन्यास: शोषण, संघर्ष और अस्मिता	71
	- डॉ. नमिता जायसवाल
10. स्त्री अस्मिता का प्रश्न और वर्तमान महिला लेखन	82
	-डॉ.सुमन कुमारी बरनवाल
11. दलित कविता में मानवतावाद	92
	- डॉ. बिजेन्द्र कुमार
12. दलितों का सामाजिक जीवन 'अनारो' उपन्यास के संदर्भ में	104
	-डॉ. हनुमंत ये. गायकवाड
13. आधुनिक हिन्दी साहित्य में दलित विमर्श	110
	-डॉ. सत्यजीत कुमार

## 12

## दलितोंका सामाजिक जीवन (‘अनारो’ उपन्यास के संदर्भ में)

-डॉ. हनुमंत ये. गायकवाड

प्रस्तावना :-

सर्वप्रथम दलित साहित्य में 'दलित' शब्द की व्याख्या निश्चित करना होगी। दलित केवल - हरिजन और नवबौद्ध नहीं। गाँव की सीमा के बाहर रहने वाली सभी अछूत जातियाँ, आदिवासी, भूमिहीन खेत मजदूर, श्रमिक, कष्टकरी जनता, और यायावर जातियाँ सभी की सभी 'दलित' शब्द से व्याख्यापित होती हैं। दलित शब्द की व्याख्या में केवल अछूत जाति का उल्लेख करने से नहीं चलेगा। इसमें आर्थिक दृष्टि से पिछड़े हुए लोगों का भी समावेश करना होगा। दलितों का दुख, परेशानी, गुलामी, अधःपतन और उपहास के साथ ही दरिद्रता का कलात्मक शैली से चित्रण करने वाला साहित्य ही दलित साहित्य है। डॉ. शरणकुमार लिंबाले कहते हैं "हर एक मनुष्य को स्वतंत्रता, प्रतिष्ठा और भययुक्त सुरक्षा मिलनी चाहिए, इसी पृष्ठभूमि पर निर्मित एक प्रवृत्ति साहित्य में अभिव्यक्त हो रही है। इस प्रवृत्ति का नाम दलित साहित्य है। दलित साहित्य मनुष्य को केंद्र मानता है। मनुष्य के सुख - दुख के समरस होता है। मनुष्य को महान मानता है। मनुष्य को सम्यक् क्रांति की ओर ले जाता है।" १

हिंदी उपन्यास साहित्य मानव जीवन के बीच सफलताओं, असफलताओं के मूल्यों को खोजता हुआ आगे बढ़ रहा है। मंजुल भगत

104 / अक्षरा पब्लिकेशन

लिखित 'अनारो' उपन्यास और अन्य उपन्यासों में दलितों का सामाजिक जीवन हमें देखने को मिलता है। जैसे 'कागर की आग' नाच्यौ बहुत गोपाल, टपोवाले, आदी। मंजुल भगत ने 'अनारो' इस उपन्यास में अनेक समस्याओं को उठाया है। अनारों संघशील और सचेत नारी है। अपने पति नंदलाल के निरुत्प्रेषण के कारण स्वयं प्रताड़ित जीवन जीती है। घर - घर बर्तन माँजकर अपनी गृहस्थी चलाती है और अपनी बेटी को पढ़ाती है। फिर भी वह अपने पति के आश्रय के लिए विवश है। जब वह अपनी बेटी गंजी का विवाह स्वयं स्पष्ट जुटाकर करती है तब नंदलाल को भी इस बात पर अपनी पत्नी अनारों पर फूट होता है। वह कहता है, "सुनों, सब कोई सुनों! मैं आज मान गया अपनी औरत को वह मेरी घरवाली नहीं यारों, मेरा बड़ा भाई है, समझे, बड़ा भाई!" "नंदलाल के यह शब्द सुनकर अनारो अपने संघर्ष को सफल समझती है। अनारो अपने पति से प्रताड़ित है पर उसे अपने जीवन के प्रति अनुराग भी है। वह नियति को कोसती भी है। और उसका डटकर मुकाबला भी करती है।

#### पारिवारिक विसंगतियाँ :

परिवार के लोगों में आपसी प्रेम, सहयोग और एक दूसरों की तकलीफ को जानने की क्षमता यदि हो तो परिवार सुचारू रूप से चल सकता है। परिवार में एक दूसरों के प्रति स्नेह, जिम्मेदारियों का अहसास होना बहुत जरूरी होता है। परंतु जहाँ शिका का अभाव हो, घर - परिवार बुनियादी सुविधाओं से वंचित हो, तो पारिवारिक एकता भंग हो जाती है। कभी - कभी परिवार में अताधिक संतानों का होना, पुरुषों द्वारा नशाखोरी और अवैध यौन संबंध, बेकारी आदि कारणों की वजह से पति-पत्नियों में तनावपूर्ण संबंध बन जाते हैं और, यही से अंतर्विरोधपूर्ण दांपत्य जीवन शुरू हो जाता है।

ऐसी समस्याओं को मंजुल भगत के 'अनारो' इस उपन्यास में देखा जा सकता है। अनारो अपने पति नंदलाल के दुराचारी व्यवहार से तंग आ जाती है। दोनों में अक्सर झगड़ा होने लगता है। अनारो की दो संतानें हैं, मगर उन संतानों के प्रति उसका पति नंदलाल बेखबर है। उसे शराब की लत है। अनारों के होते हुए वह छबीली नामक औरत को रखैल के रूप में रख लेता है। इसी बात को लेकर अनारों अपना फुला पेट नंदलाल के आगे तानकर कहती है, "ले, यह देख! अपनी करनी यहाँ भी देख ले अब तो औरत जात लग रही हूँ कि

हिंदी साहित्य के अधुनातन विमर्श / 105

नहीं? "३ अनारों सुबह से लेकर शाम तक मकान - दर - मकान घूम फिर कर काम करती है। एक - एक पाई जुटाती है। उसका मन प्रेम के लिए तरसता है। वह अपनी वेदना को प्रकट करते हुए कहती है, " चाहिए अनारो को भी प्यास चाहिए, छाँव चाहिए नंदलाल, तू मीठा बना रहे अपना बना रहे तू, जी जायेगी अनारो झेल जायेगी जिनगानी को भूख-प्यास को भी पी जायेगी बीमारी - हानि को भी जीत लेगी। " ४ इस प्रकार अनारो नियति को स्वीकार कर उसे भुगतने के लिए तैयार है, उसके बदले में उसे अपने पति का साथ चाहिए।

#### विवाहेत्तर यौन संबंध :

यौन संबंध स्त्री और पुरुष की अनिवार्य आवश्यकता है। विवाह के पश्चात् पति - पत्नी के बीच के यौन संबंधों को समाज वैध मानता है। पर विवाह पूर्व तथा विवाह के पश्चात् पत्नी के अलावा पर स्त्री के साथ जो यौन संबंध स्थापित किये जाते हैं, उसे हमारा समाज अवैध मानता है। मंजुल भगत के अनारों इस उपन्यास में अनारो का पति नंदलाल अपनी पत्नी के होते हुए छबीली के साथ अवैध यौन संबंध स्थापित करता है। उसकी पत्नी अनारो सुंदर और मेहनती होने के बावजूद भी वह छबीली को अपनी रखैल बनाता है। नंदलाल कामचोर और अहसासहीन पुरुष है। यदि उसे अपने पारिवारिक के मर्यादा की फिक्र होती तो वह अनारों के होते हुए छबीली को कभी नहीं अपनाता परंतु अधिकांश दलित या शोषित समाज में यह रिश्ते सामान्य बात है क्योंकि असहाय नारी कुछ नहीं कर सकती, क्योंकि जीवन जीने के अन्य साधन उसके पास नहीं है। इसलिए अपने पति के अवैध यौन संबंधों को जानने के बावजूद भी वह चुपचाप बर्दाश्त करने के लिए बाध्य हो जाती है। नंदलाल की इस प्रवृत्ति पर डॉ. महीप सिंह कहते हैं, " नंदलाल अपने वर्गीय संस्कारों से मुक्त पत्नी को मारने - पीटनेवाला, डेढ़ पसली की काठीवाला ब्याहता को छोड़ 'गदराई', 'रसभरी', 'गुलमहर - सी' छबीली पर मरता है। " ५ यही प्रवृत्ति समाज के कई पुरुषों में बड़ी तादाद में दिखायी देती है।

#### जीवन के लिए संघर्ष :-

भारतीय समाज में सदियों से दलित समाज विभिन्न स्तरों पर शोषित रहा है और शोषित होने के कारण समाज में उसे आगे बढ़ने के अवसर बहुत कम मिले। दलित समाज में अपने परिवार की उपजीविका चलाने के लिए

महिला और पुरुषों को तरह- तरह के काम करने पड़ते हैं। मंजुल भगत के अनारो 'उपन्यास की नायिका अनारो अपने पति से प्रताड़ित है। उसे दो संताने हैं, पर वह कहीं भी लाचार बनती हमें दिखायी नहीं देती। उसकी जिजीविषा बहुत ही कठोर है। वह मकान - दर - मकान सुबह से शाम तक काम करती है। और इज्जत से अपने परिवार को चलाती है। वर्षा हो या जाड़ा विश्राम उसके नसीब में नहीं है। आत्मसम्मान और स्वाभिमान उसकी रग-रग में भरा हुआ है। इसीलिए वह किसी के सामने दया की भीख नहीं माँगती।

अनारो के इस कर्मठ व्यक्तित्व पर डॉ. ज्ञान अस्थाना कहती है, " आत्मसम्मान के अतिरिक्त अनारो जिद्दी, संयमी और वात्सल्यमयी भी है। अनारो की जिद्द विनाशकरी नहीं है, यह जिद्द उसे संघर्षों से जूझने की शक्ति देती है। अनारो जो ठान ले सो ठान ले। "६" अनारो गरीब दलित स्त्री है। उसे अपने घर परिवार में अच्छे संस्कार मिले हैं। शायद इसी कारण वह अपनी पारिवारिक जिम्मेदारियों को समझकर कदम बढ़ाती है। अनारो कहीं भी अपनी जिम्मेदारियों से पलायन करती नहीं है, बल्कि पूरी ताकत के साथ उसे निभाती भी है। जब चौदह साल की आयु में उसका विवाह हुआ था, तब उसकी माँ और मौसी ने उसे नसीहतें दी थीं कि, " खबरदार, जो कोई फरियाद - शिकायत लेकर मैके आयी! आदमी के पाँव धो - धोकर पीना होगा रुलायें तो भी हँसायें तो भी। "७ इस प्रकार की नसीहतों के कारण ही वह अपने जीवन के प्रति गम्भीर बन गयी थी। जब किसी घर में काम में देरी हो जाती तो बहुत बार उसे लोगों की कहा सुनी सुननी पड़ती। ऐसे समय उसके भीतर का सम्मान जाग उठता और वह कहती, " बस बी बीजी बस ! कलाई पर घड़ी बंधी है हमारे ? हो गयी देर, तो हो गयी ! तुमने कह दिया और हमने सुन ली। और क्या फाँसी चढाओगी हमें? और जी, हमारे काम को तो नजर लगावो मत ! तुम मुफ्त काम नहीं कराते, तो हम भी हराम की नहीं लेते। हाथ जोड़ - तोड़ के कमाते हैं। " ८ " इस प्रकार अनारो को जीवन में संघर्ष करना पड़ा है।

आधुनिक युग में शिक्षा के सर्व सुलभ होने के कारण दलितों ने डॉ. बाबासाहब अम्बेडकर के कहे अनुसार शिक्षा का लाभ उठाया और अपने आप को परिवर्तित करने में सफल हुए। परिणाम यह हुआ कि शिक्षा के कारण और आरक्षण के आधार पर देश के विभिन्न क्षेत्रों में रोजगार का अवसर मिला।

हिंदी साहित्य के अधुनातन विमर्श / 107

परंतु कम समय में इतनी तरक्की करने के बावजूद भी उनके शोषण का पहिया कैसे धमता ? भले ही तौर पर सामाजिक तथा आर्थिक शोषण तो रुक गया पर नयी व्यवस्था के कारण विभिन्न कार्यालयों में , संस्थानों में उनका मानसिक शोषण शुरू हुआ । तरह - तरह से उन्हें छला जाने लगा । प्रताड़ित किया जाने लगा । आधुनिक मानव समाज में पनपनेवाला यह जहर हिन्दू धर्म संस्कृति के लिए शर्मिदगीपूर्ण दाग ही साबित हुआ । इसी समाज पर व्यंग्य करते हुए कृष्णदत्त पालीवाल कहते हैं, " भारतीय समाज रक्त की शुद्धता की बात चाहे कितनी ही क्यों न करें पर यह शुद्ध रक्तवाला समाज नहीं है। इस भारतीय समाज में आर्यों , द्रविड़ों , मंगोलो , शकों , हूणों , अमीरों , नागों , यक्षों आदि न जाने कितनों का संमिश्रण है । अनेक जातियाँ देश - विदेश से घूम - घामकर यहाँ पहुंची , बसी और इस देश की सांस्कृतिक धारा में मिलकर एक हो गयी । " ९ • अतः ऐसी पिछड़ी हुई मानसिकता को अनारो और अन्य उपन्यासों में उद्घाटित किया गया है । मंजुल भगत के अनारो उपन्यास में अनारो स्वयं असहाय दलित , पीड़ित नारी है, पर वह अपने भविष्य के प्रति सजग है। वह जानती है कि शिक्षा - दीक्षा से घर - परिवार में सुधार आ सकता है। अच्छा काम मिल सकता है । इस लिए स्वयं घर - घर बरतन माँजती है पर अपनी बेटी गंजी को स्कूल में पढ़ाती है ।

#### निष्कर्ष :

इस प्रकार मंजुल भगत का उपन्यास अनारो और अन्य उपन्यासों में दलितों के विभिन्न आयामों को उद्घाटित करते . हुए उनके . भीतर जागृत होती चेतना को भी उभारने का प्रयास किया है । अतः दलित समाज जीवन के विविध पहलुओं को देखने से पता चलता है कि, दलित परिवारों में . स्थित विसंगतियाँ तथा पुरुषों द्वारा होने वाला नारी शोषण 'अनारो' ऐसे उपन्यासों में पाया जाता है। और अपने ही पुरुषों द्वारा अपनी महिलाओं को प्रताड़ित होने पड़ता है। गरीबी , अज्ञान तथा तनावों के कारण दलित समाज में पुरुषों के तथा स्त्रियों के विवाहेतर संबंधों का चित्रण अनारो उपन्यास में हुआ है।

#### संदर्भ ग्रंथ सूची

- १ ) दलित साहित्य का सौन्दर्यशास्त्र - डॉ.शरणकुमार लिंगाले पृ.३९
- २ ) अनारो - मंजुल भगत पृ.१०१

108 / अक्षरा पब्लिकेशन

Scanned with CamScanner



- ३) अनारो - मंजुल भगत पृ. ३५
- ४) अनारो - मंजुल भगत पृ. ३५
- ५) हिंदी उपन्यास समकालीन परिदृश्य - सं. डॉ. महीप सिंह पृ. ७८
- ६) हिंदी उपन्यास समकालीन परिदृश्य - सं. डॉ. महीप सिंह पृ. ७९
- ७) अनारो - मंजुल भगत पृ. ३९
- ८) अनारो - मंजुल भगत पृ. ३९
- ९) डॉ. अम्बेडकर और समाज व्यवस्था-कृष्णदत्त पालीवाल पृ. ४६ -४७

सम्प्रति

हिंदी विभाग

न्यू आर्ट स्कॉमर्स अॅन्ड सायंस कॉलेज पारनेर,  
अहमदनगर

मो.नं. ९९२२६२३१०८

ई-मेल hanumanthg2006@gmail.com



हिंदी साहित्य के अधुनातन विमर्श / 109

Scanned with CamScanner

## 15. The voice of the underclass as reflected in Amitav Ghosh's The Hungry Tide



IMPACT FACTOR – 5.61

# LangLit

*An International Peer-Reviewed Open Access Journal*

ISSN 2349-5189



---

## IDENTITY CRISIS IN HENRIK IBSEN'S *A DOLL'S HOUSE* WITH FEMINIST PERSPECTIVE

**DR. BHARATE PRANJALI PANDURANG**  
New Arts, Commerce and Science College,  
Parner.

**ABSTRACT**

*The main issue on which the drama A Doll's House is written. It is the issue of women. Its subject is of women's status in the society and their treatment by men, the lack of true love and respect for a wife by a husband, and the lack of justice and dignity in the treatment of women in the society itself. A Doll's House is a blooming field for feminist criticism. Feminist critics have seen Ibsen as a social realist, a, revolutionary thinker, and a benefactor of the suppressed, repressed and oppressed women of the nineteenth century Norway and Europe. Indeed, the play concerns a woman's right to individual freedom and the ways in which marriage, especially marriage in stiflingly conventional provincial Norwegian society frustrates and thwarts the individuality of a woman who has all the potentials that her husband has. Nora, like most women of our contemporary society, has all the inherent talents for developing into a successful member of the society, as much as her husband or any man. In fact, her critical mind, sense of justice, readiness to change, absence of hypocrisy and narrow-mindedness in relation to what is called tradition, and such other positive qualities would help her to make more progress and contribute to the development of her personality, her family and her society: if she is to get the opportunities and regard of her silly husband. In discussion of A Doll's House as a feminist play, or simply as a play about women, it is necessary to rethink. When asked about his intention in the play, A Doll's House, Ibsen claimed that the play was not a 'feminist' play; it was a 'humanist' play. What Ibsen meant was that the theme of this play was the need of every individual, whether man or woman, to find out the kind of person he or she really is and to strive to become that person. Ibsen meant that it was not about women only: his suggestion was that it is about justice to humanity in general. It means that we look at the problem from a higher parlance of human concern. He saw that an injustice was done to women, and he wrote about it. This is to say that the play is about injustice first and then about women. It could be about injustice upon old men or children or the poor people. The play's concern is more humanitarian than feminist. Ibsen was humanist writer, than feminist; indeed, he saw no reason why one should be 'feminist' when he is already humanist.*

Ibsen's refusal to limit the play's meaning to being 'feminist' does not change the emotional and psychological effect of the play on the audiences and the readers. It is a woman's predicament with which the play deals; it is the disillusionment of a wife that is the subject of the play; it is the drastic step taken by a-wife with which the play ends; it is the woman in the

---

**Vol. 8 Issue 1**  
Website: [www.langlit.org](http://www.langlit.org)

**256**

**August, 2021**  
Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

play who wins our maximum sympathy. Whatever may have been Ibsen's intentions, the effect of the play is to arouse in us a great deal of sympathy for the cause of women.

In discussion of *A Doll's House* as a feminist play, or simply as a play about women, it is necessary to rethink. When asked about his intention in the play, *A Doll's House*, Ibsen claimed that the play was not a 'feminist' play; it was a 'humanist' play. What Ibsen meant was that the theme of this play was the need of every individual, whether man or woman, to find out the kind of person he or she really is and to strive to become that person. Ibsen meant that it was not about women only: his suggestion was that it is about justice to humanity in general. It means that we look at the problem from a higher parlance of human concern. He saw that an injustice was done to women, and he wrote about it. This is to say that the play is about injustice first and then about women. It could be about injustice upon old men or children or the poor people. The play's concern is more humanitarian than feminist. Ibsen was humanist writer, than feminist; indeed, he saw no reason why one should be 'feminist' when he is already humanist.

Thus, the play seeks to expose the injustice upon women, which was inherent in the culture and attitude of the male-dominated society of the late nineteenth century Norway. It is basically a demand for justice, and whether we call it justice to humanity or justice to women, it is firstly and specifically justice to women indirectly, justice to humanity.

Most modern readers like to call *A Doll's House*, a feminist play, because of many reasons. This is not to say that Ibsen was an arrant feminist, nor to say that the play is only about women, because it deals primarily with the desire of a woman to establish her identity and dignity in the society. It is about the disillusionment of a wife about how she has been dominated and how her basic right, her right to be someone, has been ruthlessly destroyed in the name of love by her husband.

The drama is about the real and a burning social issue of a revolution that had become essential for the society to progress. Not a small matter, the very title of the play is about the woman in it, and that title also emphatically suggests the treatment of her as if she was a lifeless doll. She has a house and now needs to search for a home, on her own.

The slamming of the door bears paramount significance in the play. Nora, the protagonist of Ibsen's much discussed play *A Doll's House* is a developing character. In the earlier half of the play we see her as a submissive wife and a dutiful mother. As she knows her husband more she becomes aware of her own position and more self-conscious.

All her life she has lived according to her husband's will with no sense of self. Her patronizing and domineering husband is a representative of the patriarchal society. Her slamming the door at the end of the play is thematically significant because it symbolically stands for Nora's revolt against her husband and by extension a slap in the face of patriarchy.

Nora was dominated and controlled by her father before marriage and afterwards her husband was the agency for dominating her. Helmer never treated her as equal. He treated like doll in his hand. He treated her as his chattel. She existed for her husband. However, she had always expected that her husband would come to her aid when she will be in trouble. She had been waiting for miracles to happen in the Krogstad's case too. She had the fear that the villain

**Vol. 8 Issue 1****257****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

would expose everything and their family would be undone. Contrary to her expectation, her husband behaved like a hypocrite concerned more with morality and a notion of social prestige not with his wife's welfare and care. He came out in his true colors. Nora realized that her husband didn't see her as an individual, but only as a wife and mother. She knew what her husband was like. She wanted to dissolve her ties with him by abandoning him and the children. She thought her duty towards herself was above her duty as a mother and wife. Her status as a non - entity was a product of the functioning of patriarchy. She wanted to educate herself and establish her own identity. Slamming the door is the explosion of her energies against patriarchy. It's a challenge to patriarchy. It's a bold act of revolt against male domination. The crux of the whole play hinges on this single incident. It is an individual's search for freedom.

It signifies that a lady who realizes the necessity to cultivate her full identity must be ready to sacrifice even an atom of care and concern for her children and husband. Motherly duty, the instinct of motherhood, and unconditional love for her husband are the real obstacles on the path to cultivate an identity for those ladies who are rebellious. To slam the door is to turn a deaf ear to the call of motherly duty. Maternal privilege blocks the progressive march towards the formation of identity. A lady in whom a feminist awakening has come must battle against the fascinating call of motherhood to slam the door is tantamount to discarding maternal and family role. To slam the door means to decide to rise above the temptation of baser impulses like feelings and affections. To slam the door is to slam the metaphoric door of love, sentiment and affection. To slam the door is to prepare to open the new door of identity and individuality. To slam the door means to encourage the conscious women that women should partake of active revolt against male dictatorship. The actual significance of the slamming of the door lies in the presentation of the fact that even such an ignorant and submissive wife Nora go to the violent level of launching an active revolt against male domination and dictatorship. Its metaphoric significance emerges from the fact that the slamming of the door stands for the optimistic emergence of a new revolution that is called feminism.

The title of A Doll's House is symbolically significant as well as highly suggestive of the message. Ibsen seems to have intended to convey through the play. There are two important aspects of the play, which the title directly points one is the doll and second is the house. The doll represents Nora the central character, and the house stands for the house of Helmer where Nora lives.

We read the play carefully and understand it critically; we feel that the word doll has been used in the title in a rather ironic manner. Doll signifies passivity, beauty, and the basically feminine nature which is seen in Nora when we look at her from outside. Indeed, from the viewpoint of Helmer, who is basically a traditionally possessive husband, Nora the doll is something like an inanimate object with which he can play and enjoy. As Nora says at the end of the play, she had been her father's doll until her marriage and she has been Helmer's doll for eight long years since her marriage. The word 'doll' suits Nora if we look at her with the traditional or uncritical eye, as Helmer or Mrs. Linde would look, or rather as they would like Nora to be. The reality is however that Nora has all the potential of being a real human being, seeking identity and dignity, and conscious of all the limitations imposed by her husband and his society's traditions. Nora is not a real doll but an apparent one. She is

**Vol. 8 Issue 1****258****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

subservient; she is designed as per the demand and desires of Helmer, who would like to think that he makes her what he wants her to be; she is also perfect and unchanging, insentient and easy to handle like lifeless dolls, that is, in the eyes of Mr. Helmer. Her opinions and interests are fully determined and controlled by him. She is his doll, like she was her father's doll till marriage, Helmer possesses her, basically and almost only for fun. Nora has herself explained the fun that her husband obtained while their playhouse.

*"...But our home has never been anything but a playroom, I've been your doll-wife, just as I used to be Papa's doll-child. And the children have been my dolls. I used to think it was fun when you came in and played with me, just as they think it's fun when I go in and play games with them. That's all our marriage has been...."*

Another ironic indication in the use of the word dolls is that the house does not belong to the doll. Nor is it made or maintained for her. The house, not home, is Mr. Torvald Helmer's. In one sense, he possesses the house, along with the doll! The house, therefore, seems to belong to the doll; but actually it is her cage. We say that the cover of a book belongs to it, or that it is the book's cover. It is only in that sense that the house belongs to the doll. Thus, Nora is the doll, and the house is a cage or 'case' for her. Indeed, the theme of the play suggests that her house (or home, or family) is a limitation on her freedom and prospects of life.

The word house also has symbolic suggestions and thematically significant connotations. House, as contrasted to home, means 'a structure or shelter to live in', unlike home which means 'a house where one's family lives and one gets love and care'. Home is an emotively charged word, whereas "house" is not. So, in the case of the title of this play, the word 'house' as the connotation of 'just a place to live in', a shelter, 'a lifeless thing', and so on. Indeed, for Nora, the house of Helmer has never been a home; it has been a house. As we see her in the beginning, Nora is mainly satisfied with her living place, her house; so, it is her 'home' indeed. But, as she finds out later, it has been a house, a cage; she has been living there as a plaything until her expectation of an act of, sacrifice by her husband, or what she calls "miracle", fails to happen. When she is disillusioned about her place and value, her dignity and respect from her husband, she realizes that her husband has been treating her like a child treats its doll. She has the feeling of that home which has been like the doll's house. That is the meaning of the title. The title is thus very appropriate and is also indicative of the theme of the play.

**REFERENCES:**

1. Ibsen, Henrik (trans McLeish). *A Doll's House*, Nick Hern Books, London, 1994
2. Unwin, Stephen. *Ibsen's A Doll's House (Page to Stage Study Guide)* Nick Hern Books, London, 1997
3. William L. Urban. "Parallels in A Doll's House." *Festschrift in Honor of Charles Speel*. Ed. by Thomas J. Sienkewicz and James E. Betts. Monmouth College, Monmouth, Illinois, 1997.
4. External links
5. Wikisource has original text related to this article:
6. *A Doll's House* Norwegian Wikisource has original text related to this article: Et dukkehjem
7. *A Doll's House* at the Internet Movie Database
8. *A Doll's House: A Study Guide*

**Vol. 8 Issue 1****259****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI

## 16. Influence of Colonialism on the Native African Cultural Heritage in Chinua Achebe's Things Fall Apart

	IMPACT FACTOR – 5.61	<b>LangLit</b>	ISSN 2349-5189	
<i>An International Peer-Reviewed Open Access Journal</i>				
<b>INFLUENCE OF COLONIALISM ON THE NATIVE AFRICAN CULTURAL HERITAGE IN CHINUA ACHEBE'S <i>THINGS FALL APART</i></b>				
<b>ANIL BHIMRAJ CHINDHE,</b> Assistant Professor, Department of English, New Arts, Commerce and Science College, Parner, Ahmednagar				
<b>ABSTRACT:</b>				
<i>In this paper an effort is made to focus that racist colonialist depiction of African writing in English changed primarily as a result of the Euro-African colonial encounter and its aftermath, and every novel of Achebe's marks a momentous moment in the development of this comparatively young body of literature. Literary production of Achebe's within the outline of a more socio-historical process of colonial domination, and subsequent movement for decolonization.</i>				
<b>Keywords:</b> Colonialism, African Cultural, Cultural Heritage, African Literature.				
<b>Introduction:</b>				
<p>Literature of Africa conceived as a kind of 'social protest' and a medium of 'political reassertion' occurred in a large way in the 1950s. It is a famous fact that literature of African is worried with teaching the folks and almost all the fictional works are tagged with a moral lesson on it. Chinua Achebe is the most well-known, and a famous literary figure captures the nuances and complications of African life in several steps with his artistic imagination. In 1960, African countries became independent. But the promises of freedom had turned out to be hollow. However Africa became independent, the innate still tried to look up to his overall guidance of the previous masters; technical guidance, financial support and intellectual lead, so that, ironically, the economic-political comparison between the previous and the latter remained more or less the same as it was in the days of British rule. The African themselves unsuccessful to resolve the basic difficulties of poverty, joblessness, over population, hunger, illiteracy and sickness. Politically also the native rulers had merely replaced the foreign rulers; the distance between the leaders and the people accentuating the fact that inspite of freedom, nothing had altered for the common man.</p> <p>The hope of the Africans that independence would associate in a new euphoria was all belied and the winning of freedom did not mean that there were no further difficulties to solve. Here is an appropriate comment by Fage:</p> <p style="padding-left: 40px;"><i>Each country had to work out how it wished to be governed, to consider if, or to what extent, the political and administrative legacies of its former colonial rulers could be adapted to give efficient and honest government, by its own men, suitable to its own needs.</i><sup>5</sup></p>				
<b>Vol. 8 Issue 1</b>		<b>280</b>	<b>August, 2021</b>	
Website: <a href="http://www.langlit.org">www.langlit.org</a>		Contact No. : +91-9890290602		
Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI				



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

But, freedom made the Africans better off in that they now had self-determination to concentrate on programmes of economic and social improvement, and freedom to select what rules seem best modified for the new independent Africa.

Chinua Achebe insists on the moral role of the novelist as instructor to “help my society regain belief in itself and put away the complexes of the years of denigration and self-abasement”<sup>1</sup> In his essay, “The African Writer and the Biafran Cause” Achebe highlights his promise towards his civilization as a representative of his culture:

*It is clear to me that an African creative writer who tries to avoid the big social and political issues of contemporary Africa will end up being completely irrelevant - like that absurd man in the proverb who leaves his burning house to pursue a rat fleeing from the flames.<sup>2</sup>*

To Achebe, all art including literature is a common activity and must deal with the development of a folks. He writes mostly about the purposes and ambitions of his folks with a strange sense of historicism - of what is past, passing and to come. As a aware artist he is worried with events in past, and how they affect the overall stream of life particularly when colonialism started interrupting the native social ethics and mores.

This traditional tribal world in the wake of the European colonization constitutes the content of *Things Fall Apart*. The destiny of the public revolves round what the protagonist, Okonkwo, does: when he is wealthy his civilization is also prosperous, but when he falls the society falls, too. At the beginning of the novel indicate the deftness and certainty with which Achebe founds not only the character but also the moral and ethical basis of his life, and by extension, the moral and ethical basis of the life of the clan.

*Okonkwo was well known throughout the nine villages and even beyond. His fame rested on social personal achievements. As a young man of eighteen he had brought honour to his village by throwing Amalinze the Cat. Amalinze was the greatest wrestler who for seven years was unbeaten from Umuofia to Mbaino..... In the end Okonkwo threw the Cat.<sup>3</sup>*

At the beginning of the novel, Achebe lets the reader know about the finest which is located on courage, wealth and valour among the Igbo persons. As a wrestler Okonkwo had earned his status by thrashing Amalinze, thereby bringing fame to himself and his township; as a fighter he had taken the accepted ciphers of his ability, the heads of five victims by the time he was 21 years old and as a man he had achieved and maintained personal wealth symbolized by his two barn full of yams, his three wives and most importantly, he had taken two headings which can only be developed when wealth has been achieved and his quality proven. His pliability of mind is also put to the test during the time of lack. An essence of the values of his community, he is glorified by the Igbo people and he is even considered as one of the greatest men in Umuofia.

In fact, Achebe presents the stature of Okonkwo as superhuman. And it is certainly an irony of fate that makes Okonkwo starts off with a difficulty on this score - the failure of his own father to satisfy this social rule, which enhances urgency to his known particular position. At first, Okonkwo struggled hard to remove from history the possible memory of his father's

**Vol. 8 Issue 1****281****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

poor and disgraceful upbringing and tried to live down the shame of his father so much so that he was obliged to an excessive adherence to the social code to an extent which in fact, alters a value into a weakness. Look at him:

*Okonkwo never showed any emotion openly, unless it be emotion of anger. To show affection was a sign of weakness; the only thing worth demonstrating was strength. 26*

Here, Okonkwo doesn't only have patience with his father, but also he even progresses a pathological abhorrence and allergy to all that his father signifies in terms of laziness, indebtedness, simple way of living with no care and concern for fame and success. The fear and memory of his father's disgraceful life stands as a continuous reproach, and the fear becomes the clandestine demon that destroys, the best part of him. He is so much fanatical with the failure of his father that this sense of disappointment injects a fear-psychosis in him as if he is possessed. Achebe Chinua writes:

*... his whole life was dominated by fear, the fear of failure and weakness. It was deeper and more intimate than the fear of evil and capricious gods and of magic, the fear of the forest, and of the forces of nature, malevolent, red in tooth and claw. Okonkwo's fear was greater than these. It was not external but lay deep within himself. It was a fear of himself, lest he should be found to resemble his father (12-13).*

Okonkwo hatred for his father and the morals he represents - love, delicacy, compassion and sensitivity is so enthusiastically pushed on to the edge of a precipice that the hatred is turned into his disastrous flaw. To him his father signifies the feminine principles much to the shock of Okonkwo.

Thus, Things Fall Apart emotionally respond to the disturbing effects and upheavals generated by the clash of two contradictory cultures and the social changes that Africa has been subjected to because of the insidious and vicious colonial rule and the disintegration that set in African civilization find a beautiful appearance in the novel discussed in this paper.

#### REFERENCES

1. Chinua Achebe, "The Novelist as Teacher", in African Writers on African Writing, G.D. Killam (Ed.). London: Heinemann, 1973, p.3.
2. Hans M. Zell and Helene Silver (comps & eds.). A Reader's Guide to African Literature. London: Heinemann Educational, 1972, p. 119.
3. C. Vijayashree. Ravichandra, "A Journey through History: A Study of Chinua Achebe's Fiction", in Commonwealth Fiction, R.K. Dhawan (Ed.). New Delhi: Classical Publisher, 1988, pp.226-227.
4. Ngugi Wa Thiong'O. Decolonising the Mind. New Delhi: Worldview Publication, 2007, p.3.
5. Chinua Achebe. Hopes and Impediments: Selected Essays. New York: Anchor Books, 1990, p.45.
6. Ibid. p.38.
7. Chinua Achebe. Things Fall Apart (1958). New Delhi: Allied Publishers Ltd., 2001. All further references are to this edition.
8. Chinua Achebe, "The Role of the Writer in a New Nation" in G.D. Killam (ed.), op.cit.

**Vol. 8 Issue 1****282****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



**17. Delineation of Childhood in the selected poems of Rabindranath Tagore**

IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal***DELINEATION OF CHILDHOOD IN THE SELECTED POEMS OF  
RABINDRANATH TAGORE****DR. VISHAL GULABRAO SALVE**Assistant Professor,  
New Arts, Commerce and Science College,  
Parner.**ABSTRACT**

*This paper emphasizes on the conflict among children and adult, taking into consideration both: children in their role as perpetrators of and children as targets of insensitive behaviour. A kid comes into the world, as a biological organism with animal requirements. He is progressively skilled social ways of feeling and acting. This procedure of moulding a child into a social being, called 'Socialization', makes it clear that knowledge something that is not ordinary. Progenies are as essential a part of society as adults. But human civilization is not a mere conglomeration of human beings. It is a phenomenon, which exists in the mind of its members. The natural new born is accepted as a respectable part of the human civilization only after it has been dipped in social colours and is hammered to fit into the social mould. A vital part of socialization is learning social behaviour, learning what is right what is not; learning to behave in a way that is not essential natural becomes a very vital part of the growing up process of a child. It is a study to show that Rabindranath Tagore's kids stand true to the tests of sociology and psychology and are then like ordinary kids seen in life.*

**Keywords:** Delineation, Socialization, Innocence, Kids,

Rabindranath Tagore was born on the 7<sup>th</sup> of May 1861 at Jorasanko in Calcutta. That time his family was living very simply. Rabindranath did not even have the attention and care of his mother, Sarada Devi. So, family servants taking care and all responsibility of Rabindranath. His activities were controlled by them to make their work easier. Frequently he would spend his times shut alone in a room seated silently by a window. Rabindranath Tagore's earliest sparks on creative genius can be traced back to his infantile. He started writing poetries at the initial age of nine. He composed his primary heroic poem -THE DEFEAT OF PRITHVIRAJ - at the age of eleven. Various Rabindranath Tagore's short stories reflect his adulthood and sensitivity in dealing with the period of childhood which is no doubt a tempestuous period in the life of human existences.

Delineation of childhood appears in Rabindranath Tagore's works. It is an examination of the psychological and social issues contributing to the spiritual and emotional make-up of a human existence. Humanity plays a vigorous role in moulding the thinking of a kid. A main change in the behaviour of a kid and a grown-up erudite the rules of society has fit himself into the mould that humanity wants him to fit. This vital development from the ordinary to

**Vol. 8 Issue 1****283****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



*An International Peer-Reviewed Open Access Journal*

the cultivated leaves ineffaceable impressions on the psychology of a kid. This is what Tagore's compassion captures in his works. The society needs are not bright and authentic individuals who might hamper its smooth running by questioning its basic insincerity; but well-organized and dutiful persons who will soon become kinds with no suggestions of an individual. Rabindranath Tagore's works very evidently show how wildlife cannot be potholed against nurture.

All time an effort is made to squash the "natural" out of a kid and cast him into the set communal moulds with force, a tragedy is bound to happen. This is Rabindranath Tagore's works highlight; a teen-ager's belief in truth and love should be reaffirmed by culture not crushed. The Chambers Dictionary describes a child as:

*a very young person (up to the age of sixteen for the purpose of some acts of parliament, under fourteen in criminal law,*

and childhood as:

*the state of being a child; the time of being a child.*

A new-born baby is certainly closer to wildlife than adults. The procedure of socialization starts almost as soon as the child is born, though it may not be obvious in the start. In various ways socialization is a slow and continuous pull away from natural propensities towards insincerity. Small kids consequently are full of life and show parallel characteristics in their nature almost everywhere in the world.

The kids in his works are fizzy with life; just like the kids we see everywhere. They are acquitted, naughty, curious, gullible, scared and jealous in their personal innocent way.

Innocence is one aspect that kids commonly show. The Chambers Dictionary describes "innocence" as:

*harmlessness; blamelessness; guilelessness; simplicity; freedom from legal guilt.*

Innocence is quality that leads kids to trust persons and belongings around them. It is innocence that leads kids to have faith in that the magical world of their stories is true, and that it is possible to attain everything. Various of Tagore's kids are depicted as small human beings vivacious with innocence.

In KABULIWALA, Mini is a life-like kid; frill of queries, very chatty and innocent. In the story, first line tells booklovers about how chatty Mini was:

*My five-year old daughter Mini can't stop talking for a minute. (1994-116)*

Then Mini's talk reflects her innocence:

*Guess what, Father, Bhola says it rains when an elephant in the sky squirts water through its trunk. (1994-116)*

Then again,

*Father, Ramadoyal the gatekeeper calls a crow a kauya instead of a kak. He doesn't know anything, does he! (1994-116)*

**Vol. 8 Issue 1**

**284**

**August, 2021**

Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

When Rahmat Khan, the Kabuliwala, is being led by the police hand-cuffed. Mini innocently asks:

*Are you going to your svasur-bari?*

This innocence in a kid leads him to trust that everything is conceivable and that the world of fairy-tales is as true as the world.

The kid's imagination at its spacious best is selected by Rabindranath Tagore in THE FLOWER-SCHOOL, where the kid says :

*Mother, I really think the flowers go to school underground...*

*When the rains come they have their holidays. (1994-143)*

The kid in the poem TWELVE O'CLOCK uses his imagination to encourage his mother that his study is not needed and then innocently asks :

*If twelve O'clock can come in the night, why*

*can't night come when it is twelve o'clock. (1994-146)*

A kid cannot simply recognize the customs of mature world. In the poem AUTHORSHIP the kid fails to recognize what or why his dad keeps on writing. So that kid cannot recognize why his mother should not permit him to disturb dad when his father is writing. Harmlessly he alleges to his mother:

*What's the fun of always writing and writing? (1994-147)*

In the Poem VOCATION, kid echoes this wish to grow up and be free very harmlessly. He requests to break away from the bindings of his school and :

*I wish I was a hawker, spending my day in the*

*road crying 'Bangles, crystal bangles'; (1994-144)*

Kids also love doing what they are said severely. This somehow stretches them thoughts to be playful, like Nalin in the FORBIDDEN ENTRY. Nalin's auntie Jaykali, strict and arrogant, very harshly constrained entry to anyone into her temple. That time Nalin has the very naughty idea of receiving plants from the "madhabi" creeper in the garden that is near temple.

*Except on festival-days, boys were not permitted to enter the courtyard...*

*trellis. Seeing some buds on a high branch,*

*he stretched with the whole length of*

*his body & arm to pick them;..." (1994-149)*

Therefore, representative that " boys will be boys", or somewhat "children will be children. The kids that people Rabindranath Tagore's works stand factual to the trials of psychology and more significantly to the examination of life. Like kids around, they are gullible, innocent, harmful, curious and greedy; simply recognizable with kids around us. So, they are a reflection that Rabindranath Tagore's opinion of life around was acute and sensitive.

**Vol. 8 Issue 1****285****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +91-9890290602

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

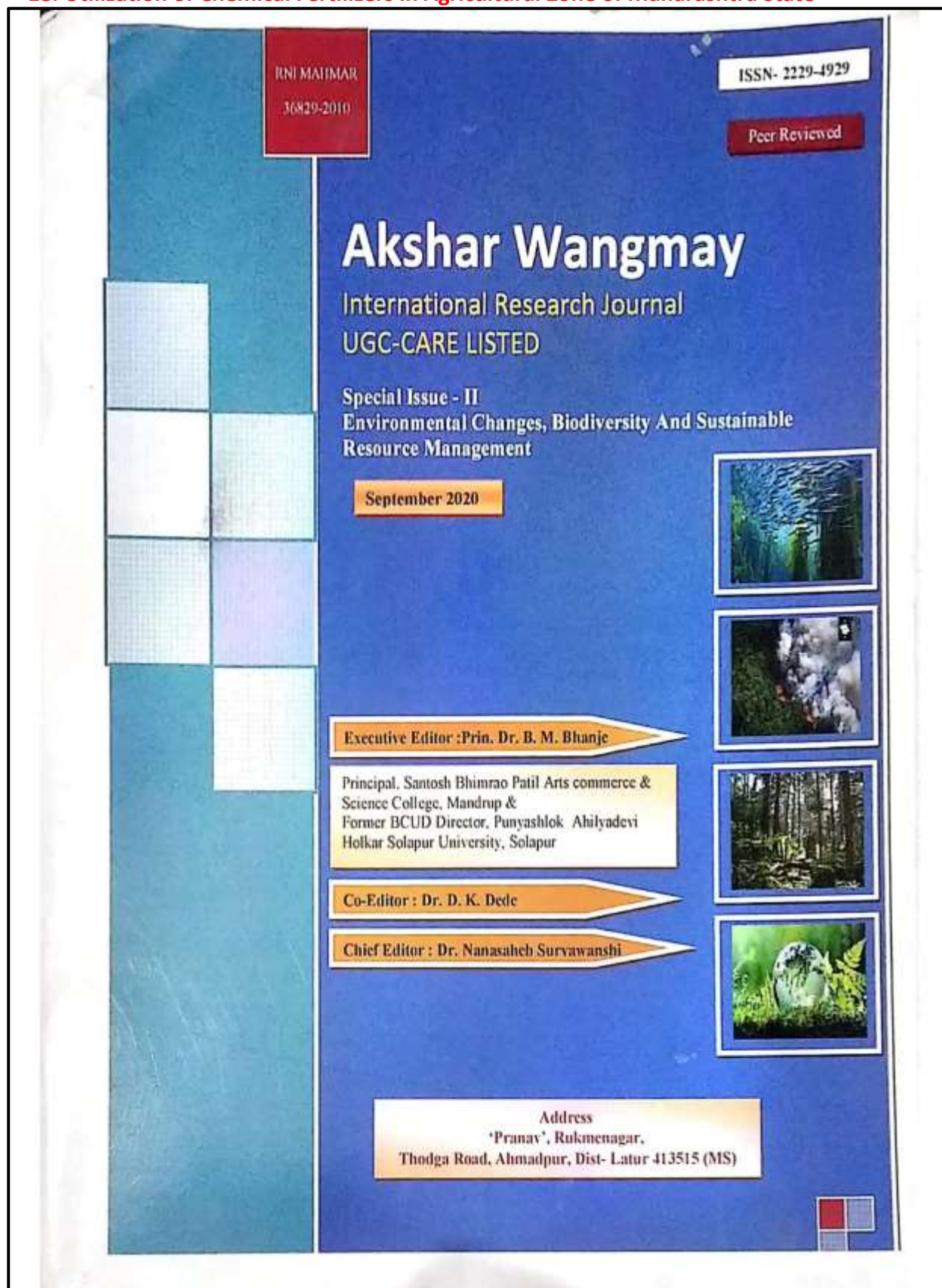
*An International Peer-Reviewed Open Access Journal***REFERENCES:**

1. Bhatta, S.Krishna (1987) 'Indian English Drama'. New Delhi Sterling Publishers Pvt. Ltd.
2. Bhushan, Vidya & Sachdeva, R (1997) 'An Introduction to Sociology'. New Delhi -ISBN.
3. Chatterjee, Samiran (1961). 'Cultural Forum- Tagore No' New Delhi - Ministry of Research & Cultural Affairs.
4. Chaudhari, Bhudeb & Subramanyan, K.G (1998) 'Rabindranath & the Challenges of Today'. Shimla. - Indian Institute of Advanced Study.
5. Gidwani, Charu (2003) Depiction of Childhood in the works of Rabindranath Tagore, (PhD Thesis) University of Pune, Pune, India.
6. Dutta, Krishna & Robmsion, Andrew (1990) 'Tagore The Myriad - minded Man.' New Delhi -Rupa & Co. Gardner,
7. George E (1971) 'The Emerging Personality Infancy to Adolescence.' London - Hutchinson & Co. (Publishers) ltd.
8. George, K.M. (1984) 'Comparative Indian Literature' Madras - Kerela Sahitya Akademi.
9. Kriplani, Krishna(1971) 'Rabindranath Tagore-A Biography.' New Delhi - Ministry of Information & Broadcasting.
10. Tagore, Rabindranath (1999) 'Lipika'Translated & Edited by Indu Dutt. New Delhi - Jaico Publishing House.
11. Tagore, Rabindranath (1992). 'I won't let you go: Selected Poems' Translated & Edited by Ketaki Kushari Dyson. New Delhi-UBPSD.
12. Tagore , Rabindranath (1994) 'Acalyatan'. Kolkata Viswa Bharati.
13. Tagore , Rabindranath (1992) 'Sisu' Kolkata Kamini Prakashalaya.
14. Tagore , Rabindranath (1994) 'The English writings of Rabindranath Tagore' Edited & translated by Sisir Kumar Das. New Delhi Sahitya Akademi.
15. Tagore , Rabindranath (2002) 'Selected Short Stories'. Edited & translated by Sukanta Chaudhari.

**Vol. 8 Issue 1****286****August, 2021**Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +91-9890290602

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI

**18. Utilization of Chemical Fertilizers in Agricultural Zone of Maharashtra State**

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal  
"Environmental Changes, Biodiversity And Sustainable Resources Management" RNI : MAHMAR - 36829-2010

ISSN : 2229-4929  
September - 2020

# **AKSHAR WANGMAY**

International Peer Reviewed Journal

UGC CARE LISTED JOURNAL

September - 2020

Special Issue-II

On

*"Environmental Changes, Biodiversity And Sustainable Resources  
Management"*

**Executive Editor**

**Prin. Dr. B. M. Bhanje**

Principal,

Santosh Bhimrao Patil Arts commerce & Science College, Mandrup

&

Former BCUD Director, Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**Co-Editor**

Dr. D. K. Dede

**Editorial Board**

Dr. S. A. Nimbargi

Dr. C. S. Mulage

Shri. S. B. Dhanshetti

Shri. J. L. More

**Chief Editor**

**Dr. Nanasheeb Suryawanshi**

PRATIK PRAKASHAN, 'PRANAV, RUKMENAGAR, THODGA ROAD AHMEDPUR,

DIST. LATUR, -433515, MAHARASHTRA

Published by - Dr. B. M. Bhanje, Principal, Santosh Bhimrao Patil Arts commerce & Science College, Mandrup

The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.

© All rights reserved with the Editors

Price :Rs.1000

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

### CONTENTS

Sr. No.	Paper Title	Page No.
1.	Location quotient of Edible Oil Industries of Kolhapur District <b>Shashikant S. Patil &amp; Dr. Arun A. Patil</b>	1-4
2	Role of NGO's in Resource Generation During Covid-19 Pandemic: A Study of Solapur District <b>Dr. D. S. Narayankar &amp; Dr. M. D. Sangepag</b>	5-9
3	Protection of Forest with Biodiversity in India <b>Dr. Seema Tiwari &amp; Dr. Vijay R. Baviskar</b>	10-16
4	Farmers' Suicides In India <b>Dr. R. M. Ghoti &amp; Ravindra P Mane</b>	17-19
5	A Study Of Health Expenditure On Kolhapur City With Reference To Panchganga River Water Pollution <b>Dr. Sachin Appasaheb Sardesai</b>	20-27
6	Women's Role in Indian Agriculture <b>Prin. Dr. B.M. Bhanje, Dr. Dede Deepak Kashinath &amp; Santosh P Mane</b>	28-31
7	Global Warming and it's Practical Solutions - A Geographical View <b>Dr. Virbhadra Chanbas Dande</b>	32-36
8	Population Growth and forthcoming Demographic Transition in India <b>Anilkumar R. Pathare &amp; Jyoti A. Pathare</b>	37-41
9	A Geographical Study Of Cropping Pattern Based on Weaver's Method In Malshiras Tahsil <b>Dr. Magar T.R.</b>	42-45
10	Environmental Issues In India <b>Paikekar Sudhir Bhimrao</b>	46-48
11	A Geographical Study of Agriculture Productivity and Efficiency in Junnar Tahsil of Pune. <b>Mr. Ashok J. Dushing</b>	49-52
12	Impact Of Agricultural Development On Natural Vegetation In Sangli District- A Geographical Analysis (Maharashtra) <b>Dr. U. N. Suryawanshi</b>	53-62
13	Development of An Activity Based Program for Inculcating The Core Element Protection of Environment Among The Students & Finding It's Effectiveness <b>Mr. Sanjay Shinde</b>	63-67
14	Child Labour A Major Problem In Slums: A Case Study <b>Dr. Sangameshwar A. Nimbargi</b>	68-71
15	Utilization of Chemical Fertilizers in Agricultural Zone of Maharashtra state <b>Dr. Ganesh K. Chavhan &amp; Dr. Raghunath E. Najan</b>	72-75
16	Morphometric Analysis in Sina River Basin: Geographical Study <b>Dr. Raghunath E. Najan &amp; Dr. Ganesh K. Chavan</b>	76-81
17	A Study of Green Marketing on Organic Farming for Sustainable Development <b>Danush Mohan</b>	82-85
18	Chloroquine: What to expect for Covid19? <b>Mrs. Vaishali S. Raut</b>	86-87
19	Manohar Shetty's poem Animal Planet: A Vocal of Biodiversity and Ecological Balance <b>Mr. S. B. Dhanashetti</b>	88-90
20	Study of Rainfall Variability of the Nashik District (MS) India <b>Rajendra P. Gunjal</b>	91-94
21	SARI an Epidemic Disease: A Geographical Perspective <b>Maruti Hajare , Suhas Raut &amp; Dr. S. K. Pawar</b>	95-99
22	A Study of Facets of Right to Privacy in India (vis-à-vis Judicial Interpretation of Right To Privacy) <b>Dr. Rajesh N. Makasare</b>	100-103
23	Environmental Assessment of Avi-Faunal study of Gokharkuda - A Coastal Village Eco-complex of Ganjam District, Odisha <b>Raj Kumar Baitharu, Nihar Ranjan Rout, Hara Prasad Sahoo &amp; C. Bhim Sen Baitharu</b>	104-110
24	Cropping Pattern Analysis of Sangola Tahsil <b>Dr. S. M. Mulani, Vijaykumar Gorakhnath Ghadage &amp; Subhash Chavare</b>	111-113
25	Study of The Water Conservation With Reference to Awareness, Attitude And Behaviour <b>Dr. M.M. Jadal</b>	114-119

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September-2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

## Utilization of Chemical Fertilizers in Agricultural Zone of Maharashtra state

*Dr. Ganesh K. Chavhan<sup>1</sup>, Dr. Raghunath E. Najan<sup>2</sup>*

<sup>1</sup>Head, Dept. of Geography & Research Centre, K. J. Somaiya College of Arts, Commerce & Science, Kopergaon.

<sup>2</sup>Head, Dept. of Geography, New Arts, Commerce & Science College, Parner.

### Abstract

India is a country of more than 1 000 million people. It is the seventh largest nation in the world with a geographical area of 328.7 million ha. Agriculture is the mainstay of the Indian economy, contributing about 22 percent of gross domestic product (GDP) and providing a livelihood to two-thirds of the population. The net cultivated area has been about 141 million ha for the last 30 years. However, there has been a progressive increase in the gross cropped area as the cropping intensity has increased from 118 to 135 percent in the last three decades. The total gross cropped area is about 190 million ha. There are 115.6 million farm holdings, with an average size of 1.41/ha.

The land in India suffers from varying degrees of degradation. Soil fertility depletion is a cause of concern for Indian agriculture. There exists a gap of about 10 million tonnes of nutrients (NPK) between the removal of nutrients by crops and their addition through fertilizers. The use of plant nutrients per hectare is relatively low and imbalanced, and this is one of the major reasons for low crop yields in India.

Soil naturally contains many nutrients like nitrogen, phosphorous, calcium and potassium. These nutrients allow plants to grow. When soil nutrients are missing or in short supply, plants suffer from nutrient deficiency and stop growing. When nutrient level is too low, the plant cannot function properly and produce the food necessary to feed the world's population.

The present investigation tries to find out the spatial changes about use of fertilizers in study area in the research paper authors also highlight which problems are created due to the heavy use of chemical Fertilizers.

### Introduction

Fertilizers are simply plant nutrients applied to agricultural field to supplements required elements found naturally in the soil. Fertilizers have been used since the start of agriculture. Fertilizers use is remarkable increased from some last decade in all over the world as well as in study area due to the pressure of growing population on agricultural land, consumption of chemical Fertilizers in the Maharashtra state for 2016-17 was 64.67 lakh MT with per hectare consumption of 122.3 kg. It was 59.63 Lakh MT with per hectare consumption of 122.5 kg for 2015-16.

Once crops are harvested for human consumption, the natural supply of nutrient's in the soil must be refilled, So farmers add nutrients the their soil. Nutrients can be added from verity of sources that is organic matter, chemical fertilizers and even by some plants. These maintain soil fertility. So the farmers can continue use the fertilizers for the healthy crops farmers turn to fertilizers because these substance.

### Study Area



'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
 Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

The selected study area, Maharashtra state is located in north Centre of peninsular India and it is lying between 15° 45' to 22° 6' north latitude and 70° 36' to 80° 54' east longitude. Maharashtra has a remarkable physical homogeneity. The dominant physical trait of the state is its plateau character. Maharashtra's western part of coastal plains western upturned rims rising to from the Sahyadri rang and its slopes gently descending towards to east and southeast. The Major rivers and their master tributaries have covered the Plateau in to alternating broad-river valleys and intervening higher level interfluves. The Sahyadri range is the physical backbone of the Maharashtra State. Rising on an average to an elevation of 1000 mtrs.

**Objectives**

1. To Find out the region wise use of chemical fertilizers.
2. To assess the temporal changes in use of chemical fertilizers.
3. To give a review to consequences of use of more chemical fertilizers in study area.

**Database & Methodology**

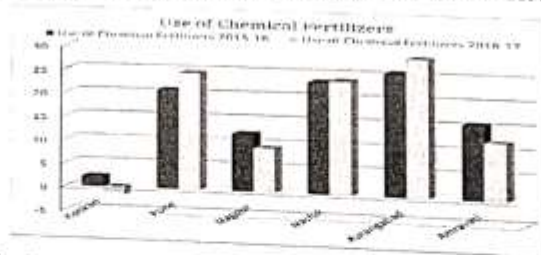
The present study based on only secondary data, with is obtained from socio-economic review of Maharashtra state for the period of 2015-16 and 2016-17. The collected data ware processed by appropriate statistical and quantitative techniques. The map, table and cartographic method are used for presenting the processed data and their interpretation, which is support for getting concluding remarks.

**Region wise use of chemical fertilizers in Maharashtra State (00 MT)**

(Fig. in Bracket indicate %)

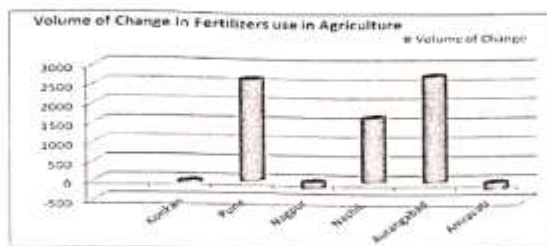
Sr. No.	Region	Use of Chemical Fertilizers		Volume of Change
		2015-16	2016-17	
1	Konkan	599 (2.17)	529 (1.54)	-70 (-0.63)
2	Pune	5755 (20.87)	8418 (24.58)	2663 (3.71)
3	Nagpur	3334 (12.09)	3155 (9.21)	-179 (-2.88)
4	Nashik	6451 (23.39)	8134 (23.75)	1683 (0.36)
5	Aurangabad	7104 (25.76)	9870 (28.82)	2766 (3.06)
6	Amravati	4328 (15.69)	4135 (12.07)	-193 (-3.62)
	<b>Maharashtra</b>	<b>27571 (100)</b>	<b>34241 (100)</b>	<b>6670 (0.80)</b>

**Table -Spatio- Temporal Changes in use of chemical fertilizers**



**Graphical presentation of use of chemical fertilizers in agriculture**

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September-2020  
 Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"



**Gaphical presentation of Volume changes in Fertilizers use in Agriculture (Region wise)**

**Result and Discussion**

1. Particularly the Aurangabad and Pune region was used high chemical fertilizers during the investigation period. Both regions are used the chemical fertilizers 25.76% (710400 mt) and 20.87% (575500 mt) in 2015-16 respectively. Aurangabad and Pune region's consumption of chemical fertilizers is about 28.82% (987000 mt) and 24.58 (841800 mt) in year 2016-17 respectively.
2. Use of chemical fertilizers of Aurangabad region 25.76% and 28.82 % in 2015-16 and 2016-17 respectively to total use of Maharashtra State. The volume of change take place positive 3.06% during the period of investigation.
3. Pune region used the 20.87% and 24.58% chemical fertilizers to total use of Maharashtra State in 2015-16 and 2016-17 respectively. The volume of change are found positive 3.71% and it change is higher than all other region of Maharashtra State.
4. Use of chemical fertilizers of Nashik region out of the total use of Maharashtra State is about 23.39% (645100 mt) in 2015-16 and is about 23.75% (813400 mt) in 2016-17. The use of chemical fertilizers is remarkable and volume of change observed to positive only 0.36% during the period of investigation.
5. Amravati region used to chemical fertilizers is about 15.69% (432800 mt) and 12.07% (413500 mt) in 2015-16 and 2016-17 respectively out of the total use to Maharashtra State. This share of utilization of Chemical fertilizers is moderate as compare to the other region of Maharashtra, But volume of change take place negative and high is about 3.62%.
6. Nagpur region used to chemical fertilizers is about 12.09%(333400 mt) and 9.21% (315500 mt) in 2015-16 and 2016-17 respectively; out of the Maharashtra. The volume of change is found negative and high 2.88%.
7. Use of chemical fertilizers of konkan region is very negligible as compare to other region of Maharashtra and it is only 2.17% (59900 mt) and 1.54% (52900 mt) in 2015-16 and 2016-17 respectively out of the total use of Maharashtra. The volume of change take place negative only 0.63%.
8. Total use of chemical fertilizers of Maharashtra observed is about 2757100 mt in 2015-16 and is about 3424100 mt in 2016-17. The use of chemical fertilizers is increased about 667000 mt (0.81%) during the period of investigation.

**Use of Fertilizers**

Sr. No.	Volume of Change in % 2015-16 to 2016-17	Region

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

1	-4.00 to 2.1	Amravati, Nagpur
2	-2.00 to 0.00	Konkan
3	0.00 to 2.00	Nashik
4	2.1 to 4.00	Pune, Aurangabad



Volume of change are take place in use of chemical fertilizers in Maharashtra during the period of investigation. Author has volume of change is classified into four class, that is negative 4.0 to 2.1%, negative 2.00 to 0.00% positive 0.00 to 2.00% and positive 2.1 to 4.0% According to this classification Amravati & Nagpur region found in high negative change, Konkan region found in low negative change, Nashik region occur in low positive change and lastly Pune and Aurangabad region observed in high positive change.

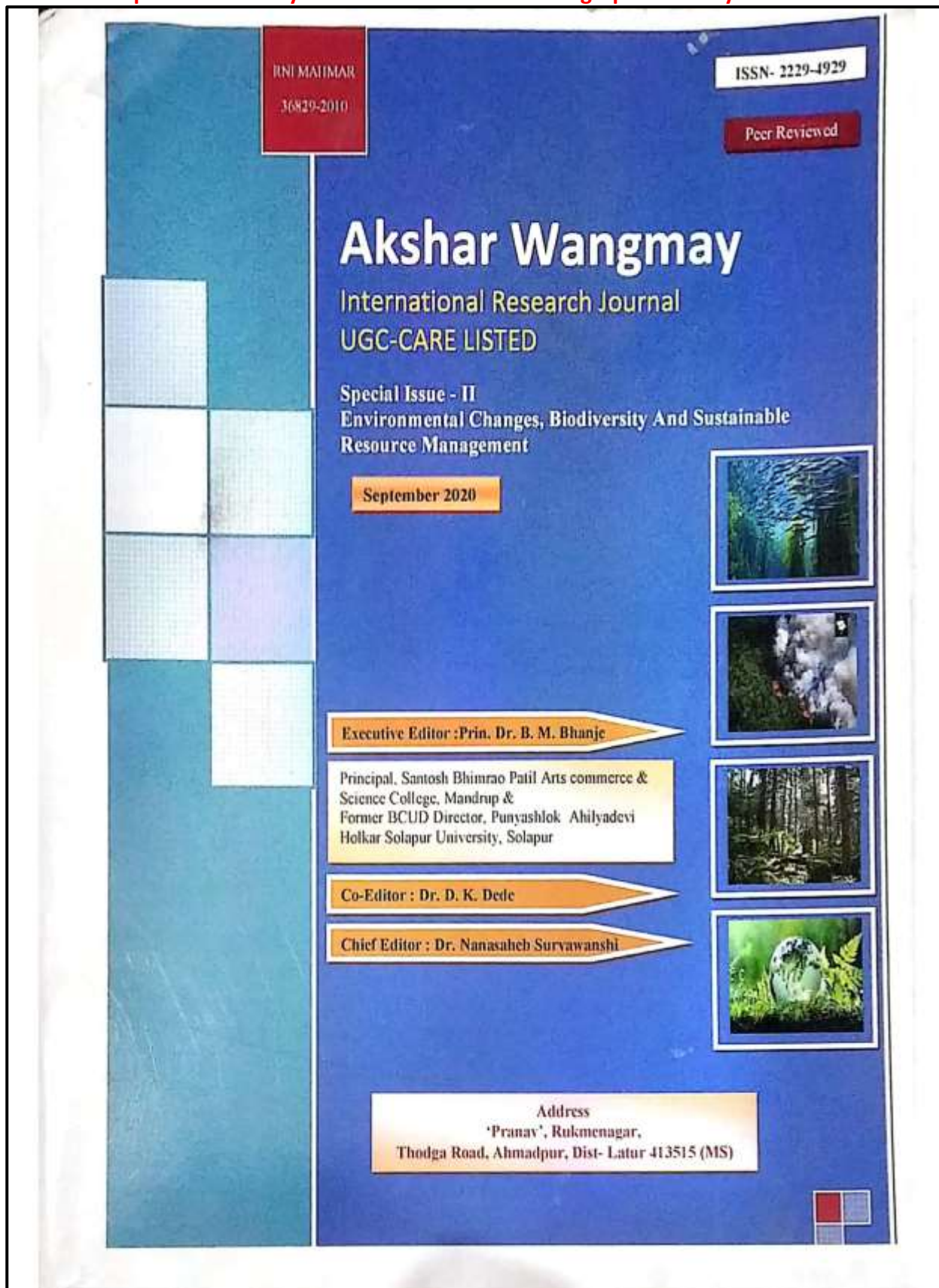
#### Conclusion

1. Aurangabad, Pune & Nashik region highly used to chemical fertilizers, due to the fertile soil & availability of irrigation sources and also this region growing the more cash crops.
2. Amravati & Nagpur region moderately use the chemical fertilizers due to the rain feed farming is more.
3. Konkan region very negligible use the chemical fertilizers because of the hilly region and rain feed agriculture.
4. Fertilizers use is very expensive and harm the environment, if not used the correctly.
5. So use of more fertilizers may affect the accumulation of heavy meatls in soil and plant system. Plant absorb the fertilizers through the soil, they can enter the food chain. So fertilizers leads to water, soil and air pollution.
6. Farmers must be careful to use the right amount at the right time, to avoid potential negative effects to the environment.

#### References

1. Agricultural Geography-Majid Husain.
2. Dr. Ashok Doke- Use of Chemical Fertilizers, chapter published in book.
3. Geography of Maharashtra.
4. Articles in Loksatta, News Paper.
5. Socio-economic review of Maharashtra State. (2015-16 and 2016-17)

19. Morphometric Analysis in Sina River Basin-A Geographical Study



'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal  
"Environmental Changes, Biodiversity And Sustainable Resources Management" BNI : MAHMAR - 36829-2010

ISSN : 2229-4929  
September-2020

# **AKSHAR WANGMAY**

International Peer Reviewed Journal

**UGC CARE LISTED JOURNAL**

September – 2020

Special Issue-II

On

*"Environmental Changes, Biodiversity And Sustainable Resources  
Management"*

**Executive Editor**

**Prin. Dr. B. M. Bhanje**

Principal,

Santosh Bhimrao Patil Arts commerce & Science College, Mandrup

&

Former BCUD Director, Panyashlok Ahilyadevi Holkar Solapur University, Solapur

**Co-Editor**

Dr. D. K. Dede

**Editorial Board**

Dr. S. A. Nimbargi

Dr. C. S. Mulage

Shri. S. B. Dhanshetti

Shri. J. L. More

**Chief Editor**

**Dr. Nanasheeb Suryawanshi**

PRATIK PRAKASHAN, 'PRANAV, RUKMENAGAR, THODGA ROAD AHMEDPUR,  
DIST. LATUR, -433515, MAHARASHTRA

Published by - Dr. B. M. Bhanje, Principal, Santosh Bhimrao Patil Arts commerce & Science College, Mandrup

The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.

© All rights reserved with the Editors

Price :Rs.1000

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4920, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

### CONTENTS

Sr. No.	Paper Title	Page No.
1.	Location quotient of Edible Oil Industries of Kolhapur District <b>Shashikant S. Patil &amp; Dr. Arun A. Patil</b>	1-4
2	Role of NGO's in Resource Generation During Covid-19 Pandemic: A Study of Solapur District <b>Dr. D. S. Narayankar &amp; Dr. M. D. Sangepag</b>	5-9
3	Protection of Forest with Biodiversity in India <b>Dr. Seema Tiwari &amp; Dr. Vijay R. Baviskar</b>	10-16
4	Farmers' Suicides In India <b>Dr. R. M. Ghoti &amp; Ravindra P Mane</b>	17-19
5	A Study Of Health Expenditure On Kolhapur City With Reference To Panchganga River Water Pollution <b>Dr. Sachin Appasaheb Sardesai</b>	20-27
6	Women's Role in Indian Agriculture <b>Prin. Dr. B.M. Bhanje, Dr. Dede Deepak Kashinath &amp; Santosh P Mane</b>	28-31
7	Global Warming and it's Practical Solutions - A Geographical View <b>Dr. Virbhadra Chanbas Dande</b>	32-36
8	Population Growth and forthcoming Demographic Transition in India <b>Anilkumar R. Pathare &amp; Jyoti A. Pathare</b>	37-41
9	A Geographical Study Of Cropping Pattern Based on Weaver's Method In Malshiras Tahsil <b>Dr. Magar T.R.</b>	42-45
10	Environmental Issues In India <b>Paikekar Sudhir Bhimrao</b>	46-48
11	A Geographical Study of Agriculture Productivity and Efficiency in Junnar Tahsil of Pune. <b>Mr. Ashok J. Dushing</b>	49-52
12	Impact Of Agricultural Development On Natural Vegetation In Sangli District- A Geographical Analysis (Maharashtra) <b>Dr. U. N. Suryawanshi</b>	53-62
13	Development of An Activity Based Program for Inculcating The Core Element Protection of Environment Among The Students & Finding It's Effectiveness <b>Mr. Sanjay Shinde</b>	63-67
14	Child Labour A Major Problem In Slums: A Case Study <b>Dr. Sangameshwar A. Nimbargi</b>	68-71
15	Utilization of Chemical Fertilizers in Agricultural Zone of Maharashtra state <b>Dr. Ganesh K. Chavhan &amp; Dr. Raghunath E. Najan</b>	72-75
16	Morphometric Analysis in Sina River Basin: Geographical Study <b>Dr. Raghunath E. Najan &amp; Dr. Ganesh K. Chavan</b>	76-81
17	A Study of Green Marketing on Organic Farming for Sustainable Development <b>Danush Mohan</b>	82-85
18	Chloroquine: What to expect for Covid19? <b>Mrs. Vaishali S. Raut</b>	86-87
19	Manohar Shetty's poem Animal Planet: A Vocal of Biodiversity and Ecological Balance <b>Mr. S. B. Dhanashetti</b>	88-90
20	Study of Rainfall Variability of the Nashik District (MS) India <b>Rajendra P. Gunjal</b>	91-94
21	SARI an Epidemic Disease: A Geographical Perspective <b>Maruti Hajare, Suhaz Raut &amp; Dr. S. K. Pawar</b>	95-99
22	A Study of Facets of Right to Privacy in India (vis-à-vis Judicial Interpretation of Right To Privacy) <b>Dr. Rajesh N. Makasare</b>	100-103
23	Environmental Assessment of Avi-Faunal study of Gokharkuda – A Coastal Village Eco-complex of Ganjam District, Odisha <b>Raj Kumar Baitharu, Nihar Ranjan Rout, Hara Prasad Sahoo &amp; C. Bhim Sen Baitharu</b>	104-110
24	Cropping Pattern Analysis of Sangola Tahsil <b>Dr. S. M. Mulani, Vijaykumar Gorakhnath Ghadage &amp; Subhash Chavare</b>	111-113
25	Study of The Water Conservation With Reference to Awareness, Attitude And Behaviour <b>Dr. M.M. Jadal</b>	114-119

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September-2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

## Morphometric Analysis in Sina River Basin: Geographical Study

*Dr. Raghunath E. Najan<sup>1</sup>, Dr. Ganesh K. Chavan<sup>2</sup>*

<sup>1</sup> Head, Department of Geography, New Arts, Commerce and Science College, Parner.

<sup>2</sup> Head, Department of Geography & Research Centre, K. J. Somaiya College, Kopergaon.

### Abstract:

The morphometric analysis of the drainage basin and channel network play a vital role. In order to understand the hydro-geological behaviour of drainage basin and expresses the current climate, geology, geomorphology and structure etc. The relationship between various drainage parameters and the aforesaid factors are well recognized by Horton 1945, Strahler 1957 and Leopold 1953. In this paper analysis of the morphometric attributes of Sina River basin have been studied. Morphometry is the measurement and mathematical analysis of the configuration of the earth's surface, shape, dimension of its landforms. The morphometric analysis includes the linear aspects and aerial aspects. In linear aspects include stream ordering, stream length, stream length ratio, and bifurcation ratio. Aerial aspect includes drainage density, stream frequency, circulatory ratio, and elongated ratio has been calculated. Morphometric analysis is an important aspect of hydrological and hydro geological studies. Morphometric analysis will help to quantify and understand the hydrological characters and the results will be useful input for flood analysis in the study area.

The natural rivers expose a wide range of channel forms. The dimensions of a river channel in cross-section and in plain are defined as channel morphology. Development of a drainage system and the flowing pattern of a river over space and time are influenced by several variables such as geology, geomorphology, structural components, soil and vegetation of the area through which it flows. Morphometric analysis gives the information about characterization of linear and areal features, gradient of channel network and contributing ground slopes of three drainage basins. Drainage provides a basic to understanding of initial slope, inequalities in rock hardness, structural control, geological and geomorphologic history. It is evaluated to get some idea of the morphological characteristic of the Sina River basin.

**Key Words:** Drainage basin, Cross-section, watershed, hydrological characters, morphometric, etc.

### Introduction:

The natural rivers expose a wide range of channel forms. The dimensions of a river channel in cross-section and in plain are defined as channel morphology described the overall geometry of a river channel as one controlled by the independent variables discharge and sediment load. But at the reach level, the channel morphology is the result of (1) the interaction of the hydraulic of flows velocity, discharge, roughness and shear stress. (2) The channel configuration at the reach and immediately upstream width, depth, shape, slope and pattern. (3) The sediment load entering the reach (caliber and amount). (4) The composition of the bed and bank material.

The resultant form is an expression of the balance between stream powers and the resistance offered by the channel parameter and the adjustment of the channel geometry to the different control listed above take place at the following degrees of freedom. In the

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN- 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

following section the channel cross-sectional form, the channel pattern and bed slope have been evaluated to get some idea of the morphological characteristic of the Sina River.

**Objective:**

1. To study the quantitative analysis of morphometric characteristics
2. To study the areal and linear analysis of drainage system.

**Methodology:**

The present morphometric analysis covers Sina River drainage basin. The drainage map with watershed boundaries were generated through DEM as a line coverage giving unique ID for each order of stream. The fundamental parameters namely: Stream length, area, perimeter, number of streams and basin length are divided from the drainage layer. The morphometric parameters such as stream order, stream number, Bifurcation Ratio, Drainage density (km/sq. km), Drainage (Stream) frequency, Drainage texture, The circulatory ratio, Compactness Coefficient, Elongation Ratio, Form Factor ratio are calculated based on the formula suggested by Strahler (1964), Horton (1945), Schumm (1956), Smith (1950), Miller (1953).

**Study Area:**

The study area falls between Latitude 17°15' to 19°15' North Latitudes and 74° 30' to 76° 15' East Longitude covered by 1:50,000 map numbers. 47I/16 1:50,000 of Survey of India (SOI 1973, 1995). It covers the border areas of water is very low. The Sina river basin has very little the Ahmednagar irrigated land, so most of it is scrubland or districts. As mentioned above, this under dry land. As compared to the other area is a chronic draught prone region and sub-basins of the Bhima, this basin has the Sina River is highly seasonal. The source comparatively little cash-crop cultivation. Area of the river is the NW-SE trending. The reform economic condition of the Balaghat hill range of which shows well people in the basin is weak; as compared dissected, undulating topography. The to the other basin conditions. There is a downstream area is nearly plain and consists need to reconstruct the paleo-environment of a thick carpet of black cotton soil. Isolated of the basin to understand, whether dry hills are also observed in this area (GSI environment of the basin has long history 2001).

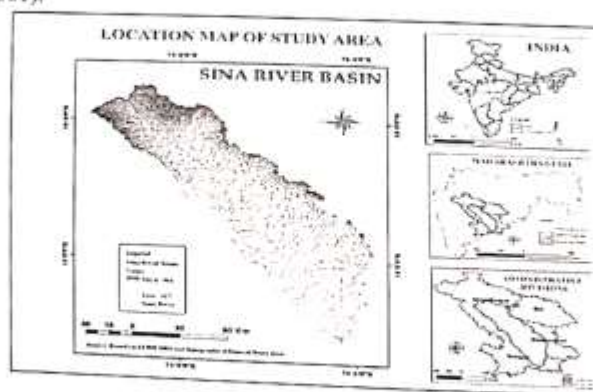


Fig. Location Map of Sina River Basin



'Akshar Waagnay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

### Linear Aspects of the Sina River Basin:

#### 1. Stream Orders (u)

Ordering of the streams is done with the Strahler method (1964).

#### 2. Stream Number (Nu)

After assigning stream orders, the segments of each order are counted to get the number of segments of the given order (u). The stream lengths of the various segments are measured with the help of GIS software. In the study area, the total streams are present 323 of which 73.68 % first order streams having 238. The second order streams are 62 and account for 19.19 %; Third order streams are 18 and accounted 5.57 %; Fourth order streams are 4 and account for 1.24%; Fifth order streams are 1 and account for 0.30 .

#### 3. Bifurcation Ratio(Rb)

Formula -  $Rb = Nu / Nu+1$

Where,

Nu=Number of stream segments present in the given order

Nu+1= Number of segments of the next higher order

Bifurcation Ratio is the ratio of the number of streams of an order to the number streams of the next higher order ( Strahler, 1964). In the Sina basin bifurcation ratio ranges from 0.00 to 4.50 (Table 1). The average bifurcation ratio of area is 3.15. This means that on an average, there are 3.15 times as many channel segments to any given order as of the next higher order. Bifurcation ratios are related to the structural control on the drainage. A lower Rb range suggests that structure does not exercise a dominant influence on the drainage pattern. Higher Rb indicates some sort of geological control. If the Rb is low, the basin produces a sharp peak in discharge and if it is high, the basin yields low, but extended peak flows. In well developed drainage network the bifurcation ratio is generally between 0 to 5.

#### 4. Stream Length (Lu)

The stream length of various orders has been measured from topographical map. Horton's law of stream length supports the theory that geometrical similarity is preserved generally in the basins of increasing order (Strahler, 1964). The mean length of channel Lu of order U is the ratio of the total length to the number of streams of a given order. Mean length of channel segments of a given order is greater than that of the next lower order but less than that of the next higher order. The logarithm of stream length of each order as a function of order is plotted and yields a set of points lying generally along a straight line.

Table No.1 : Linear Aspects of the Sina River Basin

Stream order	Number of Stream	No of Stream %	Stream Length in cm	Bifurcation Ratio	Mean Stream Length	Stream Length Ratio
1	238	73.68	130	3.83	0.55	2
2	62	19.19	65	3.44	1.05	1.10
3	18	5.57	59	4.50	3.27	2.80
4	04	1.24	21	4.00	5.25	1.11
5	01	0.31	19	0.00	19	0.00

78

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
 Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

323	294
-----	-----

**Areal Aspects of Sina River Basin:**

**Table No.2 : Areal Aspects of the Sina River Basin**

Basin Area (cm)	Basin Length (cm)	Form Factor	Elongation Ratio	Drainage Density	Stream Frequency
288	22	0.59	0.44	1.02	1.12

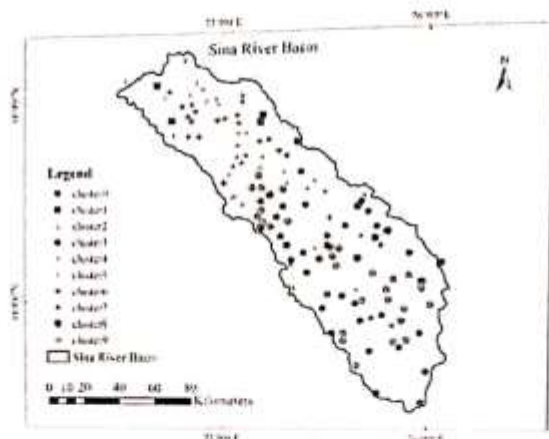


Fig.2. Cluster points of Sina River Basin

**Basin Area (A)**

Basin area is very important morphometric attributes. It is related to the spatial distribution of a number of significant attributes such as drainage density and relative reliefs, dissection index. If the basin size is small, it is likely that rainwater will reach the main channel more rapidly than in a larger basin, where the water is much further to travel. The length of the Sina River basin is 22 cm . Basin area is the direct outcome of the drainage development in a particular basin. It is usually seen that the basin are pear shaped in early stages, but as the cycle advances, the shape tends to become more elongated. The shape of the Sina basin is significant since it affects the stream discharge characteristic. It has long been usual that a circular area is more likely to have a shorter cover time and a higher peak flows than an elongated basin. Three dimensionless ratios via, form factor, circularity ratio and elongation ratio reflect the basin shapes.

**2) Form Factor Index (F)**

Formula –  $Rf = A / (Lb)^2$  . Where, A=Area of basin, Lb=Basin length

It is the ratio of a basin area Au (Horton, 1932) to the square of the basin length Lb. For Sina basin, the form factor is 0.59 . A form factor nearer to zero indicates a highly elongated shape and the value that is closer to 1 indicates circular shape. The basins with high form factor value have high peak flows for short duration whereas elongated basin with low

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

form factor will have a flatter peak flows of longer duration. Flood flows in elongated basins are easier to manage than that of the circular basins. The Sina River basin, being elongated in shape, has an F of 0.59 .

### 3) Elongation Ratio (R)

Formula -  $R = \sqrt{(A/\pi)/L_b}$ , Where, A=Area of basin,  $\pi=3.14$ ,  $L_b$ =Basin length

It is the ratio of the diameter of a circle of the same area as the basin to the maximum length of the basin (Schumm, 1956). For the study area, the elongation ratio is 0.44 . Values range from 0.6 to 0.8 is generally associated with strong relief and steep ground slopes.

### 4) Drainage Density (Dd)

Formula -  $Dd=L/A$  ., Where, L=Total length of stream, A= Area of basin.

The Drainage density (Dd) is defined as the length of streams per unit area. It is obtained by dividing the cumulative stream length by the basin area (Horton, 1932). For the Sina basin the overall drainage density is 1.02 per cm. In general, high drainage density is characteristic of regions having non-resistant or impermeable subsurface materials, sparse vegetation and mountainous relief, whereas low drainage density indicates regions of highly resistant rock or highly permeable subsoil materials under dense vegetative cover, where the relief is low. In the study area, the hilly region to the west shows high drainage density.

### 5) Stream Frequency (SF)

Formula -  $F_s=N/A$ ., Where, L=Total number of stream, A=Area of basin

Stream frequency of the basin may be defined as the ratio of the total numbers of segments cumulated for all orders with a basin to the basin area (Horton, 1945). The SF of the whole basin is 1.12 cm . High drainage density and stream frequency indicate larger run off from a basin.

### 6) Drainage Texture (DT)

The drainage texture may be defined as the relative spacing of drainage lines. The drainage density and drainage frequency have been collectively defined as drainage texture.

### Conclusion:

The Sina river basin is drained by the river Sina which is a stream of 5th order. GIS and Remote sensing techniques have proved to be accurate and efficient tool in drainage delineation and their updation. Bifurcation ratio, length ratio and stream order of basin indicates that the basin is fourth order basin with dendritic type of drainage pattern with homogeneous nature and there is no structural or tectonic control. Relief ratio, Ruggedness number and visual interpretation of DEM of study area indicate moderate and high relief, low run off and high infiltrations with early mature stage of erosion development. Drainage density, texture ratio and elongation ratio shows that texture of basin is moderate and shape of basin almost elongated. The complete morphometric analysis of drainage basin indicates that the given area is having good groundwater prospect.

### References:

1. Strahler A. H and Strahler, A. N. (1992) : Modern Physical Geography, John Wiley, New York
2. King, C. A.M (1966): Techniques in Geomorphology, Edward Arnold, London
3. Monkhouse, F. J. and Wilkinson, H. R., (1976). Maps and Diagrams, Methuen & Co.
4. Savindra Singh (2002): Geomorphology, PrayagPustakBhawan, Allahabad.

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

5. Miller, Austin (1953): The skin of the Earth, Methuen & Co. Ltd. London Strahler: Physical Geography
6. Schumm, S.A., (1956). The evolution of drainage systems and slopes in badlands of pertyambo, New Jersey, Bull. Geol. Soc. Amer., 67.
7. Smith, K.G., (1953). Erosional processes and landforms in badlands national monument, south Dakota, Columbia university.
8. Strahler, A.N. (1964). Quantitative Geomorphology of Drainage Basin and Channel Networks, In: V.T.Chow Handbook of Applied Hydrology", McGrawHill Book Company, Newyork.
9. Thakkar, A. &Diman, S.D., (2007). Morphometric Analysis and Prioritization of Mini Watershed in Mohr Watershed", Gujrat using Remote Sensing and GIS Techniques, Jour. Ind. Soc. of Remote Sensing..
10. Horton, R.E. (1945). Erosional development of streams and their drainage basins: Hydrological approach to quantitative morphology, Bulletin of American Geological Society. 56. 275-370.
11. Horton, R.E., (1932). Drainage basin characteristics. Trans., American geophysics Union., 13 350-361.

'Akshar Wangmay' UGC Approved & Peer Reviewed International Research Journal, ISSN: 2229-4929, September- 2020  
Special Issue "Environmental Changes, Biodiversity and Sustainable Resources Management"

5. Miller, Austin (1953): The skin of the Earth, Methuen & Co. Ltd. London Strahler; Physical Geography
6. Schumm, S.A., (1956). The evolution of drainage systems and slopes in badlands of pertyambo, New Jersey, Bull. Geol. Soc. Amer., 67.
7. Smith, K.G., (1953). Erosional processes and landforms in badlands national monument, south Dakota, Columbia university.
8. Strahler, A.N. (1964). Quantitative Geomorphology of Drainage Basin and Channel Networks, In: V.T.Chow Handbook of Applied Hydrology", McGrawbHill Book Company, Newyork.
9. Thakkar, A. &Diman, S.D., (2007). Morphometric Analysis and Prioritization of Mini Watershed in Mohr Watershed", Gujrat using Remote Sensing and GIS Techniques, Jour. Ind. Soc. of Remote Sensing..
10. Horton, R.E. (1945). Erosional development of streams and their drainage basins; Hydrological approach to quantitative morphology, Bulletin of American Geological Society. 56. 275-370.
11. Horton, R.E., (1932). Drainage basin characteristics. Trans., American geophysics Union., 13 350-361.

## 20. Global Climate Change & Agricultural Technologies: A Geographical Perspective

I J R B A T, Issue (VIII), Vol. III, Sept 2020: 203-206

A Double-Blind Peer Reviewed &amp; Refereed Journal



e-ISSN 2347 – 517X

Original Article



INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

© VMS RESEARCH FOUNDATION [www.ijrbat.in](http://www.ijrbat.in)

### GLOBAL CLIMATE CHANGE & AGRICULTURAL TECHNOLOGIES: A GEOGRAPHICAL PERSPECTIVE

<sup>1</sup>R. E. Najan and <sup>\*2</sup>A. S. Darandale<sup>1</sup>New Arts, Commerce and Science College, Parner Tal. Parner, Dist. Ahmednagar<sup>\*2</sup>Arts, Commerce and Science College, Sonai, Tal. Newasa, Dist. Ahmednagar

\*Email: amoldarandale87@gmail.com

Communicated: 30.07.20

Revision: 12.08.20 & 30.8.2020  
Accepted: 14.09.2020

Published: 30.09.2020

#### ABSTRACT

Climate change is one of the inescapable global issues of today. Climate change and agriculture are interrelated processes, both of which take place on a global scale. Global warming affects Agriculture in a number of ways, including through changes in average temperatures, rainfall, and climate extremes (e.g., heat waves, cyclones); changes in pests and crop diseases; changes in atmospheric carbon dioxide; changes in the nutritional quality of some foods; and changes in sea level. Agriculture is an important sector of the Indian economy. Indian agriculture sector accounts for 18 per cent of India's gross domestic product (GDP) and provides **employment** to 50% of the countries **workforce**. India remains among main three as far as production of different agricultural things like paddy, wheat, pulses, groundnut, rapeseeds, natural products, vegetables, sugarcane, tea, jute, cotton, tobacco leaves and so on. The article addresses adoption of agricultural technologies to cope with climate change such as biotechnology (HYV), farm ponds, watershed management, improved irrigation techniques, chemical fertilizers, farm machineries, organic farming, weather forecasting system, drone technology, RS & GIS, infrastructure development storage facilities, poly houses, shed net, vertical farming, hydroponics and so on.

**Key words:** Climate, Technology, Crops, Production, Global Warming.

#### INTRODUCTION:

Agriculture is a primary source of food & it is an important sector of the Indian economy. Today climate change has become a cross cutting issue. Agriculture industry has been adversely getting affected by climate change. Agricultural technologies can play a crucial role in addressing these fundamental challenges. Several agricultural technologies could help farmers to coping with climate change such as biotechnology, watershed management, farm ponds, improved irrigation techniques, farm machineries, organic farming, accurate weather forecasting, drone technology, poly houses etc. Adoption & proper implementation of such technologies could help farmers for agricultural development.

#### OBJECTIVES:

- i) To observe how the climate changed & its impact on agriculture activity.
- ii) To utilize new technologies with respect to climate change.
- iii) To find out efficiency of new technology in agriculture practices.
- iv) To explore merits & demerits of these technologies.

#### Hypothesis:

- i) There is a positive impact of technology on agriculture with respect to climate change.
- ii) Agriculture technology has merits & demerits.

#### **CLIMATIC CHANGE & ITS IMPACT ON AGRICULTURE:**

The climate is long term and average condition of the Earth's atmosphere regarding atmospheric elements. The climatic elements like as temperature, precipitation, humidity etc. The type of climate we experience now might be prevailing over the last 10,000 years with minor and occasionally wide fluctuations. The planet earth has witnessed many variations in climate since the beginning. The rings in the trees provide clues about wet and dry periods. Historical records describe the vagaries in climate. All these evidences indicate that change in climate is a natural and continuous process. India also witnessed alternate wet and dry periods. Earth's climate has been changed lot of times. According to experts major cause of climate change is global warming.

Global warming has adverse effects on the agriculture, biodiversity, human health, forests and so on. After the 1950, the issue of global warming is rise up. Green House Effect is the major cause of global warming and GHGs like CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>x</sub>, etc. are responsible for it. The human activities like industrialization, deforestation, urbanization, transportation etc..are intensifying it. Let us hope the world community responds to this challenge and adopts a lifestyle that leaves behind livable world for the generations to come.

Higher CO<sub>2</sub> levels can affect crop yields. Some laboratory experiments suggest that elevated CO<sub>2</sub> levels can increase plant growth. However, other factors, such as changing temperatures, ozone, and water and nutrient constraints, may counteract these potential increases in yield. For example, if temperature exceeds a crop's optimal level, if sufficient water and nutrients are not available,

yield increases may be reduced or reversed. Elevated CO<sub>2</sub> has been associated with reduced protein and nitrogen content in alfalfa and soybean plants, resulting in a loss of quality. Reduced grain and forage quality can reduce the ability of pasture and rangeland to support grazing livestock.

More extreme temperature and precipitation can prevent crops from growing. Extreme events, especially floods and droughts, can harm crops and reduce yields.

For example The widespread floods in Sangli, Kolhapur and Satara districts are expected to cause huge losses to the agricultural sector in the region. As per initial estimates, livestock by the thousands and cropping area of around 1.5 lakh hectare has been lost in the floods. The 2013 drought in Maharashtra in India came about after the region received lower rainfall during the monsoon season June to September 2012. It is considered as the region's worst drought in 40 years. The worst-hit areas in Maharashtra were Solapur, Parbhani, Ahmednagar, Latur, Pune, Satara, Beed and Nashik.

Nitrous oxide, a powerful greenhouse gas produced by soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning

#### **Agricultural Technologies:**

Modern farms and agricultural operations work far differently than those a few decades ago, primarily because of advancements in technology, including sensors, devices, machines, and information technology. Today's agriculture routinely uses sophisticated technologies such as robots, temperature and moisture sensors, aerial images, and GPS technology. These advanced devices and precision agriculture and robotic systems allow businesses to be more profitable,

efficient, safer, and more environmentally friendly.

Farmers no longer have to apply water, fertilizers, and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently. Benefits include:

- Higher crop productivity
- Decreased use of water, fertilizer, and pesticides, which in turn keeps food prices down
- Reduced impact on natural ecosystems
- Less runoff of chemicals into rivers and groundwater
- Increased worker safety

**Agricultural biotechnology**, also known as **agritech**, is an area of agricultural science involving the use of scientific tools and techniques, including genetic engineering, molecular markers, molecular diagnostics, vaccines, and tissue culture, to modify living organisms: plants, animals, and microorganisms. Crop biotechnology is one aspect of agricultural biotechnology which has been greatly developed upon in recent times. Desired trait is exported from a particular species of Crop to an entirely different species. These transgene crops possess desirable characteristics in terms of flavor, colour of flowers, growth rate, size of harvested products and resistance to diseases and pests.

The main aim of watershed management is to conserve the soil, plant, and water resources of a catchment while benefiting humanity. The watershed management implies, the judicious use of all the resources i.e. land, water, vegetation in an area for providing an answer to alleviate drought, moderate floods, prevent soil erosion, improve water availability and increase food, fodder, fuel and fiber on sustained basis. Watershed to achieve maximum production with

minimum hazard to the natural resources and for the well-being of people. The management should be carried out on the watershed basis.

Improving irrigation efficiency aims at minimizing water use within the agricultural sector while continuing to maintain optimal crop productivity rates. Water (and energy) efficient irrigation also provides a number of environmental and socio-economic benefits. High irrigation efficiency is becoming increasingly important due to the current decrease in available water resources and growing populations that drive expansion of agricultural activities.

One alternative form of agriculture that is much more sustainable for urban environments is hydroponics. Hydroponic agriculture involves growing plants in nutrient-rich water that can be recycled, all with minimal use of soil.

The rise of digital agriculture and its related technologies has opened a wealth of new data opportunities. Remote sensors, satellites, and UAVs can gather information 24 hours per day over an entire field. These can monitor plant health, soil condition, temperature, humidity, etc. The amount of data these sensors can generate is overwhelming, and the significance of the numbers is hidden in the avalanche of that data.

#### CONCLUSION:

Though climate change has become a major obstacle in the agriculture sector from the last few decades. It basically has been affecting global average temperature increase, rainfall irregularity & uncertainty, climatic extreme events, etc. These all elements, in turn, has an adverse effect on the agriculture industry. But with the help of modern technologies, farmers could able to tackle & manage the agricultural practices such as watershed management program, biotechnology, hydroponics, use of



I J R B A T, Issue (VIII), Vol. III, Sept 2020: 203-206

A Double-Blind Peer Reviewed & Refereed Journal



e-ISSN 2347 – 517X

Original Article

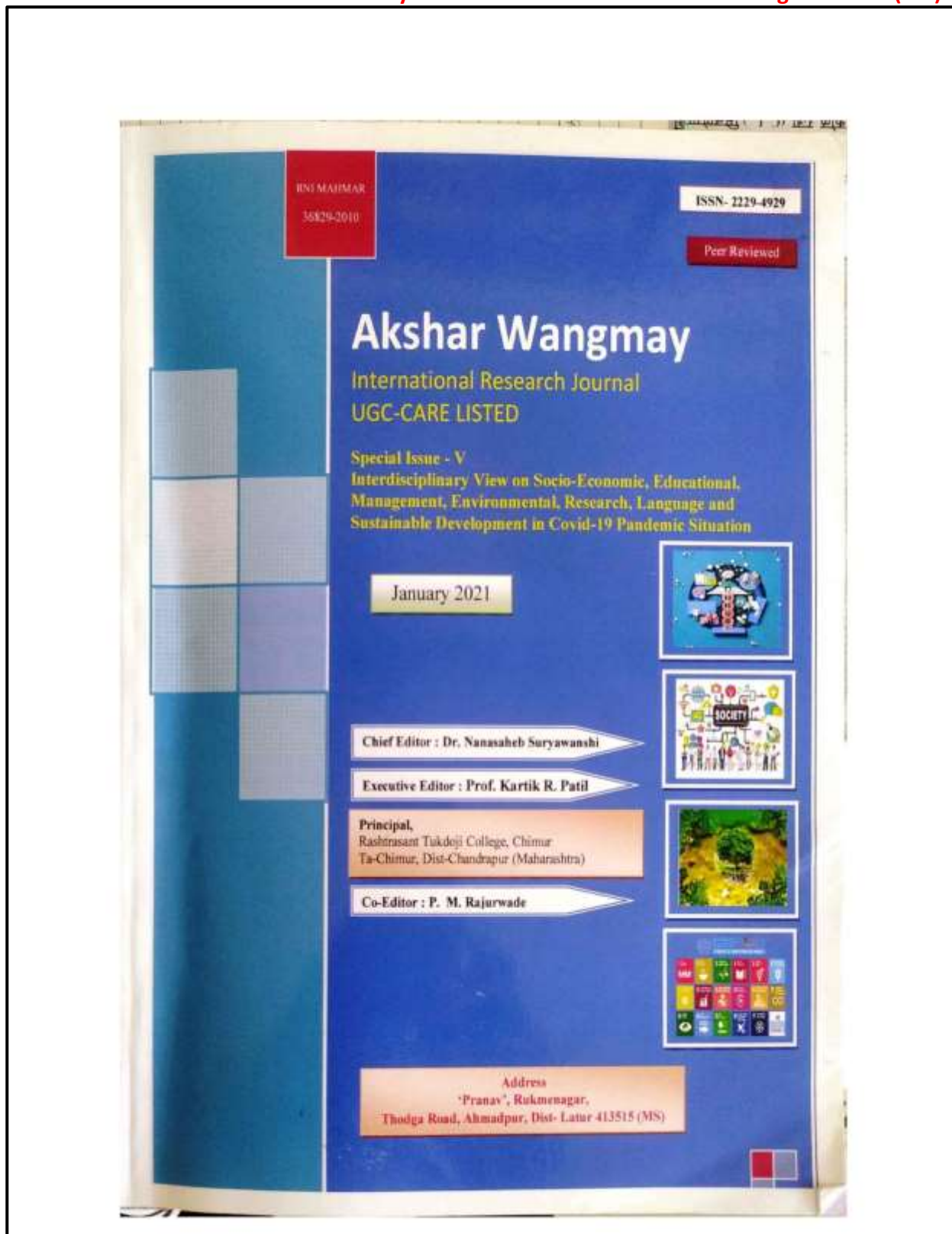
chemical fertilizers & insecticides, GIS and Remote sensing techniques enable farmers to cope with climate change. That's why the role of technology had been helpful in the sector but at the same time, it is necessary to protect & conserve natural resources.

**REFERENCES:**

- Shafi, M., 2006: Agricultural Geography, Doring Kindersley India Pvt. Ltd., New Delhi
- Singh, J., and Dhillon, S.S., 1984: Agricultural Geography, Tata McGraw Hill, New Delhi.
- Hussain, M. (1978): Agricultural Geography, Rawat Publication, Jaipur
- [https://en.wikipedia.org/wiki/Climate\\_change\\_and\\_agriculture](https://en.wikipedia.org/wiki/Climate_change_and_agriculture)

- <https://allianceforscience.cornell.edu/blog/2018/04/agricultural-technology-can-help-curtail-climate-change/>
- <http://www.fao.org/3/CA3204EN/ca3204en.pdf>
- [https://www.researchgate.net/publication/228445877\\_Agricultural\\_technologies\\_for\\_climate\\_change\\_in\\_developing\\_countries\\_Policy\\_options\\_for\\_innovation\\_and\\_technology\\_diffusion](https://www.researchgate.net/publication/228445877_Agricultural_technologies_for_climate_change_in_developing_countries_Policy_options_for_innovation_and_technology_diffusion)
- <https://www.sciencedirect.com/science/article/pii/S037837741400211X>

21. Environmental Analysis of Climatic Elements of Ahmednagar District (MS)



"Akshar Wangmay" UOC Care Listed, International Research Journal, ISSN: 2229-4829, January 2021  
Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

# AKSHAR WANGMAY

International Peer Reviewed Journal  
UGC CARE LISTED JOURNAL

January 2021

Special Issue Volume-V

On

*"Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"*

Chief Editor

**Dr. Nanasheh Suryawanshi**

Pratik Prakashan, Pranav, Kulkarninagar, Thodga Road Ahmedpur,  
Dist. Latur, -433515, Maharashtra

Executive Editor

**Prof. Kartik R. Patil**

Principal,

Rashtrasant Tukdoji College, Chimur  
Ta-Chimur, Dist-Chandrapur (Maharashtra)

Co-Editor

**P. M. Rajurwade**

Rashtrasant Tukdoji College, Chimur  
Ta-Chimur, Dist-Chandrapur (Maharashtra)

Editorial Board

Dr. Praful T. Bansod	Dr. Haresh T. Gajbbhiye	Prof. Ashutosh M. Popte	Prof. Pitambar T. Pise
Dr. Nitin T. Katrojwar	Dr. Rajeshwar D. Rahangdale	Dr. Laxman T. Kamdi	Dr. Udhay D. Mendulkar
Dr. Santosh P. Bansod	Dr. Dilip S. Telang	Prof. Kishor S. Chaurse	Dr. Manisha Warma
Dr. Rupesh M. Meshram	Dr. Sharad B. Belorkar	Dr. Subhas K. Shinde	Dr. Chetankumar Vyas

Published by- Prof. Kartik R. Patil, OE Principal, Rashtrasant Tukdoji College, Chimur, Ta-Chimur, Dist-Chandrapur (Maharashtra)

The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.

© All rights reserved with the Editors

Price :Rs.1000

**CONTENTS**

No.	Page Title	Page No.
1	Water Treatment - A Case Study of Saha Vastu of Hojai District Dr. Maheswari Bhargava, Dr. Sanku Hazra	100
2	A Geographical Study of Karmura Under Village of Nalanda District Dr. Sanyalanga Bhargava, Dr. Sanku Hazra	101
3	Water Quality Study (TDS/TD) parameters: Chhatrapati Road by Gopabandhu Dr. Pradyumna Bha, Dr. Tapaswini Karm	102
4	Impact of Covid-19 on School Education Ms. Sanyal Ananta Karm	103
5	Salmonella of Poultry Litter during Covid-19 Dr. Jayanti Sanyal	104
6	Food Hygiene & Control System with Special Reference to India Dr. Rajat P. S.	105
7	Antimicrobial The Service of Health Care Dr. Sanku Karm	106
8	Changing Land Use: A Environmental Aspect of Forest Land in Assam Dr. Pradyumna Bha	107
9	Impact of Pesticide Control in Education Ms. Manoj S. Bha	108
10	Studying the Antimicrobial Capabilities of New Varieties of Rice Dr. Jayanti Sanyal	109
11	Impact of COVID-19 on the Socio-Economic Conditions of Women in Rural Areas of Assam Dr. Pradyumna Bha	110
12	Geographical Analysis of Industrial Development in Lakhimpur District Dr. Pradyumna Bha	111
13	Effect of Resonance in Rural Areas Dr. Pradyumna Bha	112
14	Impact of Pesticide Control in Education with Reference to the Chhatrapati Road Dr. Pradyumna Bha	113
15	Impact of Covid-19 on the Socio-Economic Conditions of Women in Rural Areas of Assam Dr. Pradyumna Bha	114
16	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	115
17	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	116
18	Being 'Food for Life' and University Participation: An Approach to the Complex Issue of Dr. Anand	117
19	Microbiological Analysis of Drinking Water in Assam Dr. Pradyumna Bha	118
20	A Study on Impact of Education on Socio-Economic Conditions of Women in Rural Areas Dr. Pradyumna Bha	119
21	A Study on Impact of Education on Socio-Economic Conditions of Women in Rural Areas Dr. Pradyumna Bha	120
22	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	121
23	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	122
24	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	123
25	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	124
26	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	125
27	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	126
28	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	127
29	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	128
30	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	129
31	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	130
32	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	131
33	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	132
34	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	133
35	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	134
36	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	135
37	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	136
38	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	137
39	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	138
40	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	139
41	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	140
42	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	141
43	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	142
44	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	143
45	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	144
46	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	145
47	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	146
48	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	147
49	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	148
50	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	149
51	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	150
52	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	151
53	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	152
54	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	153
55	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	154
56	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	155
57	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	156
58	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	157
59	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	158
60	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	159
61	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	160
62	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	161
63	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	162
64	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	163
65	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	164
66	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	165
67	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	166
68	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	167
69	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	168
70	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	169
71	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	170
72	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	171
73	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	172
74	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	173
75	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	174
76	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	175
77	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	176
78	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	177
79	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	178
80	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	179
81	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	180
82	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	181
83	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	182
84	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	183
85	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	184
86	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	185
87	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	186
88	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	187
89	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	188
90	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	189
91	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	190
92	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	191
93	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	192
94	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	193
95	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	194
96	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	195
97	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	196
98	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	197
99	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	198
100	Assessment and Management of Agricultural Land Use in the North of Assam Dr. Pradyumna Bha	199

*Akhil Waghmare* 'ISIC' Core-Lit, International Research Journal, ISSN: 2279-1676, January, 2015  
 Special Issue, Volume-V "Interdisciplinary Linkage Series (Environment, Educational Management, Environmental Research, Education and Sustainable Development in Core/IT Field/Other) Journals"

**Environmental Analysis of Climatic Elements of Ahmednagar District (M.S.)**

**Dattatray S. Ghungarde<sup>1</sup>, Jyotiram C. More<sup>2</sup>**

<sup>1</sup>Assistant professor, Post Graduate Department of Geography, New Arts Commerce and Science College, Parner, Dist-Ahmednagar, Email-dsghungarde@gmail.com

<sup>2</sup>Head, Department of Geography, BJS college Wagholi, Dist-Pune, Email-jyotirammore@gmail.com

**Abstract:**

Climatic elements are vital in day to day life which affects and determine the behavior of organisms in all eco systems of the world. Present paper focus upon various climatic elements and their distribution in the study area. The main purpose of present study is to investigate and evaluate climatic elements in Ahmednagar District. The temperature of the district is dry and hot. The seasonal variation in temperature is quite high from March to May. The average relative humidity is 35.64%, minimum while 76.79% maximum in the district. The average annual rainfall from year 1981 to 2014 in the district is about 527.3 mm. The rainfall in the study region is estimated to be less than 500 mm over a 17-year out of 34 years' period from 1981 to 2014.

Key words: Climate, Eco-system, Rainfall distribution, Variability

**Introduction:**

Ahmednagar district is a drought-prone area and it is situated in the central part of Maharashtra state. Generally, the study area has hot summer and dry air except monsoon season. Intergovernmental Panel on Climate Change (IPCC). The main purpose of present study is to investigate and evaluate Climatic elements in Ahmednagar District. Many scholars like Singh (1991), Saptarshi (1993), More (2013) etc., have explained that climatic factors are very significant to determine the agricultural land use and agricultural pattern of the region

**Study Area:**

The present study deals with environmental analysis of climatic elements in Ahmednagar district. Ahmednagar is the largest district of Maharashtra State with a geographical area of 17418 sq. km. which is 5.66% of the area of Maharashtra State. It lies between 18° 2' to 19° 9' N latitude and 73° 9' to 75° 5' E longitude with covering 14 tehsils.

**Objectives:**

To Study the environmental analysis of climatic elements in Ahmednagar district.

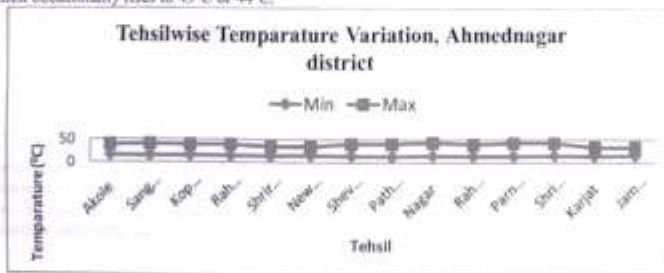
**Database and Methodology:**

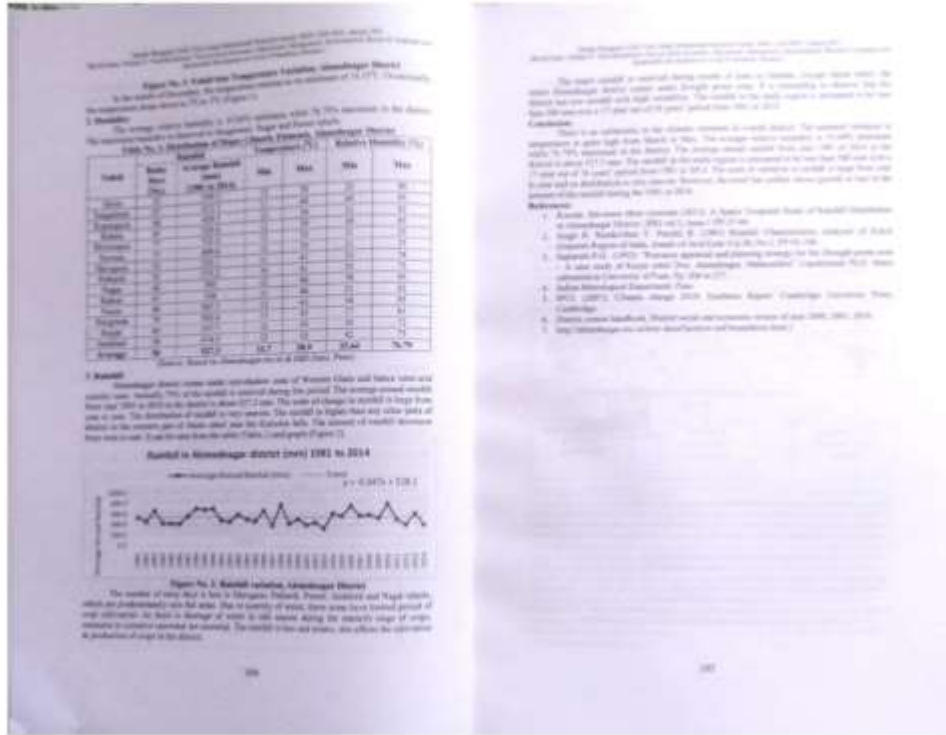
The Climate of the study area is studied on the basis of secondary information gathered from IMD (Pune), District census handbook, District social and economic review.

Tehsil wise temperature variation is presented with the help of table and graph. Average annual rainfall is calculated for the period of 1981 to 2014 with the help of Microsoft excel. Average annual variation of rainfall presented with the help surface trend analysis.

**Results and Discussion:** For the present analysis, the three elements are selected viz. temperature, humidity and rainfall of the whole district.

**1. Temperature:** The temperature of the district is dry and hot. The seasonal variation in temperature is quite high from March to May. There is continuous increase in day temperature, nights comparatively remain cool. In the month of May, the temperature remains to its maximum of 38.9°C which occasionally rises to 43°C or 44°C.





## 22. Impact Analysis of 'Jalukta Shivar' Scheme: A Case Study of Chas Village in Ahmednagar District



### IMPACTANALYSIS OF 'JALUKTA SHIVAR' SCHEME: A CASE STUDY OF CHAS VILLAGEIN AHMEDNAGAR DISTRICT

□ Dattatray Sheshrao Ghungarde\*  
Dr. Jyotiram C. More\*\*

#### ABSTRACT

*The Maharashtra government has launched a water conservation scheme named Jalukta Shivar Abhiyan to make Maharashtra a drought-free state by 2019. The key aim of Jalukta Shivar Abhiyan is to establish a belief in farmer that "every drop of rainwater is owned by me and it should percolate in my land".*

*'Jalukta Shivar Abhiyan' aims to bring water empowerment to 25,000 drought-affected villages in Maharashtra within next five years. The scheme has been going strong with villages building infrastructure in terms of public participation. The project involves deepening and widening of streams, construction of cement and earthen stop dams, work on nalla's and digging of farm ponds.<sup>[1]</sup>*

*The present research paper attempts to review the work done for water conservation through 'Jalukta Shivar Abhiyan' scheme and its impact on agricultural development in Chas village. The scheme found to have significant impact on Runoff retardation by 916.28 T.C.M. after implementation of 'Jalukta Shivar' scheme in the village. It also has significant impact of the scheme on Agricultural development of Chas village by Increasing NSA by 2.43% and also increment in ground water level by 6 meter for well and 25 meter for bore well.*

**Keywords:** *Jalukta Shivar Abhiyan, Earthen stop dams, Agricultural development*

#### ➤ Introduction:

Irregular and discontinuous rainfall during crop growth has led to continuous scarcity- conditions in Maharashtra. The last few years have seen a huge impact of these conditions on the agricultural sector. The Rainfedcrop production is showing significant fluctuations. This situation is mainly due to scarcity of water.The various measures under water conservation can definitely be planned and implemented to make water available for drinking and sustainable agriculture. To overcome this scarcity situation, the

government of Maharashtra has launched a water conservation scheme named 'Jalukta Shivar Abhiyan' (JSA) in 2015.The slogan 'Water for all-Drought free Maharashtra 2019' has been well announced by this scheme. Various comprehensive watershed development works were done under this scheme.<sup>[2]</sup>

The drought stricken village Chas was selected in the year 2015 under this scheme. The village is situated on Nagar-Pune state highway (SH-27). The present research paper attempts to review the work done under 'Jalukta Shivar Abhiyan' scheme and its impact

\*Assistant Professor, Dept. of Geography, New Arts, Commerce & Science College, Parner, Dist.: Ahmednagar

\*\*Head, Dept. of Geography, BJS College, Wagholi, Pune

on agricultural development in this village.

➤ **Objectives:**

The main objectives of present research paper are;

1. To review of works done under '*Jalukta Shivar Abhiyan*' scheme in the Chas village.
2. To assess the impact of water conservation on General Landuse and Groundwater levels.

➤ **Database and Methodology:**

To fulfil the above objectives, data has been collected from various primary and secondary sources. The primary data is collected through field survey. The secondary data is obtained from various sources viz, Agricultural department of Ahmednagar tehsil, Village *Krushisahayak* and Talathi office etc.

On the basis of the statistical data extracted from the sources referred of Chas village, the comparative study has been carried out before and after implementation of the scheme. The collected data has been processed, tabulated and prepared graphs for the purpose of analysis.

➤ **Study area:**

Chas village is located in Nagar tehsil of Ahmednagar district, Maharashtra. The village is situated on Nagar-Pune state highway (SH-27) and 12 km away from Ahmednagar district headquarters. The Geographical location of the village is  $19^{\circ} 1' 59''$  N latitude and  $74^{\circ} 38' 54''$  E longitudes. The village has average elevation of 546 m from mean sea level. It lies on the bank of Mendka river which is tributary of Sina river. The total geographical area of the village is 2257.44 hect which is 1.42% of tehsil land. The village receives an average annual rainfall of 533 mm. The minimum and maximum temperature ranges between  $14^{\circ}\text{C}$  to  $44^{\circ}\text{C}$ .

The village has population of 4610 persons of which 2391 are males while 2219 are females as per Population Census 2011. The Sex Ratio of village is 928 'F/1000 M', which

is lower than Maharashtra state average of 929 'F/1000 M'.<sup>[3]</sup>



Figure No. 1: Location map of study area

➤ **Result and Discussion:**

1. **Water Conservation works carried out under JSA Scheme:**

The drought prone village Chas was selected in the year 2015 under the '*Jalukta*



Shivar' scheme. The table (Table No. 1) represents the completed water conservation works before as well as after implementation of this scheme in the village. It also shows the retarded runoff by respective water conservation work in thousand cubic meter (T.C.M.).

**Table No. 1: Water Conservation works and respective retarded runoff before and implementation of JSA Scheme**

Sr. No.	Type of Work	Before JSA Scheme		After JSA Scheme		Increment in Retardation of Runoff (T.C.M)
		Number	Retarded Runoff (T.C.M)	Number	Retarded Runoff (T.C.M)	
1	Continuous Contour Trenches	83	12.90	83	12.90	N.C
2	Earthen Nala Bund	60	10	62	150	+100
3	Cement Nala Bund	6	24	11	129	+105
4	Compartment Bunding	95	28.50	81992	519.88	+491.38
5	Farm-ponds	18	2.70	23	12.70	+10
6	Mud removal work	0	0	2	2.80	+2.80
7	Recharging of wells	0	0	2	1.60	+1.60
8	Repairing of K T weirs	0	0	1	40.5	+40.5
9	Repairing of village lake	5	325	5	450	+125
<b>Total</b>		<b>267</b>	<b>403.1</b>	<b>82181</b>	<b>1319.38</b>	<b>+916.28</b>

(Source: Compiled by researcher based on Secondary data)

From the table (Table No. 1), it is observed that total eight types of work were carried out during the course of 'Jalukta Shivar' Scheme in the village. The Mud removal work, recharging of wells and repairing of K T weirs are newly introduced works under this scheme.

Two types of Nala bunds were constructed in Chas village depending upon the type of material used for the construction work, viz, Earthen Nala Bund and Cement Nala Bund. Before JSA scheme, the Earthen bunds were 60 in number, which then increased to 62 while Cement bunds were 6, which then increased to 11 in number after JSA scheme. The retarded runoff by these bunds is increased by 205T.C.M.

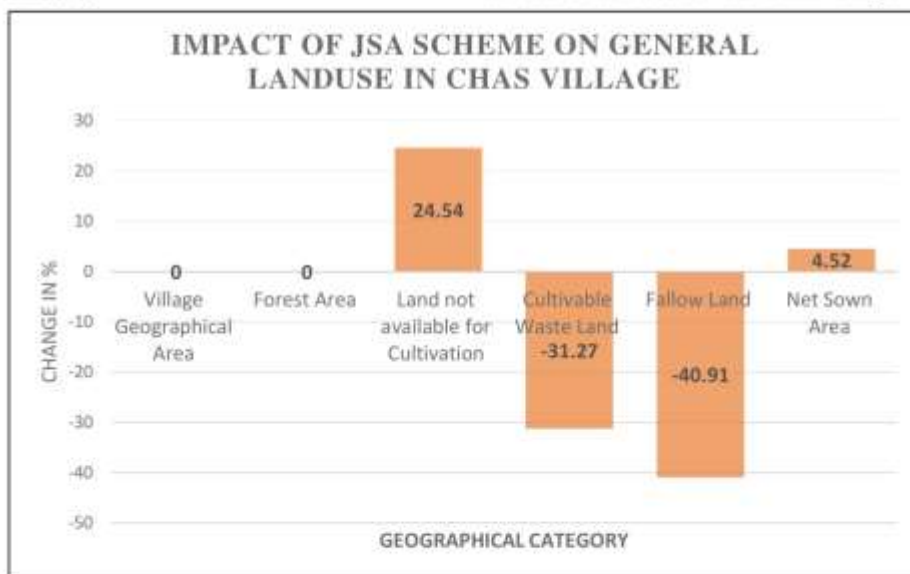
The Compartment bunding is a major work carried out under this scheme. They are 81,992 in number after implementation of JSA scheme, while before JSA there were only 95 in number. The highest amount of water (519.88 T.C.M.) is retarded by this structure in Chas village. The Farm-ponds under this scheme are the water harvesting structures constructed on the lower side of the farm to collect runoff water. The constructed farm ponds are increased from 18 to 23 after implementation of JSA scheme, while the retarded runoff is increased by 10 T.C.M. As discussed earlier, the Mud removal work, recharging of wells and repairing of K T weirs are the three newly introduced works under this scheme with retarded runoff of 2.80, 1.60 and 40.5 T.C.M. respectively.

The five village lakes are repaired under JSA scheme which contributed in runoff increment of 125 T.C.M. in the village. As a result, it is recorded that there is increment in Runoff retardation by 916.28 T.C.M. after implementation of 'Jalukta Shivar' scheme in the village.

**2. Impact of JSA Scheme on General Landuse:**

Agriculture is the main occupation of the people of Chas village. The table (Table No. 2) and figure (Figure No. 2) shows the detailed land use pattern of the Ahmednagar district before as well as after implementation of JSA scheme.

The total geographical area of the Chas village is 2557.44 hect. It is recorded that, there is absence of forest cover in Chas village.



**Figure No. 2: Impact of JSA Scheme on General Landuse in Chas village**

**I. Land not available for cultivation:**

The land not available for cultivation is may be described as non-cultivable land. It includes two types of land namely barren and uncultivable land i.e. land of rock, small sand mountains, etc. Area under non-agricultural uses i.e. land under settlement, roads, streams, etc. It reveals that area under this type of land before JSA scheme was 125.6 hect out of the total geographical area. While after implementation of JSA scheme, it is recorded as 152.65 hect. It is increased by 21.54% per cent. This indicates expansion of settlement, transport etc., due to increasing population and infrastructure facilities.

**II. Cultivable Waste Land:**

Cultivable waste land includes (i) permanent pasture and grazing land (ii) miscellaneous, trees, crops and groves not included in the net sown area. This category of land accounted 18.1 hect. in the village before and 12.44 hect after JSA scheme. During the period of JSA scheme, it has decreased by 31.27%. It shows the impact of JSA, which shows that Cultivable waste land comes under cultivation.

**III. Fallow Land:**

Fallow lands are divided into two sub types, 1.Current fallow land - means the land fallow during the current years.2. Other fallow

land means the land kept uncultivated one year to five years due to some problems.

Before implementation of JSA scheme, the fallow land in Chas village was 287.34 hect. and it is decreased up 169.79 hect. Throughout the study period, the fallow land has decreased by 40.91%. This means increasing in water availability decreasing drought condition resulted in increased NSA.

#### IV. Net Sown Area:

The net area sown is the actual area under crops counting areas sown more than once in the same years only once. Earlier, the net sown area was 2126.4 hect. of the total geographical area. After implementation of JSA scheme, it was recorded as 2222.56 hect. It is

increased by 4.52 %, which is a positive indicator of Agricultural development.

#### 3. Impact of JSA Scheme on Groundwater levels:

Groundwater is an important source for irrigation of agriculture as it is one of the reliable and flexible inputs of water. "Use of groundwater can boost agricultural production, improve rural incomes and strengthen farmers' ability to withstand climate shocks and water variability." (CGIAR, Research program on Water, Land and Ecosystems).

The table (Table No. 2) represents the Groundwater status of Chas village before as well as after implementation of JSA scheme.

Table No. 2: Groundwater Status of Chas village

Source of Irrigation	Number	Before JSA Scheme (m)	After JSA Scheme (m)	Average Increment in Groundwater Level (m)
Open well	243	12	6	+6
Bore well	439	58	33	+25

(Source: Compiled by researcher based on Secondary data<sup>[41][51][61]</sup>)

The 'Jalukta Shivar' scheme have a positive impact on groundwater levels. The average increment in groundwater level for Open well and Bore well are 6 m and 25 m respectively.

#### > Conclusion:

The paper concludes that, Runoff retardation by 916.28 T.C.M. after implementation of 'Jalukta Shivar' scheme in the village. Result of retardation is increasing water level of well and Bore well by 6 meter and 25 meter respectively. "The 'Jalukta Shivar' scheme is found to have significant impact on Agricultural development of Chas village by increasing NSA by 2.43%. The discussion of general landuse of Chas village clearly indicates that there is decrement in

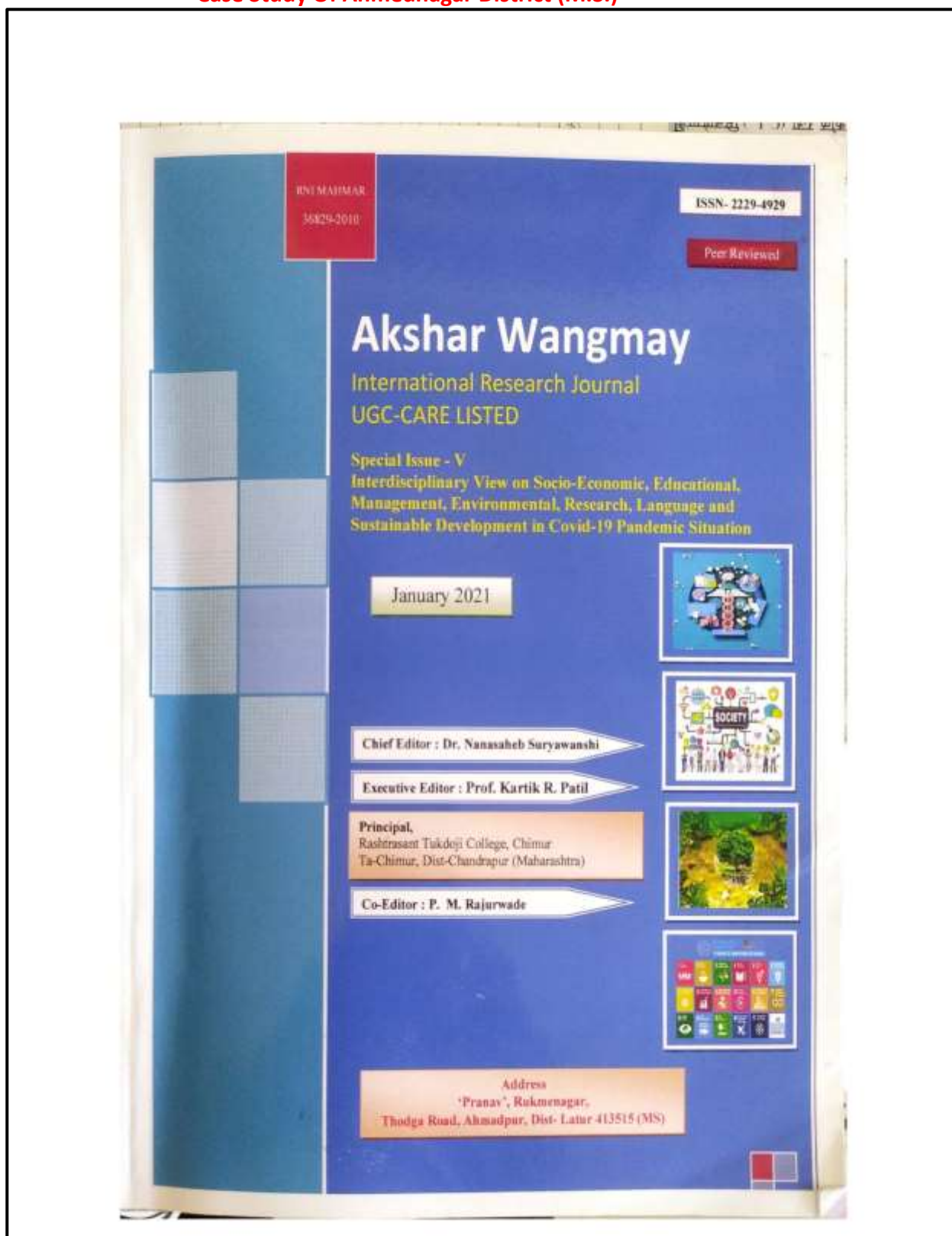
Cultivable waste land, fallow land and increment in Net sown area; which are good indicators for agricultural development.

#### > References:

1. wcd.maharashtra.gov.in
2. [https://en.wikipedia.org/wiki/Jalukta\\_Shivar\\_Abhiyan](https://en.wikipedia.org/wiki/Jalukta_Shivar_Abhiyan)
3. Government of India (2011): District Census Handbook, Ahmednagar.
4. Department of Agricultural, Ahmednagar District
5. Office of Talathi, Chas Village.
6. Krushi Sahayyak, Chas Village.



**23. Environmental Analysis of Changing Land Use And Cropping Pattern: A Case Study Of Ahmednagar District (M.S.)**



"Akshar Wangmay" UGC Care Listed, International Research Journal, ISSN: 2229-4929, January 2021  
Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

# **AKSHAR WANGMAY**

International Peer Reviewed Journal  
UGC CARE LISTED JOURNAL

January 2021

Special Issue Volume-V

On

*"Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"*

Chief Editor

**Dr. Nanasheeb Suryawanshi**

Pratik Prakashan, Pranav, Kukmesnagar, Thodga Road Ahmedpur,  
Dist. Latur, -433515, Maharashtra

Executive Editor

**Prof. Kartik R. Patil**

Principal,

Rashtrasant Tukdoji College, Chimur  
Ta-Chimur, Dist-Chandrapur (Maharashtra)

Co-Editor

**P. M. Rajurwade**

Rashtrasant Tukdoji College, Chimur  
Ta-Chimur, Dist-Chandrapur (Maharashtra)

Editorial Board

Dr. Praful T. Bansod	Dr. Hareesh T.Gajbhiye	Prof. Ashutosh M.Popte	Prof. Pitambar T. Pise
Dr. Nitin T. Katrojwar	Dr. Rajeshwar D. Rahangdale	Dr. Laxman T. Kamdi	Dr. Udhay D. Mendulkar
Dr. Santosh P. Bansod	Dr. Dilip S.Telang	Prof. Kishor S.Chaure	Dr. Manisha Warma
Dr. Rupesh M.Meshram	Dr. Sharad B. Belorkar	Dr. Subhas K. Shinde	Dr. Chetankumar Vyas

Published by: Prof. Kartik R. Patil, Off. Principal, Rashtrasant Tukdoji College, Chimur, Ta-Chimur, Dist-Chandrapur (Maharashtra)

The Editors shall not be responsible for originality and thought expressed in the papers. The author shall be solely held responsible for the originality and thoughts expressed in their papers.

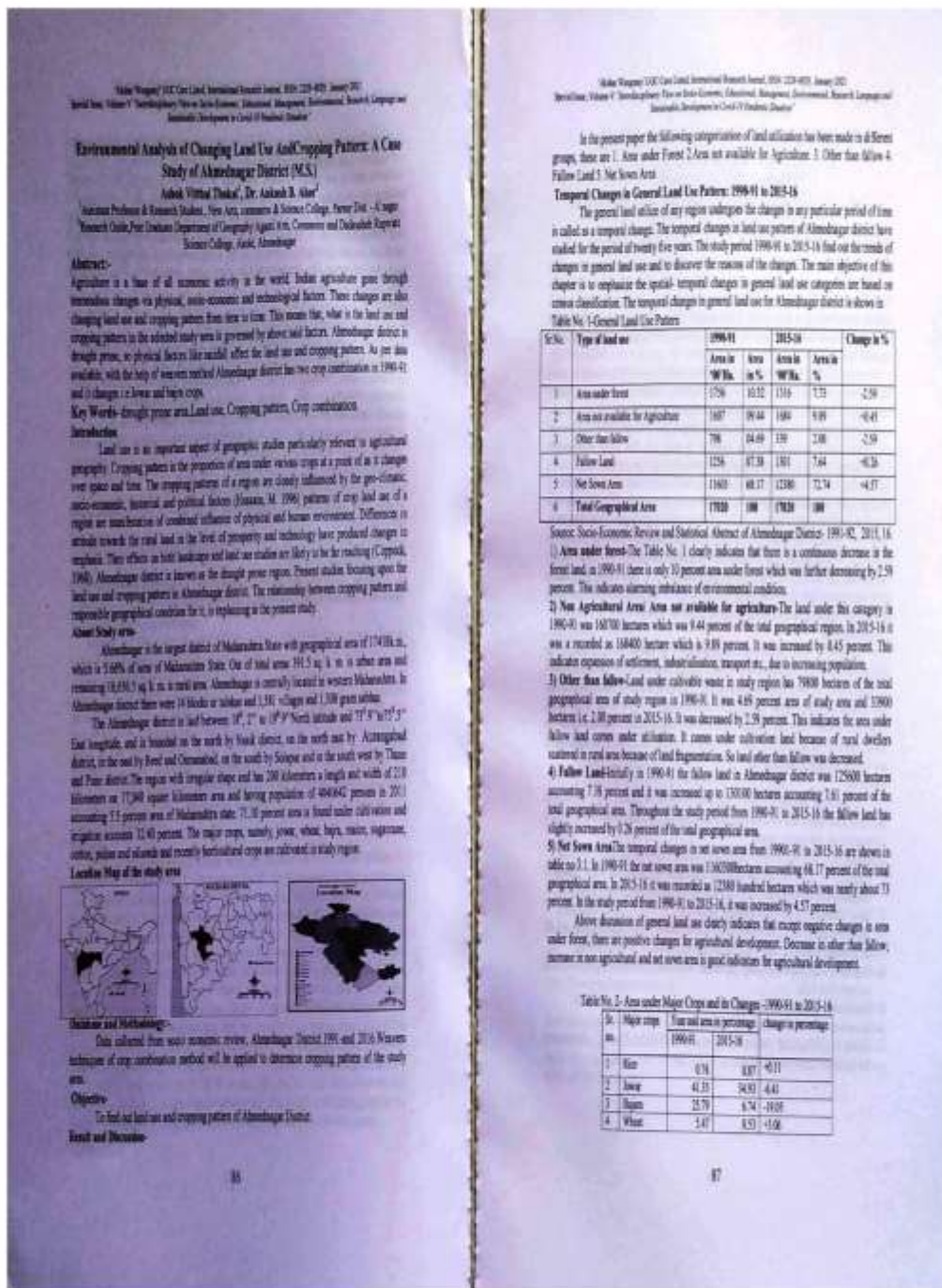
© All rights reserved with the Editors

Price :Rs.1000

"Maha Rajagya" UGC Care List, International Research Journal, ISSN: 2294-9121, January 2021  
Special Issue, Volume 5, Interdisciplinary Focus on Social Sciences, Educational, Management, Environmental, Research, Language and  
Technological Developments in Covid-19 Pandemic Situation

### CONTENTS

Sr. No.	Paper Title	Page No.
1.	Waste Treatment – A Case Study of India Veterinary of Noida District Dr. Jyotsna Harpal, Dr. Soha Harani	1-4
2.	A Geographical Study of Kalmoti Tribal Village, of Noida District Dr. Jyotsna Harpal, Dr. Soha Harani	5-9
3.	Online Learning during COVID-19 pandemic: Challenges faced by parents Dr. Pratik Raut, Dr. Gagandeep Kaur	10-12
4.	Impact of Covid-19 on Indian Economy Mr. Santosh Anand Kulkarni	13-15
5.	Relevance of Pandemic Literature during Covid-19 Dr. Jayant Chavhan	16-18
6.	Green Finance: A Conceptual Analysis with Special Reference to India Dr. Sajay P. B.	19-22
7.	Humanities: The Success of Human Selfhelp Dr. Sarika Kankia	23-27
8.	Changing Land Use: An Environmental Analysis of Parner Taluk in Ahmednagar District (M.S.) Jyotsna D. Mhaske	28-29
9.	Impact of Pandemic Covid-19 on Education Mrs. Mani S. Bhorat	29-32
10.	Standardizing the Recurrent Corpus Emergence of New Vocabulary during COVID-19 Pandemic Dr. Gajanan Pandurang Patil	33-36
11.	Impact of MGNREGS on the Socio-Economic Conditions of People in Rural Areas of Jalgaon District, West Bengal Dr. Rangita Roy Sarkar	37-39
12.	Geographical Analysis of Industrial Development in Goa Post Liberation Period Dr. Dadasaheb M. Jadhav, Dr. R. K. Haravi	40-44
13.	Ethics of Researchers in Social Sciences Prof. Dr. Ravikiran K.V.	45-46
14.	Impact of Pandemic Covid-19 on Education With Reference to The Challenges faced by Students in Online Learning Process Dr. Ravikiran Konde Vithal	47-49
15.	Impact of covid-19 on wireless transaction system in India Prof. Dr. B. S. Wankhede, Mr. Manish Dhananath Pawar	50-52
16.	Current situation of Covid-19 and its Global Impact on Food sector Dr. Prasad P. Waghmare	53-57
17.	Assessment and Management of Agricultural Land Use: A Case Study of Daptem Taluk, Malnad, Maharashtra Kavindra A. Mohar and Yashraj P. Badhe	58-59
18.	Being "Vocal for Local" and Understanding Multilingualism: An Appraisal of the Linguistic Vision in NEP 2020 Dr. Ashi Panda	60-67
19.	Mythological Aesthetics Designing through CAD: A Review Jee Gita and Saugha Srivastava	64-68
20.	A Study on Digital Marketing in the Modern Age Dr. Vijesh V. Nageshankar	69-71
21.	A Study of Impact of Online Education on Students and Parents in Maharashtra State Dr. Ajay K. Dixit, Dr. Deepak S. Narkhede	72-74
22.	A Study of Impact of Lockdown Period on Women in Maharashtra Deepak S. Narkhede, Dr. Ajay K. Dixit	75-77
23.	Promoting Physical Education at College Level for Developing Mental Health among the Students Dr. Yashvi S. S.	78-80
24.	Impact of Corona virus pandemic (Covid 19) Bhavik B. Vakh	81-82
25.	Impact of COVID-19 Pandemic on Teaching, Learning and Evaluation Prof. M. R. Bhaskar	83-85
26.	Environmental Analysis of Changing Land Use And Cropping Pattern: A Case Study of Ahmednagar District (M.S.) Ashok Vithal Thokar, Dr. Anshik B. Aher	86-88
27.	SWFC - Special Borrowing Window: Borrower's Perspective. Submitted by Rishma M. R., Dr. M. Gadhia	89-91
28.	Investment climate is favorable in Kerala for setting up small cottage industries Dr. P. Chellamoni, K.V. Lijo	93-95
29.	Tamil Bharat Mission Urban Outreach in India Mr. Dharmraj Shivaji Kadam, Mr. Vithal Sanjay Anand	96-99
30.	Socio-Economic Status of Gergon Village in Shikharshi Taluk: A Case Study Dr. M. B. Kadam, Dr. B. B. Chavris, Mr. Santosh P. Mase	100-102
31.	Environmental Analysis of Amravati District (Maharashtra) Dattatray S. Chhangarikar, Jayram C. More	103-105
32.	Changing Roles Of Education And Teacher In The Covid - 19 Pandemic Situation in Pune Gokulnagar Dr. Chandrakant Lunkar, Asst. Prof. Sujata Kulkarni	106-109
33.	Morphometric Analysis of Man River Basin in Western Maharashtra Dr. Govindrao Uttam Tolkar	110-114
34.	Unemployment Situation in India and Impact of COVID-19 Mr. Ashish Bhambhani	117-119
35.	Socio-Economic Problems of Farmers Labourers Agricultural Market: A Sociological Study- Special Reference To rural Dehshikharlapur Taluk Smt. Vijayakalshani N.	120-123
36.	Changing Patterns of Tribal: A Case Study of Solapur Taluk Chandraprakash M. Patil	126-128
37.	A Study of Socio Economic Profile of Milk Producing Farmers: Special Reference to Baramati District Prof. B. T. Laxman	130-134
38.	माहिती तंत्रज्ञानाच्या मदतीने शिक्षण कसे देणे म. शिवाजीराव शिंदे	135-138
39.	शिक्षण - 11 वे शतक ते 21 वे शतक पर्यंत श. शिवाजीराव शिंदे	139-141
40.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	142-143
41.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	144-146
42.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	147-149
43.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	150-151
44.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	152-153
45.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	154-159
46.	शिक्षण - 21 वे शतक पर्यंत म. शिवाजीराव शिंदे	160-163



Indian Journal of Land Use and Environmental Research Journal, 2019, 223-231, January 2019  
 Journal Name: Indian Journal of Land Use, Environmental, Agricultural, Environmental, Research, Geographical and Sustainable Development in Land Use Studies

**Environmental Analysis of Changing Land Use and Cropping Pattern: A Case Study of Ahmednagar District (M.S.)**

Ashok Vitthal Dinkar<sup>1</sup>, Dr. Anand B. Vite<sup>2</sup>

<sup>1</sup>Assistant Professor & Research Student, New Arts, Commerce & Science College, Parner Dist. -4, Sage Yashwantrao Chavan Pratishthan, Department of Geography, Sage Arts, Commerce and Dalalshahdeo Pratishthan, Science College, Ahera, Ahmednagar

**Abstract:-**

Agriculture is a base of all economic activity in the world. Indian agriculture gone through tremendous changes via physical, socio-economic and technological factors. These changes are also changing land use and cropping pattern from time to time. This means that, what is the land use and cropping pattern in the selected study area is governed by above said factors. Ahmednagar district is drought prone, so physical factors like rainfall, effect the land use and cropping pattern. As per data available, with the help of various methods Ahmednagar district has two crop contribution in 1990-91 and its changes in 2015-16 are and high crops.

**Key Words:-** drought prone area, Land use, Cropping pattern, Crop combination

**Introduction**

Land use is an important aspect of geographic studies particularly relevant to agricultural geography. Cropping patterns in the proportion of area under various crops at a point of or a change over space and time. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Jha, M., 1996). patterns of crop land use of a region are manifestation of combined influence of physical and human environment. Difference in attitude towards the rural land in the level of prosperity and technology have produced changes in emphasis. These effects on land landscape and land use studies are likely to be far reaching (T. S. Prasad, 1968). Ahmednagar district is known as the drought prone region. Present studies focusing upon the land use and cropping pattern in Ahmednagar district. The relationship between cropping pattern and responsible geographical condition for it, is exploring in the present study.

**About Study area**

Ahmednagar is the largest district of Maharashtra State with geographical area of 17438 sq. km, which is 5.68% of area of Maharashtra State. Out of total area 191.5 sq. km is urban area and remaining 17246.5 sq. km is rural area. Ahmednagar is centrally located in western Maharashtra. In Ahmednagar district there were 14 blocks or talukas and 1,331 villages and 1,338 gram panchayats.

The Ahmednagar district is lat between 19° 2' to 19° 59' North latitude and 73° 8' to 73° 54' East longitude, and is bounded on the north by Haveli district, on the north east by Akola district, on the east by Beed and Osmanabad, on the south by Solapur and on the south west by Thane and Pune district. The region with irregular shape and has 200 kilometers length and width of 238 kilometers at 1700 square kilometers area and having population of 490642 persons in 2011 accounting 2.5 percent area of Maharashtra state. 7.35 percent area is found under cultivation and irrigated accounts 22.40 percent. The major crops, namely, paddy, wheat, sugarcane, sugarcane, cotton, pulses and oilseeds and recently horticultural crops are cultivated in study region.

**Location Map of the study area**



**Statement and Methodology**

Data collected from various economic survey, Ahmednagar District 1991 and 2016. Various techniques of crop combination method will be applied to determine cropping pattern of the study area.

**Objective**

To find out land use and cropping pattern of Ahmednagar District.

**Result and Discussion**

Indian Journal of Land Use and Environmental Research Journal, 2019, 223-231, January 2019  
 Journal Name: Indian Journal of Land Use, Environmental, Agricultural, Environmental, Research, Geographical and Sustainable Development in Land Use Studies

In the present paper the following categorization of land utilization has been made in 4 broad groups, these are 1. Area under Forest, 2. Area not available for Agriculture, 3. Other than fallow, 4. Fallow Land, 5. Net Sown Area.

**Temporal Changes in General Land Use Pattern: 1990-91 to 2015-16**

The general land utilize of any region undergoes the changes in any particular period of time is called as a temporal change. The temporal changes in land use pattern of Ahmednagar district have studied for the period of twenty five years. The study period 1990-91 to 2015-16 find out the trends of changes in general land use and to discover the reasons of the changes. The main objective of this chapter is to emphasize the spatial-temporal changes in general land use categories are based on census classification. The temporal changes in general land use for Ahmednagar district is shown in Table No. 1-General Land Use Pattern.

S.No.	Type of land use	1990-91		2015-16		Change in %
		Area in '00 Ha.	Area in %	Area in '00 Ha.	Area in %	
1	Area under forest	1756	10.12	1316	7.53	-2.59
2	Area not available for Agriculture	1687	99.44	1861	9.91	-9.41
3	Other than fallow	798	44.49	1391	7.00	-2.59
4	Fallow Land	1256	67.38	1301	7.04	-0.34
5	Net Sown Area	1160	68.17	1238	7.74	-4.17
6	Total Geographical Area	17020	100	17020	100	

Source: Socio-Economic Review and Statistical Abstract of Ahmednagar District- 1991-92, 2011, 16.

1) **Area under forest**-The Table No. 1 clearly indicates that forest is a continuous decrease in the forest land, in 1990-91 there is only 10 percent area under forest which was further decreasing by 2.59 percent. This indicates alarming imbalance of environmental condition.

2) **Net Agricultural Area: Area not available for agriculture**-The land under this category in 1990-91 was 1687 hectares which was 9.94 percent of the total geographical area. In 2015-16 it was recorded as 1861 hectares which is 9.91 percent. It was increased by 8.45 percent. This indicates expansion of settlement, industrialization, transport etc., due to increasing population.

3) **Other than fallow**-Land under cultivable waste in study region has 7980 hectares of the total geographical area of study region in 1990-91. It was 4.69 percent area of study area and 37000 hectares i.e. 2.18 percent in 2015-16. It was decreased by 2.59 percent. This indicates the area under fallow land comes under cultivation. It comes under cultivation land because of rural dwellers scattered in rural area because of land fragmentation. So land other than fallow was decreased.

4) **Fallow Land**-Initially in 1990-91 the fallow land in Ahmednagar district was 12560 hectares accounting 7.38 percent and it was increased up to 13000 hectares accounting 7.61 percent of the total geographical area. Throughout the study period from 1990-91 to 2015-16 the fallow land has slightly increased by 0.26 percent of the total geographical area.

5) **Net Sown Area**-The temporal changes in net sown area from 1990-91 to 2015-16 are shown in table no 2.1. In 1990-91 the net sown area was 11600 hectares accounting 68.17 percent of the total geographical area. In 2015-16 it was recorded as 12380 hectares which was nearly about 73 percent. In the study period from 1990-91 to 2015-16, it was increased by 4.57 percent.

Above discussion of general land use clearly indicates that except negative changes in area under forest, there are positive changes for agricultural development. Decrease in other than fallow, increase in net agricultural and net sown area is good indicators for agricultural development.

Table No. 2- Area under Major Crops and its Changes -1990-91 to 2015-16

Sr. No.	Major crops	Area and area in percentage		Change in percentage
		1990-91	2015-16	
1	Rice	0.76	0.07	-0.71
2	Sugarcane	41.33	34.97	-6.41
3	Wheat	25.79	6.74	-19.05
4	Other	5.47	0.51	-4.96

'Akshar Wangmay' UGC Care Listed, International Research Journal, ISSN 2229-4829, January 2021  
 Special Issue, Volume-V 'Interdisciplinary Perspectives on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation'

5	Other Cereal	1.0	2.9	+1.9
6	Pulses	6.50	9.18	+2.68
7	Sugarcane	6.34	10.16	+3.82
8	Fruits & Veg	1.65	4.81	+3.16
9	Oil Seed	5.31	4.38	-0.93
10	Fiber	0.14	7.05	+6.91

Source: Socio-economic abstract, Ahmednagar district (1990-91 & 2015-16)

During the year 1990-91, Jowar occupied 39.24 percent area to total gross cropped area which was 1249841 hectares. It is major cereal crop and mainly grown in *rabhis* season in district. Bajra is the second ranking cereal crop is grown in *khari* season in throughout the district. It occupied 25.79 percent area to total gross cropped area. Wheat occupied 5.47 percent area while cotton occupied 0.14 percent area to total cropped area. Oilseeds having a share of 5.31 percent. Sugarcane is cash crop having 6.34 percent area.

During the year 2015-16 food crops namely Rice, Jowar, Bajra and Wheat occupied nearly about 43 percent area to total gross cropped area which is 1270585 hectares, while cash crops namely, cotton, oilseed and sugarcane occupied nearly about 22 percent area to total gross cropped area. Fodder crops occupied 4.81 percent area to total gross cropped area of district. Table No.2 revealed the temporal changes in major crops areal strength in the study area. This change occurs due to various factors i.e. distribution and amount of rainfall, availability of irrigation facilities, farm credit, high yielding variety of seeds and market price of agricultural commodities, chemical and domestic fertilizer, labor cost and availability etc. The temporal pattern of volume change in area under crops registered significant positive change in sugarcane (3.82 percent), other cereals (1.9 percent), fruits, vegetables, condiments and spices (3.16 percent), cotton (6.91 percent), wheat (3.06 percent) and pulses (2.68) while significant negative change recorded in jowar (6.41 percent), bajra (19.05 percent) and oilseeds (0.93 percent). This change is indicating that the farmers have changed their attitude from food crops to cash crops. The change in cropping pattern in particular span of time clearly indicates the changes that have taken place in the agricultural development

**Crop combination-**

Table No. 2 shows the crops and their percentage to the total cropped area. Applying the Weavers method of crop combination i.e.  $D = \sum d^2 / n$  Whereas D- deviation,  $\sum d^2$ -sum total of actual and theoretical distribution of crops, n-number of crops. After the calculation result shows that four crop combination, if we consider more than 5% area under crops. In 1990-91 viz Jowar, Bajra, Pulses and sugarcane is the crop combination. In 2015-16 it shows that five crop combination viz Jowar, sugarcane, pulses, wheat and bajra. This change in cropping pattern due to the technological advancement in irrigation and technology.

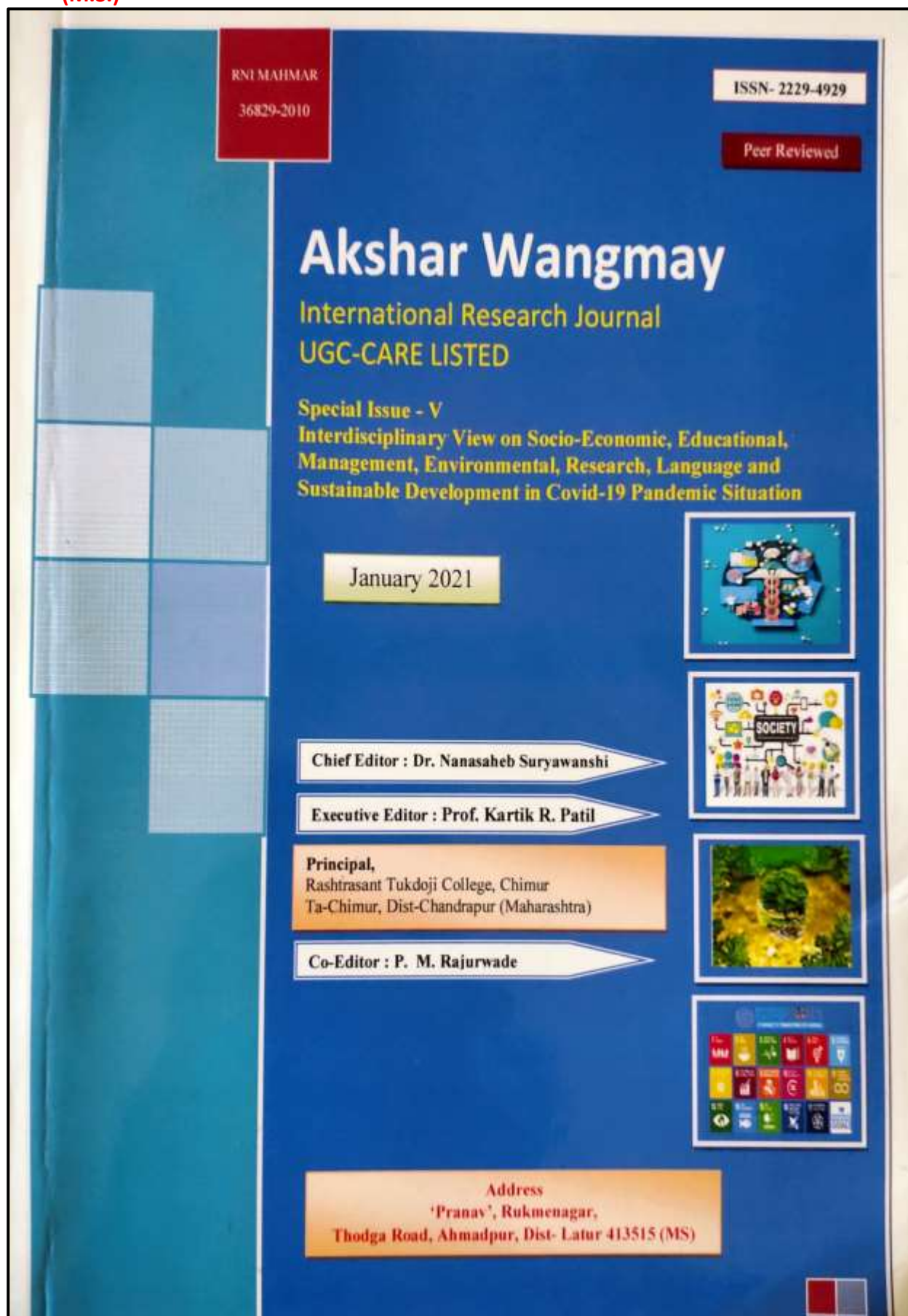
**Conclusion -**

It is universal truth that is climate is playing key role in the determining crop combination of any region of the world. But the technological advancement daily life and in agricultural practices changing land use and cropping pattern.

**References-**

1. Coppock J. T., "Crop livestock and enterprise combination in England and Wales. "Economic Geography 40, 1964 pp. 65-81.
2. Majid Husain(2002) Agriculture Geography, pp 229-231
3. Majid Husain(1992) crop combination regions in Uttar Pradesh. A study of methodology, vol, 44, no. 2, pp. 143
4. Sing Jashir and Dhillon S.S.(1984): Agriculture Geography, Tata Mc. Graw-Hill publishing company, New Delhi.
5. Socio-Economic Abstract of Ahmednagar district (1991)
6. Socio-Economic Abstract of Ahmednagar district (2016)
7. Weaver J. C. (1974). "Crop Combination Regions in the Middle West". The Geographical Review 44, (1954) pp. 175 and 175-200.



**24. Changing Land Use: A Environmental Analysis of Parner Tahsil in Ahmednagar District (M.S.)**

'Akshar Wangmay' UGC Care Listed, International Research Journal, ISSN: 2229-4929, January 2021  
Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

**CONTENTS**

Sr. No.	Paper Title	Page No.
1.	Wine Tourism – A Case Study of Sula Vineyard of Nashik District <b>Dr. Dattatraya Harpale, Dr. Smita Harane</b>	1-4
2	A Geographical Study of Kalmuste Tribal Village, of Nashik District <b>Dr. Dattatraya Harpale, Dr. Smita Harane</b>	5-9
3	Online learning during COVID-19 pandemic: Challenges faced by parents <b>Dr. Franky Rani, Dr. Gagandeep Kaur</b>	10-12
4	Impact of Covid-19 on Indian Economy <b>Mr. Santosh Ananda Keskar</b>	13-15
5	Relevance of Pandemic Literature during Covid-19 <b>Dr. Inayat Chaudhary</b>	16-18
6	Green Finance: A Conceptual Analysis with Special Reference to India <b>Dr. Sajoy P. B.</b>	19-22
7	Humanities: The Saviour of Human Sufferings <b>Dr. Sarika Kanjlia</b>	23-25
8	Changing Land Use: A Environmental Analysis of Parner Tehsil in Ahmednagar District (M.S.) <b>Jyotsna D. Mhaske</b>	26-28
9	Impact of Pandemic Covid-19 on Education <b>Mrs. Minal S. Bhojar</b>	29-32
10	Socializing the Restricted Corpus: Emergence of New Vocabulary during COVID-19 Pandemic <b>Dr. Gajanan Pandurang Patil</b>	33-36
11	Impact of MGNREGA on the Socio-Economic Conditions of People in Rural Areas of Jalpaiguri District, West Bengal <b>Dr. Ranjita Roy Sarkar</b>	37-39
12	Geographical Analysis of Industrial Development In Goa-Post Liberation Period. <b>Dr. Dadapir M. Jakati, Dr. B. K. Haravi</b>	40-44
13	Ethics of Researches in Social Sciences <b>Prof. Dr. Baviskar K.V.</b>	45-46
14	Impact of Pandemic Covid-19 on Education With Reference to The Challenges Faced By Students in Online Learning Process <b>Dr. Baviskar KundaVitthal</b>	47-49
15	Impact of covid-19 on cashless transaction system in India <b>Prof. Dr. B. S. Wankhede, Ms. Manisha Dnyanoba Pawar</b>	50-52
16	Current situation of Covid-19 and its Global Impact on Food sector <b>Dr. Pramod P. Waghmare</b>	53-55
17	Assessment and Management of Agricultural Land Use, A Case Study of Baglan Tahsil Nashik, Maharashtra. <b>Ravindra S. Medhe and Yogesh P. Badhe</b>	56-59
18	Being "Vocal for Local" and Underscoring Multilingualism: An Appraisal of the Linguistic Vision in NEP 2020 <b>Dr. Asit Panda</b>	60-63
19	Mythological Abstract Designing through CAD: A Review <b>Itee Ojha and Sangita Srivastava</b>	64-68
20	A Study on Digital Marketing in the Modern Age <b>Dr. Vivek V. Nagbhidkar</b>	69-71
21	A Study of Impact of Online Education on Students and Parents in Maharashtra State <b>Dr. Ajay K. Dixit, Dr. Deepak S. Narkhede</b>	72-74
22	A Study of Impact of Lockdown Period on Women in Maharashtra <b>Deepak S. Narkhede, Dr. Ajay K. Dixit</b>	75-77
23	Promoting Physical Education at College Level for Developing Mental Health among the Students <b>Dr. Toravi S. S.</b>	78-80

'Akshar Wangmay' UGC Care Listed, International Research Journal, ISSN: 2229-4929, January 2021  
Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

## Changing Land Use: A Environmental Analysis of Parner Tehsil in Ahmednagar District (M.S.)

Jyotsna D, Mhaske.

Assistant Professor, Postgraduate Department of Geographym New Arts, commerce & Science  
College, Parner Dist. – Ahmednagar 414302  
Email: \*jyotsnamhasket@gmail.com

### Abstract:-

Land is fundamental aspect for human survival, because it provides food and with a number of raw materials which are used in the completion of man's requirements. But necessary as the land factor may be, man plays an important role in condition and transforming his physical environment. Man uses within several frameworks i.e. physical, social and economic, which often operate together. The utility differs depending upon the soil, topography and climate. This means that, what is the land use in the selected study area is governed by above said factors. Parner tehsil is drought prone, so physical and socio-economic factors like topography, climate, cultural factors affect the land use pattern.

**Key Words-** Land use, Drought Prone.

### Introduction

Land use is an important aspect of geographic studies particularly relevant to agricultural geography. Cropping pattern is the proportion of area under various crops at a point of as it changes over space and time. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Hussain, M. 1996) patterns of crop land use of a region are manifestation of combined influence of physical and human environment. Differences in attitude towards the rural land in the level of prosperity and technology have produced changes in emphasis. Their effects on both landscape and land use studies are likely to be far reaching (Coppock, 1968). Parner tehsil is known as the draught prone region. Present studies focusing upon the land use pattern of Parner tehsil in Ahmednagar district. The relationship between land use pattern and responsible geographical condition for it, is explaining in the present study.

### About Study area-

Ahmednagar district is largest district of Maharashtra state in area and town Parner is located at coordinates of 18° 49' 40" North to 19° 21' 34" North Latitude and 74° 10' 22" East to 74° 38' 34" East Longitude. It is located on the height of 790 Meters. It is the plateau region of Maharashtra. Total part of the Parner is shown in the Toposheets 47J/5 as Parner is situated in Ahmednagar district. Parner is located between 19°00'00"N, 74°26'00"E

Parner Tehsil is bordered by the Pune District from the East, Sangamner and Rahuri from the North, Shirur Tehsil from the West, and Shrigonda from the south

The Ahmednagar district is laid between 18° 2' to 19° 9' North latitude and 73° 9' to 75° 5' East longitude, and is bounded on the north by Nasik district, on the north east by Aurangabad district, in the east by Beed and Osmanabad, on the south by Solapur and in the south west by Thane and Pune district. The region with irregular shape and has 200 kilometers a length and width of 210 kilometers on 17,048 square kilometers area and having population of 4040642 persons in 2011 accounting 5.5 percent area of Maharashtra state. 71.10 percent area is found under cultivation and irrigation accounts 32.40 percent. The major crops, namely, jowar, wheat, bajra, maize, sugarcane, cotton, pulses and oilseeds and recently horticultural crops are cultivated in study region.

Location Map of the study area



'Akshar Wangmay' UGC Care Listed, International Research Journal, ISSN: 2229-4929, January 2021  
 Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

**Database and Methodology:-**

Data collected from socio economic review, Ahmednagar District.1961and 2016.Data tabulated and finding changes in land use pattern of the study area.

**Objective-**

To find out land use pattern of Parner tehsil in Ahmednagar District.

**Result and Discussion-**

In the present paper the following categorization of land utilization has been made in different groups, these are 1. Area under Forest 2.Area not available for Agriculture. 3. Other than fallow 4. Fallow Land 5. Net Sown Area

**Temporal Changes in General Land Use Pattern: 1961-62 to 2015-16**

The general land utilize of any region undergoes the changes in any particular period of time is called as a temporal change. The temporal changes in land use pattern of Parner tehsil has studied for the period of fifty five years. The study period 1961-62 to 2015-16 find out the trends of changes in general land use and to discover the reasons of the changes. The main objective of this chapter is to emphasize the spatial- temporal changes in general land use categories are based on census classification. The temporal changes in general land use for Ahmednagar district is shows in Table No. 1.

Table No. 1-General Land Use Pattern

Sr.No.	Type of land use	1961-62		2015-16		Change in %
		Area in Ha.	Area in %	Area in Ha.	Area in %	
1	Area under forest	25279	13.53	18792	10.06	-3.47
2	Area not available for Agriculture	23037	12.33	29739	15.92	+3.59
3	Other than fallow	2325	01.25	710	0.38	-0.87
4	Fallow Land	2991	01.60	1106	0.006	-1.59
5	Net Sown Area	133162	71.29	136447	73.05	+1.76
6	<b>Total Geographical Area</b>	<b>186794</b>	<b>100</b>	<b>186794</b>	<b>100</b>	

Source: Socio-Economic Review and Statistical Abstract of Ahmednagar District- 1961-61and 2015, 16.

**1) Area under forest-**

The Table No. 1 clearly indicates that there is a continuous decrease in the forest land. in 1960-61 there is only 13.53 percent area under forest which was further decreasing by -3.47 percent in 2015-16. This indicates alarming imbalance of environmental condition.

**2) Non Agricultural Area/ Area not available for agriculture-**

The land under this category in 1960-61 was 23037 hectares which was 12.33 percent of the total geographical region. In 2015-16 it was a recorded as 29739 hectare which is 15.92 percent. It was increased by +3.59 percent. This indicates expansion of settlement, industrialisation, transport etc., due to increasing population.

**3) Other than fallow-**

Land under cultivable waste in study region has 2325 hectares of the total geographical area of study region in 1960-61 It was 01.25 percent area of study area and 710 hectares i.e. 0.38 percent in 2015-16. It was decreased by 0.87 percent. This indicates the area under fallow land comes under utilisation. It comes under cultivation land because of rural dwellers scattered in rural area because of land fragmentation. So land other than fallow was decreased.

**4) Fallow Land-**

Initially in 1960-61 the fallow land in Ahmednagar district was 2991 hectares accounting 01.60 percent and it was decreased up to1106 hectares accounting 0.006 percent of the total geographical area. Throughout the study period from 1960-61 to 2015-16 the fallow land has slightly decreased by 1.59 percent of the total geographical area.

**5) Net Sown Area-**

The temporal changes in net sown area from 19901-91 to 2015-16 are shown in table no.1. In 1960-61 the net sown area was 133162 hectares accounting 71.29 percent of the total geographical area. In 2015-16 it was recorded as 136447 hectares which was nearly about 73.05 percent. In the study period from 1990-91 to 2015-16, it was increased by 1.76 percent.

'Akshar Wangmay' UGC Care Listed, International Research Journal, ISSN: 2229-4929, January 2021  
Special Issue, Volume-V "Interdisciplinary View on Socio-Economic, Educational, Management, Environmental, Research, Language and Sustainable Development in Covid-19 Pandemic Situation"

Above discussion of general land use clearly indicates that except negative changes in area under forest, there are positive changes for economic development. Decrease in other than fallow; increase in non agricultural and net sown area is good indicators for economic development. But it is alarming to imbalance of environment.

**Conclusion:**

Above discussion of general land use clearly indicates that except negative changes in area under forest, there are positive changes for economic development. Decrease in other than fallow; increase in non-agricultural and net sown area is good indicators for economic development. But it is alarming to imbalance of environment.

**References-**

1. Coppock J. T., "Crop livestock and enterprise combination in England and Wales. "Economic Geography 40, 1964 pp. 65-81.
2. Majid Husain(2002) Agriculture Geography, pp 229-231
3. Socio-Economic Abstract of Ahmednagar district (1991)
4. Socio-Economic Abstract of Ahmednagar district (2016)

## 25. Corona A Biological Disaster: A Geographical Analysis



### CORONA A BIOLOGICAL DISASTER: A GEOGRAPHICAL ANALYSIS

Prof. Jyotsna Dattatraya Mhaske\*

#### ABSTRACT

After the outbreak of Covid-19 from China to the rest of the world, its onset was felt in India in the last week of February. After this, its effect was started to felt after March 14. Outbreaks appear to be exacerbated during this time. Outbreaks appear to be exacerbated during this time. Infections of bacteria, viruses, micro-organisms, animals cause this catastrophe on human beings.

The number of deaths due to the disease spread from the city of Wuhan in China is increasing day by day. However, the virus was suddenly referred to as COVID-19 from the 2019 novel coronavirus because the World Health Organization (WHO) named the virus. The WHO declared corona as disease. The virus that causes this disease is called COVID-19.

As of February 14, 2021, the total number of corona-infected patients in the world was 10,94,22,906 and the death toll was 24,30,363. There are 1,09,04,940 corona-infected patients in India and 1,55,642 people have died due to the disease in India. It is still on the rise. India is home to 17% of the world's population but the mortality rate will be 10% of the world's. The highest prevalence of corona in India was in Maharashtra, Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Delhi and Uttar Pradesh, while Delhi witnessed three waves of corona infection.

**Keywords:** Novel coronavirus, COVID-19, microbes, biological disaster etc.

#### • Introduction:

Human beings need to be diligent in protecting themselves from the calamities caused by various environmental disasters, reducing environmental disasters and not endangering the lives of other living beings including human beings. Humans themselves are an important component of a social and natural environment. But humans have continued the race for development using many of the resources in the environment. While developing itself, human beings are unknowingly harming the environment as well as human beings.

The incidence of man-made disasters seems to be increasing along with natural disasters. Humans are seen using biological

weapons in this age of competition. It includes biological disasters. The events / disasters are botanical and zoological as well. Climate change as well as human intervention have been observed as major reasons to increase biological disasters.

When a disease infects many people at the same time, such diseases are called epidemics. Outbreaks appear to be exacerbated during this time. They are spread by bacterial, viral, microbial, animal infections as well as by natural disasters such as droughts, overcrowding. Some pathogens are caused by human intervention and grow in the environment. In the case of such diseases, it is not a natural disaster but human intervention eg. AIDS, Cold, Chickenpox, Plague, Sore Throat, Eyesight, Swine Flu are all diseases.

Covid-19 is also a biological disaster which means that it can be transmitted from one person to many people.

- **Objectives:**

- 1) To study that corona is a biological disaster.
- 2) To explain the cause of the spread of corona in India.
- 3) To study the damage caused by corona.

- **Database and Methodology:**

- 1) The secondary data intended for the study is obtained from ArogyaSetu application, Times of India and MOHFW (India) and John Hopkins. This information is from March 2020 to February 14, 2021.
- 2) The information is tabulated for analysis and conclusions and create a computer based line graphs.

- **Study Area:**

The study area selected for this dissertation is India and it includes the highest Himalayan ranges from the coast considering the natural structure of India. India is located in Asia. India is a nation in the Northern Hemisphere with a Latitudinal range of  $8^{\circ}4'28''\text{N}$  to  $37^{\circ}17'53''\text{N}$  and a Longitudinal range of  $68^{\circ}7'33''\text{E}$  to  $97^{\circ}24'47''\text{E}$ . India is bounded on the east by the Bay of Bengal, on

the west by the Arabian Sea, and on the south by the Indian Ocean. India covers an area of 32,87,263 Sq. Km. The country ranks seventh in the world in terms of area.

- **Results and Discussion:**

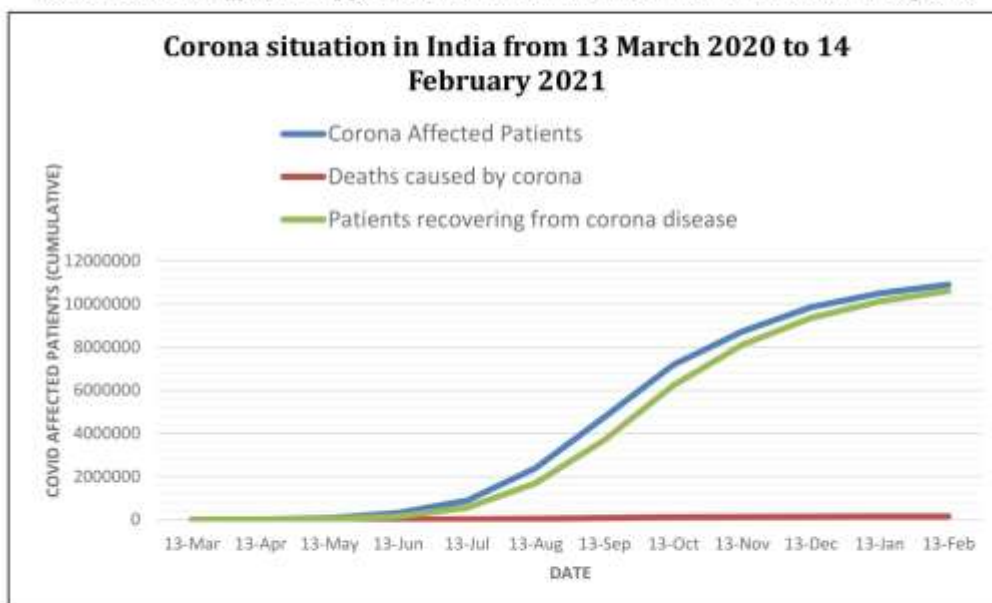
- 1) Extremely serious warning to the world that the process of "complete biological destruction" has begun given from a research paper in an international level journal. Scientists have found that there have been five "biological catastrophes" on Earth. When a disease infects many people at the same time, such diseases are called epidemics. Outbreaks appear to be exacerbated during this time. Bacterial, viral, microbial, animal infections as well as natural disasters such as droughts, excess rainfall. Some pathogens are caused by human intervention and grow in the environment. In the case of such diseases it is not a natural disaster but human intervention is predominant e.g. AIDS, colds, chickenpox, plague, sore throat, conjunctivitis, swine flu are all diseases. Covid-19 also infects many people from one person to another, which means it is also a biological disaster. From 13 March 2020 to 14 February 2021, Corona continued to grow as follows.

**Table No. 1: Corona situation in India from 13 March 2020 to 14 February 2021**

Sr. No.	Month	Corona Affected Patients	Deaths caused by corona	Patients recovering from corona disease
1	March 13	82	2	10
2	April 13	9,352	324	980
3	May 13	74,281	2,415	24,386
4	June 13	3,08,993	8,884	1,54,330
5	July 13	8,78,254	23,174	5,53,471
6	August 13	23,96,637	47,033	16,95,982
7	September 13	47,54,356	78,586	37,02,595
8	October 13	71,75,880	1,09,856	62,27,295

9	November 13	87,28,795	1,28,668	81,15,580
10	December 13	98,57,029	1,43,019	93,57,464
11	January 13	1,04,95,147	151529	10129111
12	February 14	1,09,04,940	1,55,642	1,06,11,731

(References: ArogyaSetu App, Times of India and MOHFW (India) and John Hopkins)



(Figure No. 1: Corona situation in India from 13 March 2020 to 14 February 2021)

The table (Table No. 1) and figure (Fig. No. 1) shows the number of corona infected patients in India from 13 March 2020 to 14 February 2021. It clearly shows that only 82 corona cases were reported in India on the 13th or 14th of March month. The mortality rate and the number of recovered patients are shown. The mortality rate in India is less than the death rate in the world.

As of February 14, 2021, the total number of corona-infected patients in the world was 10,94,22,906 and the death toll was 2430,363. There are 1,09,04,940 corona-infected patients in India and 1,55,642 people have died due to the disease in India. It is still on the rise. The rapid transmission from one person to another led to the formation of a

chain and the number of patients in India increased rapidly.

**3) The Corona disease spread because of following reasons:**

The effect of the corona appears to be increasing for a variety of reasons. In India, it was customary to meet each other by joining hands. But in imitation of Westerners, it has become common practice to shake hands and meet each other. The opening of religious places, bus stands, crowds at railway stations, agitations of politicians, elections, wedding ceremonies, various offices spread rapidly. The lockdown began to stop the corona spread. But the bags for vegetables, milk bags, groceries also started to transition. According to various experts, the effects of corona virus can last up to 4 hours on copper, 4 hours on glass, 8 hours



on rubber, 16 hours on polythene, 24 hours on cardboard, 72 hours on plastic, 72 hours on stainless steel and 3 hours in air.

Since this is a biological disaster, a corona-infected patient is more likely to infect others than the area around which he or she touches and touches objects. In addition, the spread of corona in India has increased due to fears about corona, lack of hygiene and growing fear of the mind. With the opening of schools in many states, people are not willing to stay at home without being forced to do so, with mass migration from one state to another. Due to many such reasons, corona spread rapidly in India.

#### 4) Damage caused by corona:

Due to Corona, Government imposed lockdown in the country which resulted in good changes in the environment for some time, but the closure of schools, the closure of industries, the closure of tourism has hit the economy hard. Many people lost their jobs, new jobs were not created, farm labor was not available in time, large scale migration in the state led to shortage of agricultural and construction labor, livelihood of tribal people was disrupted, primary occupation fishing, agro mining and forestry came to a standstill. The rural economy in India as a whole collapsed completely. Poor students deprived of education, online education started, parents started buying new mobiles, money for mobile recharges, inflation soared, students were confused because there were no competitive exams throughout the year. In the upper class without exams, college students got confused due to online exams.

According to a UNESCO report, in April 2020, 154 million students in 188 countries stayed at home. As many as 1.5 million schools are closed in India, leaving 26 crore students and 89 lakh teachers at home,

while 50,000 higher education institutions are closed. And 3.07 crore students, 1.5 million teachers are at home. It is a time bomb for 30 crore students to sit at home empty handed.

#### • Conclusion:

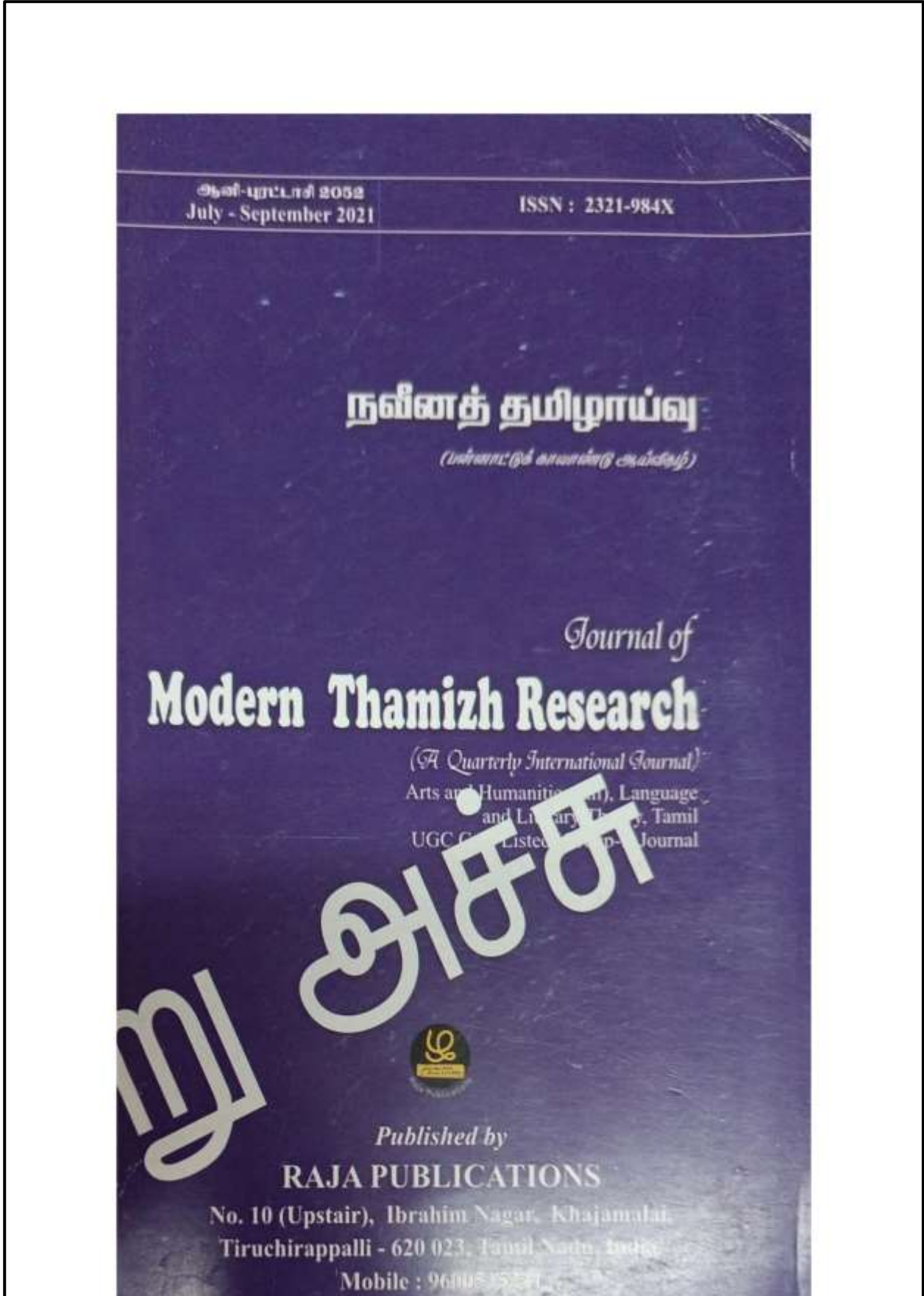
The Corona is a biological disaster and has taught the world a great deal. The number of patients in India today is on the rise. As of February 14, 2021, there were a total of 10,94,22,906 corona-infected patients in the world and the death toll was 24,30,363. There are 1,09,04,940 corona-infected patients in India and 1,55,642 people have died due to the disease in India. It is still on the rise. In India, Maharashtra, Kerala, Karnataka, Andhra Pradesh, Tamil Nadu and Delhi have the highest number of corona patients throughout the year. More research is needed on this biological disaster. There is more need to increase health facilities than religious facilities. Awareness, hygiene is important, use of masks, social distance is needed, it is important to take care as the disaster is contagious and there is not enough reliable medicine availability. Maximum vaccination is required. Public cooperation is important to stop the spread of biological disasters.

#### • References:

1. Current Events and Geography - Pvt. A. H. Chaudhary, Pvt. P. N. Salve, Atharva Publications. Page No- 76, 90-97.
2. ArogyaSetu Application
3. Johns Hopkins University and CORONAVIRUS RESOURCE CENTER.
4. News papers: Lokmat, Sakal, Times of India and MOHFW (India) and John Hopkins.



## 26. A study of Information need of computer science Student in New Arts College, Parner



Author(s)	Topic	Page No.
<b>Volume 9 No. 3</b> <b>July - September 2021</b> <b>ISSN : 2321 - 984X</b>		
101	Dr. S. Srinivas & Dr. S. Srinivas	711-716
102	Dr. S. Srinivas & Dr. S. Srinivas	717-721
103	Dr. S. Srinivas & Dr. S. Srinivas	722-726
104	Dr. S. Srinivas & Dr. S. Srinivas	727-732
105	Dr. S. Srinivas & Dr. S. Srinivas	733-737
106	Dr. S. Srinivas & Dr. S. Srinivas	738-742
107	Dr. S. Srinivas & Dr. S. Srinivas	743-747
108	Dr. S. Srinivas & Dr. S. Srinivas	748-752
109	Dr. S. Srinivas & Dr. S. Srinivas	753-757
110	Dr. S. Srinivas & Dr. S. Srinivas	758-762
111	Dr. S. Srinivas & Dr. S. Srinivas	763-767
112	Dr. S. Srinivas & Dr. S. Srinivas	768-772
113	Dr. S. Srinivas & Dr. S. Srinivas	773-777
114	Dr. S. Srinivas & Dr. S. Srinivas	778-782
115	Dr. S. Srinivas & Dr. S. Srinivas	783-787
116	Dr. S. Srinivas & Dr. S. Srinivas	788-792
117	Dr. S. Srinivas & Dr. S. Srinivas	793-797
118	Dr. S. Srinivas & Dr. S. Srinivas	798-802
119	Dr. S. Srinivas & Dr. S. Srinivas	803-807
120	Dr. S. Srinivas & Dr. S. Srinivas	808-812
121	Dr. S. Srinivas & Dr. S. Srinivas	813-817
122	Dr. S. Srinivas & Dr. S. Srinivas	818-822
123	Dr. S. Srinivas & Dr. S. Srinivas	823-827
124	Dr. S. Srinivas & Dr. S. Srinivas	828-832
125	Dr. S. Srinivas & Dr. S. Srinivas	833-837
126	Dr. S. Srinivas & Dr. S. Srinivas	838-842
127	Dr. S. Srinivas & Dr. S. Srinivas	843-847
128	Dr. S. Srinivas & Dr. S. Srinivas	848-852
129	Dr. S. Srinivas & Dr. S. Srinivas	853-857
130	Dr. S. Srinivas & Dr. S. Srinivas	858-862
131	Dr. S. Srinivas & Dr. S. Srinivas	863-867
132	Dr. S. Srinivas & Dr. S. Srinivas	868-872
133	Dr. S. Srinivas & Dr. S. Srinivas	873-877
134	Dr. S. Srinivas & Dr. S. Srinivas	878-882
135	Dr. S. Srinivas & Dr. S. Srinivas	883-887
136	Dr. S. Srinivas & Dr. S. Srinivas	888-892
137	Dr. S. Srinivas & Dr. S. Srinivas	893-897
138	Dr. S. Srinivas & Dr. S. Srinivas	898-902
139	Dr. S. Srinivas & Dr. S. Srinivas	903-907
140	Dr. S. Srinivas & Dr. S. Srinivas	908-912
141	Dr. S. Srinivas & Dr. S. Srinivas	913-917
142	Dr. S. Srinivas & Dr. S. Srinivas	918-922
143	Dr. S. Srinivas & Dr. S. Srinivas	923-927
144	Dr. S. Srinivas & Dr. S. Srinivas	928-932
145	Dr. S. Srinivas & Dr. S. Srinivas	933-937
146	Dr. S. Srinivas & Dr. S. Srinivas	938-942
147	Dr. S. Srinivas & Dr. S. Srinivas	943-947
148	Dr. S. Srinivas & Dr. S. Srinivas	948-952
149	Dr. S. Srinivas & Dr. S. Srinivas	953-957
150	Dr. S. Srinivas & Dr. S. Srinivas	958-962

Published by: Raja Publications, No. 15, Uppar, Ibrahim Nagar, Kraganala, Trichirappalli - 620 021, Tamil Nadu, India. Mobile: 9855555551  
 Print: The Printing House, Trichirappalli - 620 021, Tamil Nadu, India. Ph: 461-431-8471/72

**A STUDY OF INFORMATION NEEDS OF COMPUTER SCIENCE STUDENTS IN NEW ARTS COMMERCE AND SCIENCE COLLEGE, PARNER, DIST- AHMEDNAGAR (M.S)**

**Dr. BHUSAHEB B.SHELKE**

Librarian, New Arts Commerce and Science College, Parner, Dist-Ahmednagar.(M.S) 414 302. (Affiliated to Savitribai Phule Pune University, Pune), India.

**Abstract**

Everyone is requires Information for his study or business. Information generated by individual or group of people or institution is very important. *This information is required by many.* In business sector information is own value. The users of the information need change as and when their priorities and interest is changed. Information needs analysis technique is used to identify all the information necessary for in achieving specified goals or objectives such as performing an activity, satisfying user needs or making strategic decisions. The information needs is an unstructured statement that describes a type of information required by an organizational unit to enable it to meet its objectives and support its functions.

The user is an important component in any information system. User is the important link in the information communication system. The information system exists to satisfy the information needs of users. There are different categories of users, depending on the extent of use of the information system for satisfying their information need. For creating information awareness and to promote the use of information, it is necessary to know the needs of users.

The development of Information Technology has made grate changes in all industries. Library is no more an exemption of this. The Technological advancement in the use and

delivery of information media has changed the role of library professions. The library is no more a only stack holders of books, now they become owner of electronics information. The print media is getting digitalized and through the advent of internet, the information is available to anybody from any corner of world. The use of e-journals, e-books has created a new source of information to the users. Their feature attracts the users to seek information from these media. The open access publishing has enhanced the availably of information by breaking down the financial barriers. It is this technology which has made greater impact of libraries.

**Keywords :- Information, Information need, Use of Resources.**

**Introduction:**

Computer Science Students is a subject in which daily information is required by many people and it has been used to day to day life. A Computer Science Students deals with various commercial issues. They can earn money with the help of information. Now a day's economy is increasingly depending upon the information. But following questions come in to mind-

- How students use information located in various resources?
- Are they able to use all the resources of information ranging from manuscripts to digital?

தமிழ் தர்ப்புறம் (கலை அழகு அறிவுரை, சாதி அறிவுரை அறிவுரை) தர்ப்புறம் தர்ப்புறம் 9, சாதி அறிவுரை - சாதி அறிவுரை 2021 ISSN 2201-5664  
 Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.9, No.3, July - September 2021 ISSN 2201-5664

Dr. BHANUSAIHER V. SHIEKKE 882

> How do they keep track with current information at global level.

**Information:-**

Information is defined in the Random House Dictionary-

- i) The data or knowledge which is communicated or received concerning a particular fact or circumstances in order to reduce the users' uncertainty by meeting their needs.
- ii) Information is that which reduces the uncertainty.
- iii) It is a symbol or string of symbols which have potential for meaning.

**Information need:-**

Information need is often understood in information science as evolving from a vague awareness of something missing and as culminating in locating information that contributes to understanding and meaning.

**Objective:-**

- To study the information needs of Computer Science Students in New Arts Commerce and Science College, Parner
- To study the problems faced by students while seeking and using the Information.
- To study how the college Libraries helps students to satisfy their Information needs.
- To review internet use for searching the information of the Computer Science Students.
- To study analytically the information needs, sources and services.

**Review of Literature:-**

- A brief description on information needs, status of work on national and international level and literature survey is presented in this Chapter.

- The broad aspects and need of present work are briefly mentioned at the end of this chapter.

- The literature review is made through various books, articles, national and international journals, reputed daily newspapers.

- The literature review mainly focuses on variety of case studies as well as thoughts of esteemed researches on the issues of information needs.

- The literature review also focuses the limitations, problem and Information needs of Commerce students associated with future.

**Research Methodology:-**

- Sampling method is use for this study. For data collection questionnaire is design.

**Collection of Data:-**

- The information is collected through well-structured questionnaire. In this include following contain-

1. General Information
2. Study of the Information needs of the Computer Science students
3. Study of the problem faced by Computer Science Students
4. Satisfaction of the students by seeking their information needs from the library
5. Internet facilities

**Analysis and Interpretation of Data:-**

For data collection analyses 15 questions intended to judge the information needs of Computer Science Students in New Arts Commerce and Sciences College Parner. For data collection use Questionaire method. The Total 100 questionnaire distributed to the students in the 1<sup>st</sup> week of october 2019, out of 94 students were responses. Out of them 39 (41%) Boys and 45 (59%) Girls respondents. The % of responses shown in figure 1.

தமிழ் நவீனக் கல்வி ஆய்வுகள் (தமிழ் அறிவியல், மொழி, இலக்கியம் மற்றும் மனிதநேயம்) இதழ் 3, சூன்-செப்டம்பர் 2021 (ISSN 2321-984X)  
Journal of Modern Tamil Research (A Quarterly International Arts and Humanities, Language) Vol.3, July - September 2021 (ISSN 2321-984X)

Figure 5:

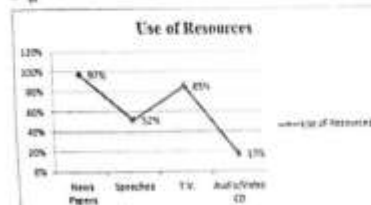


Figure 6: Awareness of N-List Program:

College Library take membership of IFLIBNET (Information Library Network) for the N-List facilities is provide to students. 74% students are use N-List facility, show in following table and graph.

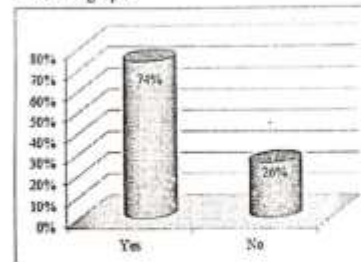


Table 4: Availability of Information: Following table show that duration for searching their reading material from library

More than 10 minutes	Within 10 minutes
38.30%	61.70%

Figure 7:

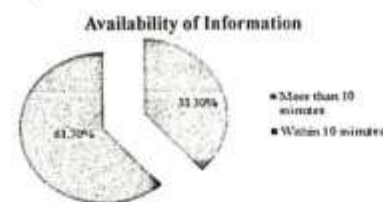


Figure 8: Use of Internet: College provide to student Wi-Fi and internet facility, 92% students use these facilities. This information show in graph

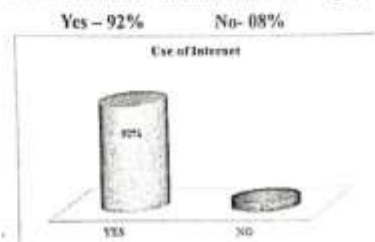


Table 5: Problem faced by Students:

Computer science student's face following problem, In this electricity problem is created in rural area

Sr. No.	Problem faced	Yes
01.	Internet connectivity not working	30.6%
02.	Website not working	14.3%
03.	Confusion of searching information	28.1%
04.	No electricity available	39.3%

Figure 9: Resources of fulfilment of Information Needs:

59 % computer science students are fulfilling their information needs from Internet. They search their study material i.e. reference books etc.

From Library	Purchase Own Book	From Internet
19 (20%)	20 (21%)	55 (59%)

Resources of fulfillment of Information Needs



**27. Synthesis of MnS<sub>2</sub> Thin Films by Chemical Route: Physicochemical properties**

International e-Conference on Recent Trends in Nano-Materials and Its Applications-2021  
In Association with International Journal of Scientific Research in Science and Technology  
Volume 9 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijrst.com)

### Synthesis of MnS<sub>2</sub> Thin Films by Chemical Route: Physicochemical Properties

R. B. Kharade<sup>1</sup>, S. K. Jare<sup>2,6</sup>, D. K. Sonavane<sup>2</sup>, C. K. Kalawade<sup>3</sup>, S. L. Kadam<sup>1</sup>, R. N. Bulakhe<sup>4</sup>, A. B. Bhalerao<sup>5</sup>, R. V. Kathare<sup>6\*</sup>

<sup>1</sup>P.G. Department of Physics and Research Centre New Arts Commerce and Science College, Parner, Ahmednagar, Maharashtra, India

<sup>2</sup>P.G. Department of Electronic Science, New Arts, Commerce and Science College, Ahmednagar, Maharashtra India

<sup>3</sup>Dr. Vithalrao Vikhe Patil College of Engineering, Post MIDC, Vadgaon Gupta (Vilad Ghat), Ahmednagar, Maharashtra, India

<sup>4</sup>Department of Polymer Science & Engineering, Korea National University of Transportation, Chungju, Republic of Korea

<sup>5</sup>Department of Applied Science, K. K. Wagh Institute of Engineering Education and Research, Amrutdham, Panchavati, Nashik, Maharashtra, India

<sup>6</sup>Karmaveer Mamasheeb Jagdale Mahavidyalaya, Washi, Osmanabad, Maharashtra, India

#### ABSTRACT

In present work, manganese sulfide (MnS<sub>2</sub>) thin films have been deposited by chemical route at room temperature on commercial glass substrate. Employed chemical method is inexpensive, simple and does not require any sophisticated instrument for deposition. The chemical bath is prepared from the mixture as solutions of manganese acetate tetrahydrate [C<sub>4</sub>H<sub>6</sub>MnO<sub>4</sub>H<sub>2</sub>O] as a manganese source, thiourea [(H<sub>2</sub>N)<sub>2</sub>CS] as a sulfur source and ammonia solution used as a complexing agent, respectively. The structural and morphological analysis has been investigated using X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM).

**Keywords:** DMS, chemical route, X-ray diffraction, Scanning, Electron Microscopy (SEM).

#### I. INTRODUCTION

Various kinds of binary and ternary chalcogenides materials are in focus of extensive research [1]. Chalcogenides materials have applications in optoelectronic devices, solar cells, photoconductors and infrared detector devices, etc. respectively. The

various chalcogenides such as ZnS, Cu<sub>2</sub>S, MnS<sub>2</sub>, MoS<sub>2</sub>, WS<sub>2</sub> are commonly used. Among all the manganese sulfide (MnS<sub>2</sub>) is especially used in mixing with Zn and Cd to form (Zn, Mn)S and (Cd, Mn)S composites used in various applications. Manganese sulphide thin films with main advantages like wide direct band gap, cheap processing. As far as we know, there are

Copyright: © the author(s), publisher and licensee Technoscience Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited

83

various methods of synthesis for manganese sulphide thin films like successive ionic layer adsorptions and reaction (SILAR), chemical bath deposition (CBD) and RF-sputtering etc. [2]. Chemical route is most feasible technique for film synthesis, since it is easy, simple and most-cost effective method of deposition [4]. In chemical route, manganese ions and a sulfur-containing organic compound (thiourea) are processed in alkaline water medium. Ammonia is used as complexing agent in deposition as it reduces spontaneous precipitation by slowly releasing of metallic ions, which avoids precipitation. In this work, MnS<sub>2</sub> thin film structures are reported by easy and simple chemical route at room temperature. Its structural and morphological studies are revealed by X-ray diffraction and Scanning electron microscopy, respectively.

## II. EXPERIMENTAL DETAILS

### Materials:

All The chemicals used are analytical grade. Manganese acetate tetrahydrate [C<sub>4</sub>H<sub>6</sub>MnO<sub>4</sub>·4H<sub>2</sub>O] used as a manganese source, thiourea [(H<sub>2</sub>N)<sub>2</sub>CS] used as a sulfur source and Ammonia solution was used as complexing agents and D.I. used as solvent. The pH of the solution was maintained by using ammonia solution.

### Instruments:

For structural studies Philips PW1710 Diffractometer for the 2θ ranging from 200 to 800 with Cu-K<sub>α</sub> (λ = 1.5418 Å) radiation. The Scanning Electron Microscopy (SEM) analysis is used for surface morphology study.

### Glass substrate cleaning:

Commercial glass slides of dimensions 25 mm x 30 mm x 1.2 mm are used for the deposition. For better homogeneity and quality of films, cleaned slides are essential. The slides cleansed with help of detergent, after they are boiled in concentrated chromic acid

(0.5 M) for 1 hour. The substrates washed with distilled water. Slides are immersed in distilled water before deposition.

### Preparation of the MnS<sub>2</sub> thin films:

A total reactive solution prepared in a 100 ml beaker containing equimolar solutions of manganous acetate tetrahydrate (0.3M) as Mn source (50ml) and thiourea (0.3M) as a S sources (50ml). Solution is stirred well so that homogeneous solution was formed. The pH of the solution mixture was set with the help of ammonia to near about 10.6 with help of pH meter. The substrates were kept in the solution vertically at room temperature without stirring with the help of specially designed substrate holder for 24 hours. Dark brown deposited glass slides are removed gently. Finally substrates were washed in distilled water gently and dried in warm air.

## III. RESULTS AND DISCUSSION

For Structural identification X-Ray Diffraction (XRD) was carried out within the range of angle 2θ between 10° to 80°. The MnS<sub>2</sub> thin films XRD pattern of deposited at room temperature for 24 hours deposition time is shown in Fig.1. The cubic crystal structure with five principal peaks corresponding to (2 0 0), (2 1 0), (2 1 1), (2 2 1) and (4 1 1) orientations. This XRD data is in good agreement with standard JCPDS card no.00-010-0616 and JCPDS card no. 00-010-0476 conforms cubical hauerite phase of MnS<sub>2</sub>. Lattice constant (c) for cubical phase was determined from the relation in eq.1 [3].

$$\frac{1}{d^2_{hkl}} = \frac{4}{3} \left( \frac{h^2 + hk + k^2}{a^2} \right) + \frac{l^2}{c^2} \quad (1)$$

From the position of the peak (2 0 0), determined lattice parameters a=b=c=6.09 Å, 17.4 nm is the average crystalline size of MnS<sub>2</sub> in the films. It was determined from line (2 0 0) by using Scherrer's formula,

$$D = \frac{0.9\lambda}{\beta \cos \theta} \quad (2)$$



where,  $\beta$  is the FWHM,  $\lambda$  is the X-ray wavelength and  $\theta$  is the Bragg's angle.

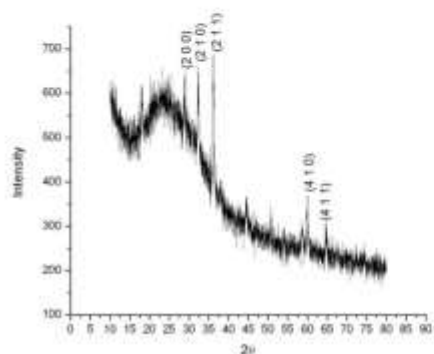


Fig.1. XRD pattern of MnS<sub>2</sub> thin films deposited on glass substrate.

2θ( degree )	FWHM in nm	h k l	d-spacing in (Å)
28.88	0.47	2 0 0	3.05
32.41	0.39	2 1 0	2.73
36.13	0.27	2 1 1	2.50
44.50	0.47	2 2 1	2.04
64.74	0.57	4 1 1	1.44

Using Scanning Electron Microscopy surface morphology was determined. Fig. 2 shows the SEM micrograph of MnS<sub>2</sub> films prepared on glass substrate for 24 h at room temperature by using simple chemical route. The film well covered and smooth all over glass substrate.

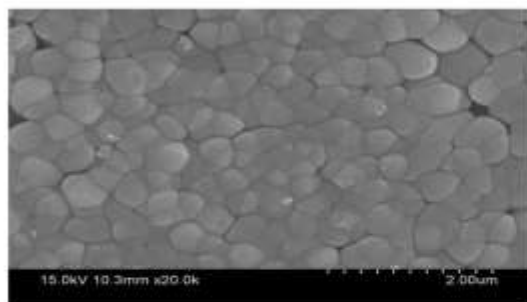


Fig.2. SEM images of MnS<sub>2</sub> thin films.

The films are firm and densely adhere to the surface. The grains are smaller with unequal in size and shapes. The particles are well adhering with unequal distribution the fine grain background.

#### IV. CONCLUSION

MnS<sub>2</sub> thin films have been deposited successfully on a glass substrate at room temperature by simple and cost effective chemical route method. From the XRD analysis, it was confirm that the film possesses a cubical structure of MnS<sub>2</sub> of hauerite. The determined lattice parameters a=b=c=6.09Å were in a good match with the reported hauerite structured data. The SEM study showed smooth and well covered thin film on entire glass substrate.

#### V. REFERENCES

- [1]. A. Kassim, T. W. Tee, H. S. Min, A. H. Abdullah, A.H. Jusoh, S. Nagalingam, Natural Science, 44 (2010) 446-453.
- [2]. C. Gumus, C. Ulutas, Y. Ufuktepe, Optical Materials, 29 (2007) 1183-1187.
- [3]. Cullity, Elements of X-ray Diffraction, Addison-Sesley Publishing Company Inc. USA.(1978) P-575.
- [4]. P. R. Deshmukh, N. M. Shinde, S. V. Patil, R. N. Bulakhe, C. D. Lokhande, Chemical Engineering Journal, 223 (2013) 572-577.
- [5]. D. B. Fan, H. Wang, Y. C. Zhang, J. Cheng, B. Wang, H. Yan, Mater Chem. Phys. 80 (2003) 44-47.
- [6]. C. D. Lokhade, A. Ennaouti, P. S. Patil, M. Giersig, M. Muller, K. Diesner, H. Tributsch, Thin Solid Film. 330(2) (1998) 70-75.
- [7]. A. B. Lundin, G. A. Kitaev, Inorg. Mater. (1965) 2107.
- [8]. R. Tepparo, P. D. Arco, A. Lichanot, Chem. Phys. Lett. 273(1-2) (1997) 83-90.
- [9]. H. M. Pathan, S. S. Kale, C. D. Lokhande, S. H. Han, O. S. Jou, Mater. Res. Bull. 42(2007) 1565.

- [10]. N. Khaorapapong, A. Ontam, J. Khemprasit, M. Ogawa, *Appl. Clay Sci.* 43 (2009) 238.
- [11]. S. A. M. Hernandez, S. J. Sandoval, R. C. Perez, G. T. Delgado, B. S. Chao, O. J. Sandoval, *J. Cryst. Growth*, 256 (2003)12.
- [12]. M. Demper, L. Chen, C. Bradford, K.A. Prior, W. Heimbrodt, *Solid State Communication*, 150 (2010)1092.
- [13]. P. Zhao, Q. Zeng, X. He, H. Tang, K. Huang, *J. Cryst. Growth*. 310 (2008) 4268.
- [14]. J. Lu, P.F.Qj, Y.Y. Peng, Z. Y. Meng, Z.P. Yang, W. C. Yu, Y.T. Qian, *Chem. Mater.* 13 (2001) 2169.
- [15]. C. D. Lokhande, *Mater. Chem. Phys.* 27(1991)1.
- [16]. R. N. Bhattacharyya, *J. Electrochem. Soc.* 129 (1982) 332.
- [17]. I. Kaur, D. K. Pandya, K. L. Chopra, *J. Electrochem Soc.* 127 (1980)143.
- [18]. D. K. Sonavane, S. K. Jare, R. V. Kathare, R. N. Bulakhe, J.-J. Shim, *Materials Today: Proceedings* 5 (2018) 7743–7747.

## 28. Challenges for India: Sustainable Development Goals,

**சிறப்பு இதழ்**  
**Special Issue**

*Chief Editor*  
Dr. M. Sadik Butcha

*Advisory Editor*  
Dr. N. Chandra Segaran

*Editorial Board*  
Dr. MAM. Rameez  
Dr. Jeyaraman  
Dr. A. Ekambaram  
Dr. G. Stephen  
Dr. S. Chitra  
Dr. S.Senthamizh Pavaai  
Dr. A. Shunmughom Pillai  
Dr. P. Jeyakrishnan  
Dr. Seetha Lakshmi  
Dr. S. Easwaran  
Dr. Kumara Selva  
Dr. Ganesan Ambedkar  
Dr. Krishnan  
Dr. Kumar  
Dr. S. Kalpana  
Dr. T. Vishnukumar  
Dr. M. N. Rajesh  
Dr. Govindaraj  
Dr. Uma Devi  
Dr. Senthil Prakash  
Dr. Pon. Kathiresan  
Dr. S. Vignesh Ananth  
Dr. M. Arunachalam  
Dr. S. Bharathi Prakash

20-22 ஆகஸ்ட் 2021  
3<sup>rd</sup> to 5<sup>th</sup> June 2021

ISSN : 2321 - 984X

**நவீனத் தமிழாய்வு**  
(உலகளாவிய/நவீன/அனைத்து அம்சங்கள்)

*Journal of*  
**Modern Thamizh Research**  
(A Quarterly International Multidisciplinary Thamizh Journal)  
Arts and Humanities (all), Language  
Literature and Literary Theory, Tamil  
UGC Care Listed (Group-I) Journal

Multi-Disciplinary International Webinar -2021  
P.G. & RESEARCH DEPARTMENT OF HISTORY  
C. ABDUL HAKEEM COLLEGE (Autonomous)  
Special Issue :  
(Affiliated to Thanjavur University Seerkadu, 612015, Wilks.,  
Melvisharam, Ranipet District, Tamilnadu.)

**THE IMPACT OF LIBERALIZATION, PRIVATIZATION AND GLOBALIZATION (ICLPG-2021)**

*Special Issue Editors*

<p><b>Mr. J. BENET RAJADURAI</b> Assistant Professor</p> <p><b>Prof. S.C. ANDREW MICHAEL</b> Assistant Professor</p>	<p><b>Dr. P. KUMARAN</b> Assistant Professor</p> <p><b>Dr. K. M. A. MOHAMED OMER FAROOQUE</b> Assistant Professor</p>
--	---

**Dr. NISHA JOLLY NELSON**  
Head & Assistant Professor



*Published by*  
**RAJA PUBLICATIONS**  
10, (Upstair), Ibrahim Nagar, Khajamalai,  
Tiruchirappalli - 620 023, Thamizh Nadu, India.  
Mobile : +91-9600535241  
website : rajapublications.com

21 பகுதி-4  
Part -4

#முப்பத்தியேழு Special Issue	20-22 ஜூன் 2022 3 <sup>rd</sup> to 5 <sup>th</sup> June 2021	ISSN : 2321 - 984X
126. SWAPNAKASH R K.M.A MOHAMED OMER FAROOQUE	INTERNATIONAL SOCIAL CONCERNS AND MARKET PRESSURE FOR SUSTAINABILITY IN THE TWENTY-FIRST GENERATION	911-921
127. K. UDAYA SANKAR	PROBLEMS OF DOMESTIC WOMEN WORKERS IN TAMIL NADU	922-934
128. ANNA PURVA KUMBAR	VALMIGI AMBEDKAR AWAS YOJANA: WAY TO DEVELOP SOCIO-ECONOMIC CONDITION OF SLUM DWELLERS	925-928
129. KUSUMA R. J. BENET RAJADURAI & AUGUSTIN JOSEPH M	ALCOHOL CONSUMPTION AND RISKY DRINKING PATTERNS AMONG UNMARRIED MEN	929-935
130. R. VATHSALA SRINALAN	A CASE STUDY REPORT ON DISCRIMINATION OF STIMULUS CONSECUTIVELY IN AUTISM	936-942
131. M. SATHYA	GLOBALIZATION -MARKETING STRATEGIES OF WOMEN SELF HELP GROUP IN INDIA	943-950
132. MANGALAGOURI V. MANKIADE & KANCHANA GOUDAR	PLETHORA OF TRANSGENDER COMMUNITY IN BANGALURU CITY.	951-957
133. S. MUALIDHARAN & K.M.A MOHAMED OMER FAROOQUE	THE DEVELOPMENT OF THE LABOUR WELFARE COMMUNITY IS OCCURRING IN INDIA, ACCORDING TO THE WORLD BANK	958-970
134. LATHA T & N. RANGASWAMY	THE STRUCTURE AND GROWTH OF TAX REVENUE IN INDIA: A CRITICAL VIEW OF KARNATAKA	971-980
135. MADHUNIM. & PARVATHAMMA G.L.	A STUDY ON THE PROGRESS OF INVESTMENT IN SPECIAL ECONOMIC ZONES (SEZS) WITH RESPECT TO KARNATAKA STATE	981-987
136. KALPALATA RAJ & MANOJ KUMAR PRADHAN	STUDY HABITS AND ACADEMIC ACHIEVEMENT OF STUDENTS AT ELEMENTARY LEVEL	988-995
137. A. SREEMATHI	IMPACT OF VARIED PACKAGES OF PLYOMETRIC TRAINING ON FLEXIBILITY AMONG INTERCOLLEGE LEVEL FEMALE PLAYERS	996-1003
138. SRI SHRANNA	POLITICAL PARTICIPATION OF WOMEN: SOME ISSUES AND CHALLENGES	1004-1007
139. VARSHA KOTWAL	OVERVIEW OF SKILL DEVELOPMENT SYSTEM IN JAMMU AND KASHMIR	1008-1014
140. J. ONJIA	ROLE OF WOMEN IN HILL AGRICULTURE	1015-1018
141. PRAWNY DHWAN	THE MARXISM AND HISTORICAL WRITING	1019-1022
142. MOHAN KUMAR H.T	THE CHALLENGES & PERSPECTIVES OF FOOD SECURITY IN INDIA: A VIEW	1023-1030
143. MADHUR CHAVLA	A WOMAN'S JOURNEY OF THE 'SELF' IN VEENA VERMA'S SHORT STORY	1031-1036
144. SREVARDHAN V & SHILPAKALYAN	IMPACT OF URBAN MIGRATION ON SOCIO-ECONOMIC RELATIONS IN RURAL LANDSCAPE	1037-1042
145. JAYESH VIKRAM PADVI	DR. BABASAHEB AMBEDKAR'S DECISIVE FIGHT FOR SOCIAL JUSTICE	1043-1048
146. S. R. WAGH & S. S. THUBE	CHALLENGES FOR INDIA: SUSTAINABLE DEVELOPMENT GOALS	1050-1055
147. LILITH ANNA PHILIP	SABARIMALA: THE MYTH BEHIND PURITY AND IMPURITY OF WOMEN ENTRY	1056-1064
148. KAVITA RAJ SINGH	THE LINK BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND EMPLOYEE ENGAGEMENT	1065-1071
149. NEETHU MARY ABRAHAM	REGULARISING OBJECTIFICATION AND VOYEURISM IN THE MOVIE ANGU VAKUNTAPURATHU	1072-1076
150. S.K. ANER & V.P. DHAWALE	INVESTIGATION OF BIOCOMPONENTS OVER GROUNDNUT CROP FIELDS AT AHMEDNAGAR	1077-1082
151. SEEMA GUPTA	EMPOWERMENT OF WOMEN THROUGH MUSHROOM FARMING IN INDIA	1083-1094
152. S. R. WAGH & ANOKADAM V. C.	DEVELOPMENT AND GROWTH OF RURAL ECONOMY IN AKOLE AND BARAMATI TEHSIL (M.H.)	1096-1100
153. AMRANATHI V	COMPARATIVE STUDY ON STUDY HABITS AMONG UG STUDENTS : A SURVEY	1101-1107
154. SHIVA KUMAR S.M. & D. KUMUDA	IMPACT OF MIGRATION ON SOCIO-ECONOMIC CONDITIONS OF MIGRANTS IN BANGALORE URBAN	1108-1116
155. SURINDER SINGH MANJEET SINGH & NIDER PUNEET SINGH	EFFECT OF RURAL CREDIT AGENCIES ON MENTAL HEALTH OF THE BORROWERS	1117-1126
156. P.B. DEEPA & JOSEPHINE DAISY	AN ANALYTICAL STUDY OF RETAIL INVESTORS POST COVID 19 ON INVESTMENT PATTERNS AND PREFERENCES	1127-1136
157. VEENA VASANT MOOGANUR	FAMILY SUPPORT AND STRESS MANAGEMENT AMONG NURSES	1137-1140
158. SHANTA Y. BANQARI	FOOD HABITS OF PREGNANT WOMEN IN RURAL INDIA	1141-1144
159. MONICA SHARMA	SOCIO-CULTURAL TRANSFORMATION OF FARMING COMMUNITY: PAST AND PRESENT	1145-1150
160. AKANKSHA SINGH & BHARTI RASTOGI	ADDRESSING THE STATUS OF MARGINALISED WOMEN IN VARANASI: A SOCIOLOGICAL STUDY	1151-1154
161. KAPIL BHIMRAO CHAURRANGAR	THE PROBLEM OF FOOD SAFETY IN INDIA AND LEGAL MEASURES: AN OVERVIEW	1155-1170
162. ALIAS KUTTY POULOSE	ARKHOSE PADRI: A PIONEER OF CULTURAL ACCULTURATION OF KERALA CHRISTIANS	1171-1177
163. AKASH & B. VIJAYA	CUSTOMER SATISFACTION TOWARDS STATE BANK OF INDIA: A STUDY WITH REFERENCE TO KALABURAGI DISTRICT	1178-1183
164. B. VIJAYA & HANAMANTRAYA	SERVICE QUALITY ATTRIBUTES AFFECTING PASSENGERS' SATISFACTION OF PUBLIC BUS TRANSIT USERS	1184-1191
165. ANSHUMAN RANA & NARESH KUMAR	SIGNIFICANCE OF SOCIAL MEDIA IN LIFESTYLE MIGRATION: EMPIRICAL INSIGHTS FROM VARANASI DISTRICT OF UTTAR PRADESH	1192-1201
166. CHIKKARAJU C.	SOCIO-ECONOMIC PROFILE AND PROBLEM FACED BY THE COCONUT GROWERS OF TUMKURU DISTRICT- A SOCIOLOGICAL STUDY	1202-1208
167. N. PARAMESHWARA	SOCIO-ECONOMIC AND HEALTH PROBLEMS OF POURAKARMIKAS/GAFAI KARMICHARS IN BANGALORE CITY-A SOCIOLOGICAL STUDY	1209-1219
168. SARASWATHAMMA M	INCLUSIVE EDUCATION: NEED AND IMPORTANCE-A SOCIOLOGICAL ANALYSIS	1220-1228
169. MANJULA S.V	PROBLEMS AND CHALLENGES FACED BY URBAN WORKING WOMEN IN INDIA- A CASE STUDY IN BANGALORE CITY	1229-1238
170. SIKRASO MAHAMMAD	A BRIEF REVIEW OF THE MENTAL HEALTH OF THE COLLEGE STUDENTS IN PASCHRAMONDIJKUR, WEST BENGAL	1239-1241
171. MANGESH VASUDEO PANCHAL	AN ANALYTICAL STUDY OF AWARENESS ABOUT INVESTMENT AVENUES AND INVESTMENT PATTERN AMONG THE PEOPLE RESIDING IN THE DISTRICT OF RATNAGIRI AND SINDHUDURG, MAHARASHTRA, INDIA	1242-1248
172. BALWINDER SINGH & APPERDEEP KAUR	URBAN SPRAWL AND LAND USE/LAND COVER CHANGE DETECTION USING REMOTE SENSING AND GIS IN AND AROUND MANGA CITY, PUNJAB	1249-1256
173. SANTOSH M. SINGH	PROBLEMS OF THE SHG MEMBERS IN KALABURAGI DISTRICT OF KARNATAKA	1257-1261
174. HARSHWARDHAN REDDY	A STUDY ON AWARENESS AND SATISFACTION LEVEL TOWARDS CROP INSURANCE IN SHAHAPUR TALUKA	1262-1271
175. ARUNIMATI	A STUDY ON THE CBSE SCHOOL TEACHERS' PARTICIPATION IN SCHOOL ADMINISTRATION IN WEST BENGAL	1272-1277

Published by : Raja Publications, No. 10, Uppark, Ibrahim Nagar, Khajamalai, Trichirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241  
 Printed : The Printing House, Trichirappalli - 620 023, Tamil Nadu, India. Ph : +91 - 431-2420121

**CHALLENGES FOR INDIA: SUSTAINABLE DEVELOPMENT GOALS**

**S. R. WAGH**

Department of Zoology, New Arts, Commerce and Science College, Parner,  
Tal. Parner, Dist. Ahmednagar. Pin. 414302, Maharashtra, India.

**S.S. THUBE**

Department of B.B.A.-C.A., New Arts, Commerce and Science College, Parner,  
Tal. Parner, Dist. Ahmednagar. Pin. 414302, Maharashtra, India.

**ABSTRACT**

The endeavor for excellence and growth has produced imbalance in the development of economy among the countries, diminished some of the natural resources and thus having altered the ecological balance, which has the effect of climate change and global warming. The world economies have unified in their efforts to achieve the goals of sustainable development. This is in sheer contrast to the earlier approaches where governments pursued goals for the growth and development of their respective economies. It endangers the very existence of human life - on earth. At present it has become important to take action that will help for ensuring the future generation a safe environment. The term sustainable development ensures that development will undergo such change in a way that it will keep the natural resources sustainable and be passed to future generation unharmed. This paper deals regarding the challenges that come across in India and attempts to understand the challenges encountered by India in attaining the sustainable development goals and gives suggestions for its attainment.

**KEY WORDS:**SDG – Sustainable Development Goals, MDG – Millennium Development Goals, NITI Ayog

**INTRODUCTION:**

Sustainable development comprehends of the attainment interrelated objectives – economic development, environmental sustainability and social inclusion being meant for the welfare of every individual and the societies. Struggle for development and growth has an impact on the imbalance of economic development among the countries where some of the natural resources have been depleted thus changing the ecological balance. Much remains to be done the 17 goals comprise 169 targets, 90 of which need to be specified in more detail. Metrics need to be developed to measure progress towards the targets on local, regional, national and global levels and across sectors. Monitoring and evaluation procedures and standards need to be set up.

This is harmful, for the human existence and so an action is required to safeguard the environment for next generations to come. Natural resources have to be taken care of and its development should take place for passing it to next generations. Sustainable Development Goals (SDGs) are seventeen. It will help to build a secure world by the end of the year 2030. As a part of their agenda SDGs have been adopted by 193 member states, at the UN General Assembly.

சென்னை மாநில பல்கலைக்கழகம் (சென்னை மாநில பல்கலைக்கழகம்) 3-5 ஜூன், 2021 - (தமிழ்) (ISSN: 2321-8944)  
Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-8944)  
Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

S. R. WAGH & S.S. THUBE

1051

Summit dated September, 2015. India is a participant and ensures commitment to this agenda.

**Sustainable Development Goals:**

These goals came into effect from the year 01/01/2016 being an improvement of

Millennium Development Goals (MDGs). With the help of SDGs the Indian government is trying to achieve integration in the efforts that are taken for achieving Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs). Somemost important SDGs are as follows.

**Sustainable Development Goals (SDGs):**

Goals	Particulars
1.	Poverty should end from everywhere in all forms
2.	By removing inequality in gender and the empowerment of all girls and the women
3.	Reducing inequality from and amongst the countries.
4.	To bring about environmental awareness and overcoming the problems
5.	Bringing about sustainable agriculture, achieving security of food and nutrition value
6.	Providing with reliable, affordable and sustainable energy (modern) to everyone
7.	Ensuring sustainable consumption and the production patterns
8.	To avail water, sanitation for everyone and its sustainable management
9.	Ensuring well-being and healthiness for all
10.	Making human settlements sustainable
11.	Quality Education
12.	Zero Hunger

Source: [www.un.org/sustainabledevelopment/sustainable-development-goals/](http://www.un.org/sustainabledevelopment/sustainable-development-goals/)

**RESULTS AND DISCUSSION:**

Leave no one behind' is the Universal Principle on which the SDGs are based on. India's National Development Goals meet well with the Sustainable Development Goals, where our country has the main role to play for determining its success globally. Few important Sustainable Development Goals are:

**No Poverty:**

Poverty is multidimensional phenomenon. It not only indicates the lack of income or access to resources but it also manifests in the form of hunger & malnutrition, diminished opportunities for education, social discrimination and the inability to participate in decision-making processes. Eradicating poverty in all its forms remains one of the formidable

challenges before the mankind. One should not forget that the extreme deprivation is not just about wellbeing and opportunity, it is a question of survival also. Government of India has launched a multi-pronged strategy to eradicate poverty in all its form. Due to the multidimensional nature of poverty, the Government is implementing a number of welfare schemes in the areas of nutrition, health, education, housing, drinking water, sanitation, skill development, social protection etc. At the global level, this Goal has 7 targets to measure the progress of nation in ending poverty in all its forms everywhere.

**Gender Equality:**

Ending all forms of discrimination against women and girls is not only a basic human right but also is crucial for sustainable future of

\* தமிழ்நாடு பல்கலைக் கல்வி ஆய்விதழ் (தமிழ்நாடு பல்கலைக் கல்வி ஆய்விதழ்) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-884X)  
 Modern Tharnzh Research (A Quarterly International Multilateral Tharnzh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-884X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [JCLPG-2021]"  
 Organized by: PG. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

societies. Providing women and girls with equal access to education, health care, decent work, and representation in political and economic decisionmaking processes will achieve sustainable economies and will benefit societies and humanity at large. Gender equality aims to ensure end to all forms of discrimination against women and girls everywhere. It is vital to give women equal rights on land and property, sexual and reproductive health. Today there are more women in public offices than ever before which will help to achieve greater gender equality. Government has initiated several social protection and financial inclusion programs focusing on women. Such type of initiatives has ensured the increased women participation. The BetiBachaoBetiPadhao created awareness and improved the efficiency of welfare services intended for girls. The Pradhan Mantri Matru VandanaYojana has been instrumental in providing the social protection through maternity benefits to women.

**Clean Water and Sanitation:**

Clean water and sanitation protects people from disease and enables them to be economically more productive. Water scarcity, poor water quality and inadequate water hygiene negatively impacts food security, livelihood choices and educational opportunities of low-income families across the world. Clean water and Sanitation ensures availability and sustainable management of water and sanitation for all and reflects its increased attention in the global political arena. The 2030 Agenda recognizes that social development and economic prosperity depends on the sustainable management of freshwater resources and ecosystems.

**Quality Education:**

Affording the opportunity of quality education is basic to improve people's lives and

their sustainable development. Quality education aims to ensure the completion of primary and secondary education by all boys and girls and guarantee opportunities for equal access to quality technical and vocational education for everyone. It also aims to provide equal access to affordable vocational training to eliminate gender and wealth disparities and achieve universal access to a quality higher education. India has made significant progress in improving school infrastructure, increasing enrolment of students and improving the level of gender parity. The Right to Education (RTE) Act makes education a fundamental right of every child between the ages of 6 and 14 years and ensures free and compulsory education. The coverage of education is constantly increasing across the country. A lot of emphasis has also been given to the skill development and vocational education.

**Zero Hunger:**

The central theme of Zero Hunger aims to end all forms of hunger and malnutrition by 2030 and making sure that all people, especially those in vulnerable situations have sufficient nutritious food. It also aims to double agricultural productivity by 2030 and generate decent incomes while supporting people-centered rural development and protecting the environment. The measures such as promoting sustainable agriculture, supporting small-scale farmers and creating equal access to land, technology and markets is fundamental to eradication of hunger and poverty. It also requires international cooperation to ensure investment in infrastructure and technology to improve agricultural productivity. It also emphasizes the need for all countries to work together to ensure enough investment is undertaken in related infrastructure

தமிழ் தாழ்வுநிலை (உள்ளூர்-தொடர்பு) ஆய்வு அறிக்கை (தமிழ்) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-584X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN: 2321-584X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Halim College (Autonomous), Melisham, Ranipet District, Tamilnadu.

by incorporating and adopting new technologies to improve agricultural productivity. A number of initiatives have been taken by the Government to ensure food for all and has launched one of the largest food security programs in the world owing to the National Food Security Act, 2013. The stress on sustainable agriculture may be observed from the fact that one of the missions under the National Action Plan on Climate Change (NAPCC) is National Mission on Sustainable Agriculture (NMSA). The net area under the organic farming is increasing over the years. India has made a significant progress in the area of food security despite of having several challenges

**Measures taken for implementing the SDGs in India:**

SDGs are entrusted with the work of coordinating the SDGs by the NITI Ayog (think tank of Indian government). Even the states have been counselled for undertaking same kind of schemes. The process to developing national indicators regarding the SDGs is done by the Ministry of Statistics and Programme Implementation. Government have taken many programmes as Digital India, Swachh Bharat Abhiyan, Make in India are the fundamentals of SDGs. Local and the state government have a very pivotal role in SDGs.

**SDGs in India and the Assistance of United Nations (UN):**

In India, the UN backs is support think tanks, the Indian media and at large the civil society organizations in side sessions and discussions at the International conference development, Addis Ababa and at the assembly (New York). The United Nations team is supportive to India.

The United Nations in India supports the participation of civil society organisations, think

tanks and the Indian media in discussions and side sessions at the International Conference on Financing for Development at Addis Ababa and during the General Assembly in New York.<sup>8</sup>

In collaboration with the NITI Ayog and its partners, United Nations are in support of the thematic consultations regarding SDGs for bringing different central ministries, civil society organizations, academia and the state governments to deliberate on the specific SDGs.

**Support given to the State Government:**

In India, the United Nations is supporting currently five governments (State) like Gujarat, Assam, Odisha, Chhattisgarh and Haryana in localizing these SDGs for addressing at the state level, the key development challenges.

**Challenges faced in achieving SDGs:**

Following are the areas that are of concerned to India for achieving the Sustainable Development Goals:

- 1 Monitoring and Ownership
- 2 Defining Indicators
- 3 Measuring Progress
- 4 Financing SDGs

**Five priorities in achieving SDGs:**

- 1. **Devise metrics:** Scientists, social scientists and economists need to design a set of practical indices for tracking progress on each SDG. Parameters other than just economic growth must be included, such as income inequality, carbon emissions, population and lifespans. Existing methodologies can form the starting points, including environmental impact assessment, natural-asset valuation, cost-benefit analysis and life-cycle costing.

മലയാളം: മലയാളം (മലയാളം) (മലയാളം) (മലയാളം) 3-5 ജൂൺ, 2021 - പ്രത്യേകം (ISSN: 2321-9840)  
 Modern Tharsh Research (A Quarterly International Multilateral Tharsh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-9840)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [CLPG-2021]"  
 Organized by: PG & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.



Ambiguous terms in the wording of the goals, such as 'sustainable', 'efficient' and 'substantial', need to be defined quantitatively so that the goals can be measurable, comparable and achievable. Scientific analyses of the effectiveness of different scenarios should inform the metrics only.

2. **Establish monitoring mechanisms:** Governments and researchers must decide which values need to be tracked and set up systems to acquire the data. Quantities such as water and energy consumption, emissions and health impacts need to be monitored, as do scientific variables such as water pH, turbidity and meta concentrations.
3. **Enhance infrastructure:** Earth observation, ground-based monitoring and information-processing capabilities need to be expanded to give better global coverage to allow direct comparisons of data by using similar instruments and to store, analyse and share data.
4. **Standardize and verify data:** Countries capabilities to acquire and process economic and social data vary greatly. The likelihood of collecting wrong or useless information is high, owing to a lack of standards and consistent methods and instrumentation. Scientists and governments need to design monitoring and sampling approaches with robustness in mind and to verify data.
5. **Evaluate progress:** Scientists should help to choose criteria such as the water-quality standards against which progress towards the goals is judged, based on accepted principles of good practice or governance such as social equality or cost-effectiveness.

**Measures to overcome the challenges:**

By the development of suitable indicators for assessing the development of the SDGs and by also at the same time develop a system which can support this by providing data required.

- 1 Normalization
- 2 Clustered indicators
- 3 Data aggregation
- 4 Ibrahim Index of African Governance
- 5 Handling missing data

**The concern to implement SDGs:**

As far as the implementation of SDGs goes NITI Ayog is in doubtful to its smooth flowing implementation and so now it has becomes essential to the Indian Government for decentralizing these tasks. While accomplishing this it should not be forgotten that the SDGs goal is to conserve and also pass on the natural resources to future generation. This requires total commitment of the society at large which is highly impossible for the society for using these natural resources in the best and as in required manner (ecologically). For changing cultural, social, technological, ecological and political conditions will impose new burden/problems on the base of natural resources regarding its overuse or misuse. For this a new upcoming system which will safeguard and ensure the participation from the groups which are connected directly towards the problems evolved.

**CONCLUSION:**

India is having the second largest population in today's world. Actions taken by India for achieving SDGs means a lot this world

சென்னைப் பல்கலைக்கழகம் (அறிவியல், வணிகம், கலை மற்றும் மனிதநேய அறிவியல்) 3-5 ஜூன், 2021 - சிறப்பு இதழ் (ISSN: 2321-9840)  
 Modern Tamilizh Research (A Quarterly International Multilateral Tamilizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-9840)  
 Three Days Multi-Disciplinary International Webinar On 'The Impact of Liberalization, Privatization and Globalization [CLPG-2021]'  
 Organized by P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

and so if we achieve these goals it can be said that a large part of the world has achieved it. Due to this it becomes essential for India for enhancing the best and effective methods for its implementation, measuring its progress and also monitoring the SDGs. Suitable Indicators have to be developed to face these challenges. This is the utmost challenge where India is facing it. The measure to curb this is to develop Indian Index for its sustainable development.

**REFERENCES:**

1. Kabeer N. "Leaving No One Behind": The Challenge of Intersecting Inequalities. ISSC, IDS and UNESCO, Challenging Inequalities: Pathways to a Just World, World Social Science Report. 2016 Sep 22:55-8.
2. Anita N. India's progress toward achieving the Millennium development goal. Indian J Community Med. 2011;36:85-92
3. Report of the third International Conference on Financing for Development. 2015. Available from <http://www.undocs.org/A/CONF227/20>
4. Chatterjee S, Hammill M, Kumar N, Panda S. Assessing India's Progress in Achieving the Millennium Development Goals: Key Drivers of Inter-state Variations. United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) South and South-West
5. India has highest population of poor: World Bank. The Hindu Business line. 2016 Oct 3. available from <https://www.presreader.com/india/the-hindu-business-line/.../281865822968167>
6. Government Flagship Programs: Make In India And Digital India. Available from <https://unacademy.com/lesson/government-flagship-programs-make-in-india-and-digital-india-for-upsc-cseias-exam/L26JW6RP>
7. Rakesh Kumar Maurya .National Implementation of the SDG Monitoring India 2015 Available from <https://unstats.un.org/sdgs/.../Presentation—4.3-Implementation-of-SDG-Monitoring—1>
8. United N. The Millennium Development Goals Report 2014. New York: United Nations. 2014.
9. Sachs JD. From millennium development goals to sustainable development goals. The Lancet. 2012 Jun 9; 379(9832):2206-11.
10. Lu Y, Nakicenovic N, Visbeck M, Stevance AS. Policy: Five priorities for the UN Sustainable Development Goals. Nature. 2015 Apr 23; 520(7548):432-3.
11. [https://www.researchgate.net/publication/324200471Sustainable\\_Development\\_Goals\\_SDGs-Challenges\\_for\\_India](https://www.researchgate.net/publication/324200471Sustainable_Development_Goals_SDGs-Challenges_for_India)



புனைவு வானொலி (சுற்று: 50 வானொலி வானொலி மையம்) 3-5 ஜூன், 2021 - திங்கள் (ISSN: 2321-984X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue: (ISSN: 2321-984X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

## 29. Development and growth of rural economy in Akole and Baramati Tehsil (M.H.)

தமிழ்நாடு Special Issue
<i>Chief Editor</i> Dr. M. Sadik Batcha
<i>Advisory Editor</i> Dr. N. Chandra Segaran
<i>Editorial Board</i> Dr. MAM. Rameez Dr. Jeyaraman Dr. A. Ekambaram Dr. G. Stephen Dr. S. Chitra Dr. S.Senthamizh Pava Dr. A. Shanmugham Pillai Dr. P. Jeyakrishnan Dr. Seetha Lakshmi Dr. S. Easwaran Dr. Kumara Selva Dr. Ganesan Ambedkar Dr. Krishnan Dr. Kumar Dr. S. Kalpana Dr. T. Vishnukumar Dr. M. N. Rajesh Dr. Govindaraj Dr. Uma Devi Dr. Senthil Prakash Dr. Pon. Kathiresan Dr. S. Vignesh Ananth Dr. M. Arunachalam Dr. S. Bharathi Prakash

20-22 ஆகஸ்ட் 2021  
3<sup>rd</sup> to 5<sup>th</sup> June 2021

ISSN : 2321 - 984X

**நவீனத் தமிழாய்வு**  
(வெள்குறியியல் மற்றும் மனித அறிவு)

*Journal of*  
**Modern Thamizh Research**  
(A Quarterly International Multilateral Thamizh Journal)  
Arts and Humanities (all), Language  
Literature and Literary Theory, Tamil  
UGC Care Listed (Group-I) Journal

Multi-Disciplinary International Webinar -2021  
**P.G. & RESEARCH DEPARTMENT OF HISTORY**  
Special Issue : **C. ABDUL HAKEEM COLLEGE (Autonomous)**  
(Affiliated to Thiruvalluvar University, Tiruchirappalli, 620015, Wilks.)  
Melvisharam, Ranipet District, Tamilnadu.

**THE IMPACT OF LIBERALIZATION, PRIVATIZATION AND GLOBALIZATION (ICLPG-2021)**

*Special Issue Editors*

<p><b>Mr. J. BENET RAJADURAI</b> Assistant Professor</p> <p><b>Prof. S.C. ANDREW MICHAEL</b> Assistant Professor</p>	<p><b>Dr. P. KUMARAN</b> Assistant Professor</p> <p><b>Dr. K. M. A. MOHAMED OMER FAROOQUE</b> Assistant Professor</p>
--	---

**Dr. NISHA JOLLY NELSON**  
Head & Assistant Professor



*Published by*  
**RAJA PUBLICATIONS**  
10, (Upstairs), Ibrahim Nagar, Khajamalai,  
Tiruchirappalli - 620 023, Thamizh Nadu, India.  
Mobile : +91-9600535241  
website : rajapublications.com

**21** பகுதி-4  
Part -4

20-22 ஜூன் 2022 <b>Special Issue</b> 3 <sup>rd</sup> to 5 <sup>th</sup> June 2021		ISSN : 2321 - 984X
126. SWAPNAKASH R	INTERNATIONAL SOCIAL CONCERNS AND MARKET PRESSURE FOR SUSTAINABILITY IN THE TWENTY-FIRST GENERATION	911-921
127. K. UDAYA SANKAR	PROBLEMS OF DOMESTIC WOMEN WORKERS IN TAMIL NADU	922-934
128. ANNA PURVA KUMBAR	VALMIGI AMBEDKAR AWARDS YUJANA: WAY TO DEVELOP SOCIO-ECONOMIC CONDITION OF SLUM DWELLERS	925-928
129. KUSUMA R. J. BENET RAJADURAI & AUGUSTIN JOSEPH M	ALCOHOL CONSUMPTION AND RISKY DRINKING PATTERNS AMONG UNMARRIED MEN	929-935
130. R. VATSALA SRINALAN	A CASE STUDY REPORT ON DISCRIMINATION OF STIMULUS CONSECUTIVELY IN AUTISM	936-942
131. M. SATHYA	GLOBALIZATION -MARKETING STRATEGIES OF WOMEN SELF HELP GROUP IN INDIA	943-950
132. MANGALAGOURI V. MANKIADE & KANCHANA GOUDAR	PLETHORA OF TRANSGENDER COMMUNITY IN BANGALURU CITY.	951-957
133. S. MUALIDHARAN & K.M.A. MOHAMED OMER FAROOQUE	THE DEVELOPMENT OF THE LABOUR WELFARE COMMUNITY IS OCCURRING IN INDIA, ACCORDING TO THE WORLD BANK	958-970
134. LATHA T & N. RANGASWAMY	THE STRUCTURE AND GROWTH OF TAX REVENUE IN INDIA: A CRITICAL VIEW OF KARNATAKA	971-980
135. MADHUN M. & PARATHAMMA G.L.	A STUDY ON THE PROGRESS OF INVESTMENT IN SPECIAL ECONOMIC ZONES (SEZS) WITH RESPECT TO KARNATAKA STATE	981-987
136. KALPALATA RAJ & MANOJ KUMAR PRADHAN	STUDY HABITS AND ACADEMIC ACHIEVEMENT OF STUDENTS AT ELEMENTARY LEVEL	988-995
137. A. SREEMATHI	IMPACT OF VARIED PACKAGES OF PLYOMETRIC TRAINING ON FLEXIBILITY AMONG INTERCOLLEGE LEVEL FEMALE PLAYERS	996-1003
138. SRI SHANNA	POLITICAL PARTICIPATION OF WOMEN: SOME ISSUES AND CHALLENGES	1004-1007
139. VARSHA KOTWAL	OVERVIEW OF SKILL DEVELOPMENT SYSTEM IN JAMMU AND KASHMIR	1008-1014
140. J. ONJIA	ROLE OF WOMEN IN HILL AGRICULTURE	1015-1018
141. PRAWNY DHWAN	THE MARXISM AND HISTORICAL WRITING	1019-1022
142. MOHAN KUMAR H.T	THE CHALLENGES & PERSPECTIVES OF FOOD SECURITY IN INDIA: A VIEW	1023-1030
143. MADHUR CHAVLA	A WOMAN'S JOURNEY OF THE 'SELF' IN VEENA VERMA'S SHORT STORY	1031-1036
144. SREERARDHAN V & SHILPKALYAN	IMPACT OF URBAN MIGRATION ON SOCIO-ECONOMIC RELATIONS IN RURAL LANDSCAPE	1037-1042
145. JAYESH VIKRAM PADVI	DR. BABASAHEB AMBEDKAR'S DECISIVE FIGHT FOR SOCIAL JUSTICE	1043-1048
146. S. R. WAGH & S. S. THUBE	CHALLENGES FOR INDIA: SUSTAINABLE DEVELOPMENT GOALS	1050-1055
147. LILITH ANNA PHILIP	SABARMATI: THE MYTH BEHIND PURITY AND IMPURITY OF WOMEN ENTRY	1056-1064
148. KAVITA RAJ SINGH	THE LINK BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND EMPLOYEE ENGAGEMENT	1065-1071
149. NEETHU MARY ABRAHAM	REGULARISING OBJECTIFICATION AND VOYEURISM IN THE MOVIE ANGU VAKUNTAPURATHU	1072-1076
150. S.K. ANER & V.P. DHAWALE	INVESTIGATION OF BIOCOMPONENTS OVER GROUNDNUT CROP FIELDS AT AHMEDNAGAR	1077-1082
151. SEEMA GUPTA	EMPOWERMENT OF WOMEN THROUGH MUSHROOM FARMING IN INDIA	1083-1094
152. S. R. WAGH & ANOKADAM V. C.	DEVELOPMENT AND GROWTH OF RURAL ECONOMY IN AKOLE AND BARAMATI TEHSIL (M.H.)	1096-1100
153. AMRANATHI V	COMPARATIVE STUDY ON STUDY HABITS AMONG UG STUDENTS - A SURVEY	1101-1107
154. SHIVA KUMAR S.M. & D. KUMUDA	IMPACT OF MIGRATION ON SOCIO-ECONOMIC CONDITIONS OF MIGRANTS IN BANGALORE URBAN	1108-1116
155. SURINDER SINGH MANJEET SINGH & NIDER PUNEET SINGH	EFFECT OF RURAL CREDIT AGENCIES ON MENTAL HEALTH OF THE BORROWERS	1117-1126
156. P.B. DEEPA & JOSEPHINE DAISY	AN ANALYTICAL STUDY OF RETAIL INVESTORS POST COVID 19 ON INVESTMENT PATTERNS AND PREFERENCES	1127-1136
157. VEENA VASANT MOOGANUR	FAMILY SUPPORT AND STRESS MANAGEMENT AMONG NURSES	1137-1140
158. SHANTA Y. BANQARI	FOOD HABITS OF PREGNANT WOMEN IN RURAL INDIA	1141-1144
159. MONICA SHARMA	SOCIO-CULTURAL TRANSFORMATION OF FARMING COMMUNITY: PAST AND PRESENT	1145-1150
160. AKANKSHA SINGH & BHARTI RASTOGI	ADDRESSING THE STATUS OF MARGINALISED WOMEN IN VARANASI: A SOCIOLOGICAL STUDY	1151-1154
161. KAPIL BHIMRAO CHAURRANGAR	THE PROBLEM OF FOOD SAFETY IN INDIA AND LEGAL MEASURES: AN OVERVIEW	1155-1170
162. ALIAS KUTTY POULOSE	ARKHOSE PADRI: A PIONEER OF CULTURAL ACCULTURATION OF KERALA CHRISTIANS	1171-1177
163. AKASH & B. VIJAYA	CUSTOMER SATISFACTION TOWARDS STATE BANK OF INDIA: A STUDY WITH REFERENCE TO KALABURAGI DISTRICT	1178-1183
164. B. VIJAYA & HANAMANTRAYA	SERVICE QUALITY ATTRIBUTES AFFECTING PASSENGERS' SATISFACTION OF PUBLIC BUS TRANSIT USERS	1184-1191
165. ANSHUMAN RANA & NARESH KUMAR	SIGNIFICANCE OF SOCIAL MEDIA IN LIFESTYLE MIGRATION: EMPIRICAL INSIGHTS FROM VARANASI DISTRICT OF UTTAR PRADESH	1192-1201
166. CHIKKARAJU C.	SOCIO-ECONOMIC PROFILE AND PROBLEM FACED BY THE COCONUT GROWERS OF TUMKURU DISTRICT- A SOCIOLOGICAL STUDY	1202-1208
167. N. PARAMESHWARA	SOCIO-ECONOMIC AND HEALTH PROBLEMS OF POURAKARMIKAS/GAFAI KARMICHARS IN BANGALORE CITY-A SOCIOLOGICAL STUDY	1209-1219
168. SARASWATHAMMA M	INCLUSIVE EDUCATION: NEED AND IMPORTANCE-A SOCIOLOGICAL ANALYSIS	1220-1228
169. MANJULA S.V	PROBLEMS AND CHALLENGES FACED BY URBAN WORKING WOMEN IN INDIA- A CASE STUDY IN BANGALORE CITY	1229-1238
170. SIKRASO MAHAMMAD	A BRIEF REVIEW OF THE MENTAL HEALTH OF THE COLLEGE STUDENTS IN PASCHRAMONDIKUR, WEST BENGAL	1239-1241
171. MANGESH VASUDEO PANCHAL	AN ANALYTICAL STUDY OF AWARENESS ABOUT INVESTMENT AVENUES AND INVESTMENT PATTERN AMONG THE PEOPLE RESIDING IN THE DISTRICT OF RATNAGIRI AND SINDHUDURG, MAHARASHTRA, INDIA	1242-1248
172. BALWINDER SINGH & APPERDEEP KAUR	URBAN SPRAWL AND LANDUSE/LANDCOVER CHANGE DETECTION USING REMOTE SENSING AND GIS IN AND AROUND MANGA CITY, PUNJAB	1249-1256
173. SANTOSH M. SINGH	PROBLEMS OF THE SHG MEMBERS IN KALABURAGI DISTRICT OF KARNATAKA	1257-1261
174. HARSHWARDHAN REDDY	A STUDY ON AWARENESS AND SATISFACTION LEVEL TOWARDS CROP INSURANCE IN SHAHAPUR TALUKA	1262-1271
175. ARUNIMATI	A STUDY ON THE CBSE SCHOOL TEACHERS PARTICIPATION IN SCHOOL ADMINISTRATION IN WEST BENGAL	1272-1277

Published by : Raja Publications, No. 10, Uppark, Ibrahim Nagar, Khajamalai, Trichirappalli - 620 023, Tamil Nadu, India. Mobile : 9600535241  
 Printed : The Printing House, Trichirappalli - 620 023, Tamil Nadu, India. Ph : +91 - 431-2420121

## DEVELOPMENT AND GROWTH OF RURAL ECONOMY IN AKOLE AND BARAMATI TEHSIL (M.H.)

S. R. WAGH

Department of Zoology, New Arts, Commerce and Science College, Parner,  
Tal. Parner, Dist. Ahmednagar. Pin. 414302, Maharashtra, India.

ANDKADAM V. C.

Department of Economics, P.V.P. College, Pravaranagar, Tal. Rahata,  
Dist. Ahmednagar. Pin. 413713, Maharashtra, India

### ABSTRACT:

Small and large-scale agro base industries uplift the rural economy. These are concerning to the rural development and growth. To solve unemployment problem by establishing all types of industries Agro base industries established in rural areas where raw material may be easily available and sufficient. The rural economy will be uplifted and become a smaller transportation cost of raw materials. Industries created employment where migration of people from rural to urban areas will be stopped. Industrialization will be dispersed and scattered to develop appropriate opportunities for particular backward areas and uplifted rural economy. These industries are having direct or indirect relationship or connection with Agriculture. Small and large-scale industries comprise as part of a complete different form and the production units are processing in the agricultural particularly by farming. In the present study, only agriculture has been taken into consideration because agriculture is the main source of income for the people of the study area.

**KEYWORDS:** Small and large-scale industries, Land Utilization Pattern, Rural development.

### OBJECTIVES:

1. Small and Large-scale industries affected the socio economic development of the rural area.

2. To solve the problems of employment generation in rural area.

### INTRODUCTION:

The population of the study area has steadily increased. These increasing populations is due to various of reasons such as better irrigation facilities and hence increasing security of agriculture, increasing tempo of agricultural small and large scale industries, improved health conditions due to better medical facilities, declining death and mortality rates and an increasing in net reproduction rate. Use of recent technology is the agricultural modernization and application of fertilizers and pesticides. The required choice of processing technology and efficient management is increasing productivity in the agricultural sphere. A growth in agricultural production combines to form of basic for extension for industrialization in the most developing rural economy. The improvement lacks of success to make the best use of time and resources is for precondition of the success of industrialization. In some part proportion of agricultural labors in relation to cultivated and irrigated area is high where irrigation facilities are developed, particularly, in the lower reaches of Pravara, Mula rivers (Akole tehsil) and Nira, Bhima rivers (Baramati tehsil). Agro base industries play on

நவீனத் தகவல்கள் (உள்ளூர், இடம், விலக்கு, தகவல் அமைதி) சூட்டி, 2021 - சிறப்பு (ISSN : 2321-884X)  
Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-884X)  
Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [ICLPG-2021]"  
Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

S. R. WAGH & ANDKADAM V. C.

1096

important role in the growth of economic development and help our country to distribute our national income equally. It means they play vital role in the process of decentralization of Indian Economy and create generator job opportunities and consequently contribute on larger scales towards making our country a self-sustaining economy. Various problems and challenges faced by these industries in the study area such as dal mill, Jaggery unit, ginning and pressing, sugar industries and also deals with some of the important industries generate employment and income.

**STUDY AREA:**

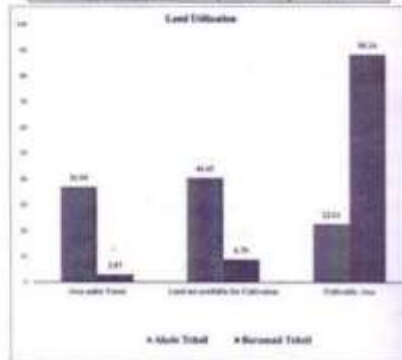
According to census 2011, out of which 94.84% in Baramati and 87.96% population in Akole tehsil is settled in rural areas. The economy of these tehsils is driven mainly through agriculture by cultivation of sugarcane, horticulture, floriculture and various major cash crops. This study of Akole and Baramati tehsil with the help of primary and secondary data.

**Land Utilization:**

In the study area, agriculture is the main economic activity. The Land utilization pattern for present study means the proportion of area under different Land utilization at a point of time. With increasing population of these areas, the demand and requirement for food is also increasing. As a result, more lands are being converted to agricultural lands. The development of the irrigation system by controlling structures, dams or reservoirs have also contributed to the rise in the area of agricultural land. Irrigated area is assumed to be irrigated for cultivation through such sources as canals (Government and Private), tanks, tube-wells, other wells and other sources.

**Table No. 1**

Sr. No	Classification	Area in %	
		Akole Tehsil	Baramati Tehsil
1	Area under Forest	36.94	2.87
2	Land not available for Cultivation	40.45	8.79
3	Cultivable Area	22.61	88.34
	Total Area	100	100



**Fig. No. 1**

**Classification of Small and Large scale industries:**



**Fig. No. 2**

நவீன தமிழ் ஆய்வு (தமிழ்நாடு முழு அளவில் வெளியாகிறது) 3-5 ஜூன், 2021 - கருத்துரை (ISSN : 2321-984X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.

DEVELOPMENT AND GROWTH OF RURAL ECONOMY IN AKOLE AND BARAMATI TEHSIL (M.H.)1097

1. **Small Scale Industries:**

The capital invested by small-scale industries is very limited e.g. Basket weaving, poultry, handicrafts, Silk weaving, Food processing, dressmaking etc.

2. **Large Scale Industries:**

These industries make enormous investments and use modern technology in their manufacturing process. These industries invest very extensive capitals.

3. **Basis on Ownership:**

Industries can further be categorized in relationship to the ownership of the concerned industry.

a. **Private Sector:**

These are owned and managed by individuals as well as a group of industries.

b. **Public Sector:**

These industries are owned and operated by the Government, such as Hindustan Aeronautics limited and Steel Authority of India limited.

c. **Joint Sector:**

These industries are owned and regulated by the state and individuals or a group of individuals.

d. **Co-operative Sector:**

These industries are owned and negotiated by the products and supplies of raw materials are workers.

The processing industries in Akole and Baramati tehsils of sugar, milk, poultry, rice mill, flourmill, edible oil, vanspati oil, fruits

and vegetable units, milk processing units etc.

**CONCLUSION:**

After the study of impact of small and large-scale industries on socio economic development, we will get some conclusions that, if the farmers of this area will think over the climatic conditions, physiography, soil types, new farming technologies, there may be considerable changes in their future economic development. In the study area, intensive subsistence agriculture is found. Farmers are cultivating various crops in their small field to fulfill their daily needs. Along with these methods, if farmers will adopt green house, shed-net, nursery, techniques of irrigation, they will have fulfilled the needs of themselves and able to provide access agricultural production to the market. For increasing the production of all crops, farmers should discuss with various agricultural universities, experts, experienced agricultural scientists and farmers. Government should provide various means of communication regarding conservation, increase in soil fertility, use of HYV<sub>s</sub> (High Yielding Varieties) and development of natural resources. Food processing industries should be established due to which food and staple crop production will increase.

From the above discussion, it can be concluded that,

- i. It ensures all round prosperity in the rural areas, providing solutions to the problems like poverty, unemployment, imbalance in the development and inequalities. As such agro base industries should be developed on a massive scale.

தமிழ்நாடு ஆய்வு (Tamil Nadu Studies) தாழ்வு அமைதி ஆய்வுகள் 3-5 ஜூன் 2021 - சிறப்பு இதழ் (ISSN: 2321-884X)  
 Indian Tamilizh Research (A Quarterly International Multilateral Tamilizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-884X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvham, Ranipet District, Tamilnadu.

2. They have to base on non-institutional sources of finance for arranging necessary finance, for starting and running their units.
3. Even through many government agencies and financial institutions cater the financial needs of agro base industries but the availability of such finance is very inadequate.
4. Among the institutional sources highest loan is taken from Commercial banks followed by cooperative bank.
5. All development activities are entirely depending on the road, rail and air transport facilities.
6. The cropping pattern of any area is generally controlled by physical, socio-economic and technological factors.
7. The productions of agricultural crops are steadily increasing due to availability of advice from the agriculture officers and weather reports, which impact on change in cropping pattern in these tehsils.
8. The catchment areas of Akole tehsil collects water from rain and cultivate rice. The study area is an attractive place for tourist, paradise, geographers, botanical and zoological students etc. Many religious and natural places are situated in the Sahyadri mountain ranges in the study area such as origin points of rivers, different types of soil, zigzag roads, hill stations, irrigation sources, Wilson Dam (Bhandardara), Umbrella fall, Nilwande and Adhala Dam, Peak Kalsubai (Highest Peak in Sahyadri elevation 1646 meters), Harishchandragarh, Ratangarh, Alang-Madan-Kulang garh, Ajuba garh, Vishram garh (Patta-Fort), Agasti Ashram, Amruteshwar Temple, Wild animals and Birds etc. The local area is associated with Adivasis such as Thakar, Warli, Katkari etc and different life style from the non-tribal people.
9. The particular processing industries in Baramati tehsil are in the areas of sugar, milk, poultry, rice mill, flour mill, edible oil, Vanaspati oil, fruits and vegetable units, milk processing units etc. In Baramati MIDC Area, industries are Dairy base industries, Automobile Components, Bio coal Briquettes from agro waste, General purpose machine shop, Herbal and Ayurveda Products, Agro processing export oriented units, Cold storage units, Starch from Jawar, Solar cell and Computer software and IT related products are established.
10. In the Akole tehsil changing agricultural cropping pattern under 13 crops. Rice is the dominant crop in this tehsil. During the year 1990-91 to 2010-11 the following are the major thirteen crop groups are taken into consideration in the study area. Such as rice 94.85% (1990-91) and 99.69% (2010-11), bajra 66.85% (1990-91) and 57.52% (2010-11), wheat 32.07% (1990-91) and 30.56% (2010-11), other cereals 16.35% (1990-91) and 18.49% (2010-11), pulses 19.12% (1990-91) and 21.02% (2010-11), soya been 20.53% (1990-91) and 22.61% (2010-11), other oilseeds 13.47% (1990-91) and 12.13% (2010-11), cotton 14.9% (1990-91) and 16.88% (2010-11), sugarcane 8.11% (1990-91) and 7.59% (2010-11), fruits 7.74% (1990-91) and 6.86% (2010-11), vegetables 68.87% (1990-91) and 62.37% (2010-11), flowers 29.31% (1990-91) and 36.58% (2010-11) and fodder crops 7.6% (1990-91) and 7.45% (2010-11).

தமிழ் தர்பிசர்சு (தமிழ்நாடு பல்கலைக் கல்வித் துறை அமைச்சர் ஆயத்தாண்டு) 3-5 ஜூன், 2021 - சிறப்புத் துருவல் (ISSN: 2221-884X)  
 Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2221-884X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization [CLPG-2021]"  
 Organized by: PG. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvisham, Ranipet District, Tamilnadu.



DEVELOPMENT AND GROWTH OF RURAL ECONOMY IN AKOLE AND BARAMATI TEHSIL (MH.)1099

11. In the Baramati tehsil changing agricultural cropping pattern under 7 crops i.e 63.76% from 1990-91 and 57.23% (2010-11). Sugarcane 13.75 % (1990-91) and 21.19%, (2010-11), fodder crops with 12.74% (1990-91) and 12.67% (2010-11), oilseeds 3.84% (1990-91) and 2.84% (2010-11), Pulses 4.14% (1990-91) and 3.07% (2010-11) and fruits - vegetables are 1.0% and 0.78% (1990-91) and 1.02% (2010-11).
12. It is observed that the use of farm technology is increasingly found in the irrigated areas. The major portion of the land is being under cultivation is positive change and significant change is noted that in cropping pattern. In case of overall change, it is observed that the shift from food grains to sugarcane is noteworthy in areas facilities by perennial sources of irrigation. The development in irrigation facilities, soil productivity, skill of farmers, using the modern techniques in agricultural land and based on demand and supply of markets will change the existing cropping pattern.
13. It impacts to increasing socio economic condition of farmers, but some remote areas of these tehsils facing lack of agricultural facilities, low level of literate farmers, negative attitude towards agriculture and performing tradition farming. In the recent year's farmers adopt new techniques and also produce various needs of market crops. In this period, the cultivation of pomegranate, vegetables, flowers are also increased. Next to it, recently most of the areas are covered by nursery, green houses, Poultry, Shed-net, poly-houses, Shet-tale, mineral water purifying plant etc. These all suitable factors are also change the situation in the tribal areas. No doubt, in future the cropping pattern will be change in the study area.
14. After the study of land use and cropping pattern we will get some conclusions that if the farmers of this area will think about the climatic condition, physiography, soil types, new farming technologies, there may be considerable changes in their future cropping pattern. High proportion of population is engaged in agricultural activities. For enhancing the production of all crops, farmers should discuss with various farming universities, experts practiced agricultural scientists and farmers. In the study area, intensive subsistence agriculture is found. Because of farmers are cultivating various crops in their small size of field to fulfill their daily needs.

REFERENCES:

1. Ahmednagar District Censes Hand book (1991): 'Series 14, Part xii A and B', Govt. Central Press, Mumbai (MS).
2. B. K Tupe (2009): 'The Changing Cropping Pattern - A Case Study of Rahata Taluka in A.nagar dist.', unpublished M.Phil Dissertation, Submitted to Tilak Maha. Vidyapeeth, Pune, M. S, India.
3. Handbook of Agriculture (2011): Indian Council of Agricultural Research (ICAR), Directorate of Knowledge Management in Agriculture, New Delhi.
4. Mishra P.L. (1994): 'Agro Industrial Development in India', Mohit Publications, 3305, Darya Ganj, New Delhi.

தமிழ் தமிழியல் (சமூக, பொருளியல், வரலாற்று) 3-5 ஜூன், 2021 - அருட்தமிழ் (ISSN: 2321-984X)  
 Modern Tamizh Research (A Quarterly International Multilingual Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-984X)  
 Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
 Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvishram, Ranipet District, Tamilnadu.

S. R. WAGH & ANDKADAM V. C.

1100

5. Pune District Censes Hand book (1991); Govt. Central Press, Mumbai (MS).
6. Tupe B. K (2014): 'Land use and Cropping Pattern Changes - A Case Study of Akole Tahsil in A.nagar Dist.', unpublished Ph.D Thesis, Submitted to SPPU, Pune, M. S, India.

□□□

தமிழ் ஆய்வுகள் (தமிழ்-பன்னாட்டுத் தமிழ் அறிவியல்) 3-5 ஜூன், 2021 - கலந்துரை (ISSN: 2321-9840)  
Modern Tamizh Research (A Quarterly International Multilateral Tamizh Journal) 3 to 5 June, 2021 - Special Issue (ISSN : 2321-9840)  
Three Days Multi-Disciplinary International Webinar On "The Impact of Liberalization, Privatization and Globalization (ICLPG-2021)"  
Organized by: P.G. & Research Department of History, C. Abdul Hakeem College (Autonomous), Melvishram, Rasipet District, Tamilnadu.

30. Studies on antibacterial activity of *Aegle Marmelos* mediated Y<sub>2</sub>O<sub>3</sub> nanoparticles

© 2021 JETIR March 2021, Volume 8, Issue 3

www.jetir.org (ISSN-2349-5162)

## Studies on antibacterial activity of *Aegle Marmelos* mediated Y<sub>2</sub>O<sub>3</sub> nanoparticles

<sup>1</sup>Sanjay R. Kale\*, <sup>2</sup>Varsha S. Garule, <sup>3</sup>Komal R. Jagtap and <sup>3</sup>Dilip R. Thube.<sup>1</sup>Department of Chemistry, Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati, 413102, Dist. Pune Maharashtra (INDIA).<sup>2</sup>Department of Microbiology, Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati, 413102, Dist. Pune Maharashtra (INDIA).<sup>3</sup>Professor, Department of Chemistry and Research Center, New Arts Commerce and Science College, Parner, 414302, Dist. Ahmednagar, Maharashtra (INDIA)  
E-mail: [latesanjan29@gmail.com](mailto:latesanjan29@gmail.com) (\* Corresponding Author)

**Abstract:** Green synthesis of Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>) nanoparticles was carried out using *Aegle Marmelos* (Bael) leaves aqueous extract as a reducing and capping agent. The synthesized metal complex was calcined at 800°C. The produced nanoparticles (NPs) were characterized by using various instrumental techniques. The characteristic study clearly indicates that the synthesized Y<sub>2</sub>O<sub>3</sub> nanoparticles are a crystalline material having cubic structure of agglomerated Y<sub>2</sub>O<sub>3</sub> NPs with particle size ~ 34nm identifies the presence of elements yttrium and oxygen with Y-O-Y and O-Y-O metal oxide linkages. This report is on the results of the antibacterial studies carried out by using synthesized *Aegle Marmelos* extract mediated Y<sub>2</sub>O<sub>3</sub> NPs revealed an increasing rate of antibacterial behavior with selected microorganisms.

### 1. Introduction:

Nanotechnology is one of the fastest developing sciences during last few years. Nanosized inner transition metal oxides, in variety of morphologies have attracted a great deal of attention due to their superior physico-chemical properties which are associated with various potential applications in the fields like catalysis<sup>1</sup>, delivery vehicles for drugs<sup>2,3</sup>, antimicrobial activity<sup>4,5</sup>.

Nowadays green route can be adopted in the synthesis of metal and metal oxide nanoparticles using plant material. The plant extract mediated method for the synthesis of nanoparticles is one of the easy, safer and non-toxic methods which have gained more interest towards environmentally conscious products. The metal and metal oxides nanoparticles have been considered as promising material that possesses remarkable antibacterial properties caused by their high surface area<sup>6</sup>. The bacteria must be controlled because it causes infection to human, contributes to several non-infectious chronic diseases and also contaminates in the open water. To control and minimize the problems caused by the bacteria, Y<sub>2</sub>O<sub>3</sub> NPs is one of the key material which can leads to cell death of bacteria in a non-toxic way to environment. Therefore in this study we use leaves extract of *Aegle Marmelos* plant to synthesize Y<sub>2</sub>O<sub>3</sub> NPs and further applied for antibacterial activity. The *Aegle Marmelos* is a traditional plant also known as Bael belongs to Rutaceae family and have been used in medicine and medical applications to cure ophthalmia, catarrh, deafness, aggravations, diabetes and asthma throughout centuries in India. The leaves extract of *Aegle Marmelos* was used to synthesize ZnO NPs<sup>7</sup> and Silver NPs<sup>8</sup> for their antimicrobial activity had been reported. Biosynthesis of Y<sub>2</sub>O<sub>3</sub> NPs using *Acalypha indica* leaf extract and their antibacterial study<sup>9</sup> has been reported. Green synthesis and characterization of Y<sub>2</sub>O<sub>3</sub>, CuO and BaCO<sub>3</sub> NPs using *Azadirachta Indica* (Neem tree) fruit aqueous extract has been reported<sup>10</sup>. Y<sub>2</sub>O<sub>3</sub> is a well known and widely used as a host material in the field of biological imaging and photodynamic therapy<sup>11</sup>, still there is no report found on antibacterial activity of *Aegle Marmelos* extract mediated Y<sub>2</sub>O<sub>3</sub> NPs.

The work presented in this report includes studies on antibacterial activity of *Aegle Marmelos* mediated Y<sub>2</sub>O<sub>3</sub> nanoparticles with selected human pathogen.

## 2. Materials and Method to study the Antibacterial Activity

Green synthesis of *Aegle Marmelos* mediated  $Y_2O_3$  NPs was carried out by using Yttrium nitrate hexahydrate ( $Y(NO_3)_3 \cdot 6H_2O$ ) was purchased from Alfa Aesar and aqueous leaves extract of *Aegle Marmelos* (Bael tree) by homogenous precipitation method. The precipitate formed is dried and calcined in a muffle furnace at  $800^\circ C$  for 4 hour to obtain  $Y_2O_3$  NPs. The *Aegle Marmelos* mediated  $Y_2O_3$  NPs was applied for antibacterial activity against *Escherichia coli* (*E. coli*), *Pseudomonas aeruginosa* (*P. aeruginosa*), *Serratia marcescens* (*S. marcescens*) and *Klebsiella pneumonia* (*K. pneumonia*). The studies on the antibacterial activity was done using disc diffusion method and Turbidimetric method by using colloidal solution of  $Y_2O_3$  NPs.

## 3. Results and Discussion

Recently nanomaterials have become a tool against multidrug- resistant bacteria<sup>12, 13</sup>. These nanomaterials can be used as nano drugs that can act individually or along with antibacterial compounds against bacteria. Nanomaterials are also used as drug delivery systems which gave more therapeutic efficacy and enhanced physicochemical properties. The metal oxide NPs are one of the most studied nanomaterials against multidrug resistant bacteria. The antibacterial properties associated with metal oxide NPs are due to their special characteristics like increased surface to volume ratio with decrease in the particle size, nanoparticles stability, Van der Waals forces (hydrophobic interactions) and electrostatic attraction. These characteristics allow NPs to show their antibacterial activity through multiple mode of mechanisms which includes damage to the membrane and bacterial cell wall, damage to proteins and internal components of bacteria, release of ions, DNA damage and oxidative stress with generation of reactive oxygen species<sup>14</sup>.

As mentioned above, the smaller the size of NPs, the greater their surface to volume ratio. The increase in surface to volume ratio of NPs improves their ability to interact with various components of bacterial cell and exercise their antibacterial activity<sup>15</sup>. The size and shape of NPs is one of the main factors of their antibacterial power along with other factors like type of synthesis, precursors and parameters used. It was reported that the NPs with smaller size and spherical shape had higher antibacterial activity due to quick response and release of metal ion that can penetrate the defense of bacteria<sup>16</sup>.

Another factor reported for antibacterial effect was the electric charge present on the surface of metal oxide NPs<sup>17</sup>. There are three types of microorganisms- Gram positive, Gram negative and endospores. The NPs showed antibacterial activity against Gram positive and Gram negative bacteria while endospores were least sensitive to metal oxide NPs<sup>18</sup>. The bacteria are able to regulate the electrical charge on their surfaces and therefore they can repel NPs with positive, negative or neutral charges from their surfaces<sup>19</sup>. The metal oxide NPs with positive charge are found to be most effective against Gram positive and Gram negative bacteria. This is due to attraction occurs between NPs and bacterial surface bearing negative charge. In some report<sup>20</sup> it was suggested that there are some bacterial species which have mechanisms to generate resistance to the charge present on the surface of NPs. This may be due to modulating the electrical charge on their surface by envelope stress response (ESR) and protect the integrity of bacterial cell.

There was a report<sup>21</sup> which suggest that the metal oxide NPs releases the toxic ions into bacterial cell causing additive, antagonistic and synergistic effects resulting in the death of bacterial cell. Also there were some reported mechanisms<sup>22</sup> for antibacterial activity like generation of reactive oxygen species (ROS) and oxidative stress by metal oxide NPs which causes damage to the internal components of bacterial cell such as structural proteins, enzymes, DNA, respiratory chain<sup>23</sup>.

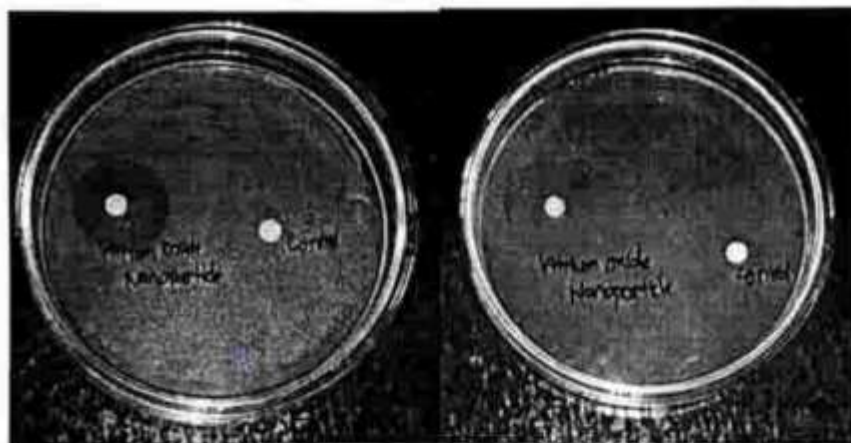
The antibacterial activity of  $Y_2O_3$  nanoparticles (NPs) was determined against representative Gram-positive microorganisms i.e. *Escherichia coli*, *Pseudomonas aeruginosa*, *Serratia marcescens* and *Klebsiella pneumonia*. The *E. coli* is the characterized bacterium mostly used as model bacterial systems for different antibacterial testing protocols, The *P. aeruginosa* is involved in hospital acquired infections (HAIs), urinary

© 2021 JETIR March 2021, Volume 8, Issue 3

www.jetir.org (ISSN-2349-5162)

tract infections and wound infections, The *S. marcescens* is found in soil, water, skin flora and manmade environments which cause diseases in human and animals, while *K. pneumonia* is an opportunistic gut bacteria normally live in intestines and feces, which are harmless when they are in intestine but if they spread to another part of body they can cause severe infections in the urinary and respiratory tracts.

The antibacterial activity of  $Y_2O_3$  nanoparticles was examined by disc diffusion method. In this method the  $Y_2O_3$  NPs laden disk is prepared by keeping the disks in 5 ml colloidal solution of  $Y_2O_3$  NPs for two days. These disks absorb  $Y_2O_3$  NPs and become dry free form chloroform. For the antibacterial susceptibility testing by the Kirby- Bauer method, the cultures of different microorganisms under study were used as reference strains. The bacterial suspensions were applied uniformly on the surface of Muller Hinton agar (MHA) plate in the concentration range of  $10^3 - 10^6$  CFU  $ml^{-1}$  before placing the  $Y_2O_3$  NPs laden disk. The strains were cultured on nutrient agar plate. The plates with the disk were incubated aerobically at  $35^\circ C$  for one day. Afterwards the average diameter of the inhibition zone surrounding the disk was measured with scale. Fig. 1- 4 shows plates with *E. coli*, *P. aeruginosa*, *S. marcescens* and *K. pneumonia* bacterial suspension were applied with NPs laden disk and antibiotic impregnated disks. The diameter of inhibition zone surrounding the disk in presence of  $Y_2O_3$  NPs in *E. coli*, *P. aeruginosa* and *S. marcescens* bacterial suspension are 8, 9.5 and 11 mm, respectively while *K. pneumonia* do not show any remarkable zone of inhibition. (Table 1)

Fig.1: Inhibition of *Escherichia coli*Fig.2: Inhibition of *Pseudomonas aeruginosa*

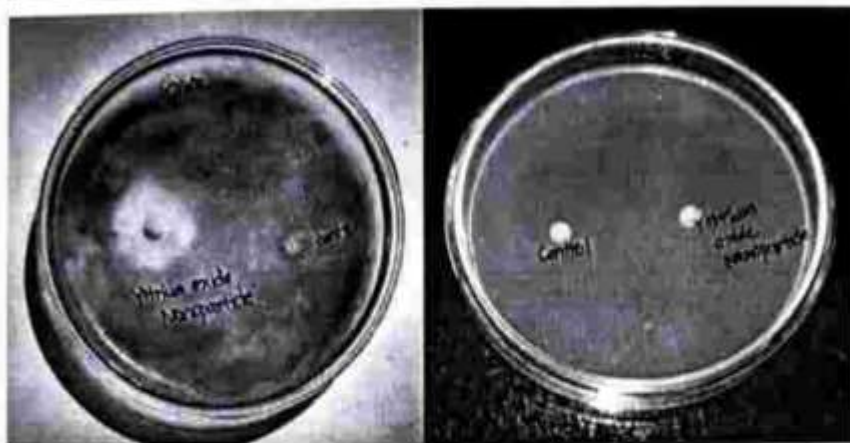


Fig.3: Inhibition of *Serratia marcescens*

Fig.4: Inhibition of *Klebsiella pneumonia*.

Table 1: Inhibition in growth of microorganisms due to  $Y_2O_3$  nanoparticles.

Sr. No.	Indicator Microorganism taken for study	Inhibition zone diameter (mm)
1	<i>Escherichia coli</i>	8
2	<i>Pseudomonas aeruginosa</i>	9.5
3	<i>Serratia marcescens</i>	11
4	<i>Klebsiella pneumonia</i> .	--

The antibacterial effects of  $Y_2O_3$  nanoparticles are also studied by determining the minimum concentration required to inhibit the growth of microorganisms under study. In this method, the antibacterial behavior of  $Y_2O_3$  NPs against *E. coli*, *P. aeruginosa*, *S. marcescens* and *K. pneumonia* in Luria Bertani (LB) broth is studied. For that purpose, 24 hour old cultures were inoculated into LB broth supplemented with various concentrations of  $Y_2O_3$  nanoparticles (2, 4, 6, 8 and  $10 \mu g.ml^{-1}$ ) while  $Y_2O_3$ - free LB broth was used as control. The broth containing tubes were incubated at room temperature under stirring for 24 hour and the vulnerability of the tested microorganisms was observed by determining optical density (O.D.) values at 600 nm using UV-Visible spectrophotometer. It reflects the growth rate of different microorganisms, *E. coli*, *P. aeruginosa*, *S. marcescens* and *K. pneumonia* with various concentrations of  $Y_2O_3$  nanoparticles. The growth curves (Fig. 5 - 8) represents the inhibitory effect of various concentrations of  $Y_2O_3$  nanoparticles. This study shows that the growth rate of microorganisms was decreased with increase in concentration of  $Y_2O_3$  nanoparticles and the maximum inhibition for growth was obtained at  $10 \mu g.ml^{-1}$  (Table 2)

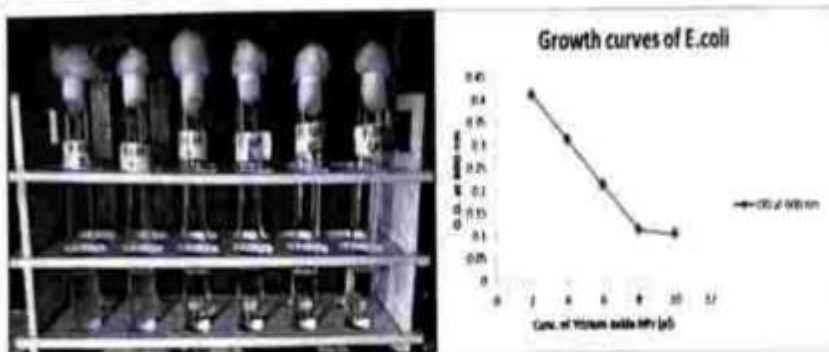


Fig.5: MIC of *Escherichia coli*

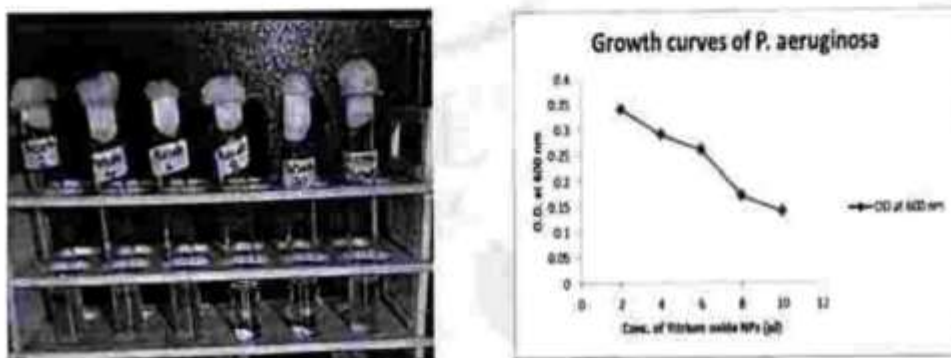


Fig.6: MIC of *Pseudomonas aeruginosa*

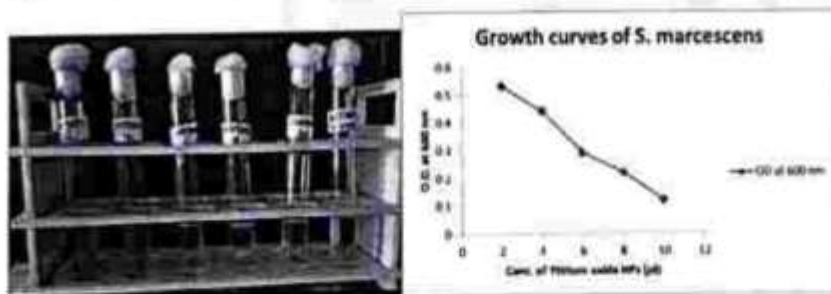


Fig.7: MIC of *Serratia marcescens*

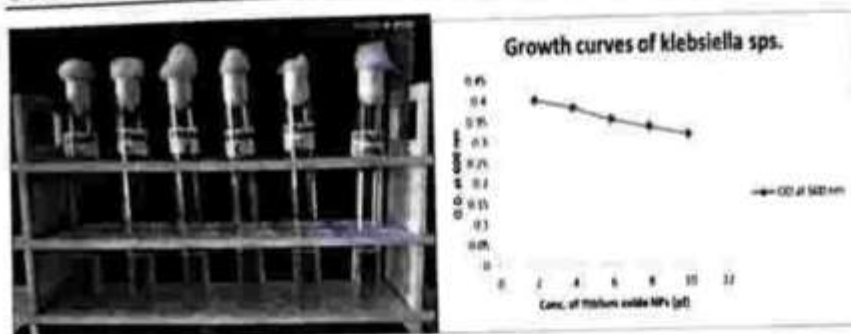


Fig.8: MIC of *Klebsiella pneumonia*

Table 2: MIC in  $\mu\text{g.ml}^{-1}$  of  $\text{Y}_2\text{O}_3$  nanoparticles against tested microorganisms.

Microorganism →	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. marcescens</i>	<i>K. pneumonia</i>
MIC in $\mu\text{g.ml}^{-1}$ of $\text{Y}_2\text{O}_3$ nanoparticles→	8	8	10	10

The detailed mechanism of antibacterial activity and inhibition of growth of microorganisms using  $\text{Y}_2\text{O}_3$  nanoparticles was not very well known yet, but it was believed that in presence of  $\text{Y}_2\text{O}_3$  NPs the cellular proteins in the microorganisms became inactive when they penetrates into microorganisms and inactivated their enzymes. During this process  $\text{H}_2\text{O}_2$  gas liberates which is responsible for the death of cells of microorganisms. The heavy metal like Yttrium is toxic which react and bind with cellular protein molecule, inhibits the cellular mechanism and causes death of microorganism.

This experimental study confirmed that the  $\text{Y}_2\text{O}_3$  nanoparticles can show antibacterial behavior and therefore used as effective growth inhibitors against various microorganisms during preparation of various antibacterial control systems and effective inhibitory nanomedicines.

#### 4. Conclusion

In the field of nanotechnology a considerable attention has been directed towards use of plant materials to synthesize metallic oxide nanoparticles with green approach by developing suitable, reliable and eco-friendly method. The present study fulfils the objectives of green synthesis by adopting a simple, fast and economical approach for preparation of *Aegle Marmelos* mediated  $\text{Y}_2\text{O}_3$  nanoparticles. The experimental results confirmed that the synthesized *Aegle Marmelos* mediated  $\text{Y}_2\text{O}_3$  nanoparticles are stable with an average size about 34.58 nm. It was proved that these nanoparticles have antibacterial activity against *Escherichia coli*, *Pseudomonas aeruginosa*, *Serratia marcescens* and *Klebsiella pneumonia* bacteria.

The achievement of such green synthesis of  $\text{Y}_2\text{O}_3$  nanoparticles could be the alternative and be useful in the field of biomedicine for their antibacterial properties. Therefore, this green method is one of the eco-friendly, economical and effective process to synthesis  $\text{Y}_2\text{O}_3$  NPs and it may lead to the further study on use of *Aegle Marmelos* in the area of biomedical and nanotechnology.

#### References:

1. Shaban S.A. *Egyptian Journal of Chemistry*, 55(5), 453-473 (2012)
2. Soppimath K.S, Aminabhavi T.M, Kulkarni A.R. *J. Control. Release*70 1(2001)



3. Kreuter J. *Adv. Drug Delivery. Rev.* **47** 65 (2001)
4. El-Aify E.A. Attya M. and Shaban M.F. *Egyptian Journal of Chemistry*, **58**(6), 671-680 (2015)
5. Kannan S.K. and Sundrarajan M. *Bull. Mater. Sci. Ind. Acad. of Sciences*, **38**(4), 945-950 (2015)
6. Mirzaei H. Darroudi M. *Ceramic. Int.* **43**, 907-914 (2017)
7. Fowsiya J. Asharani I.V. Madhumitha G. *Green Process Synth.* **8**, 488-495, (2019)
8. Patil S. Shivraj R. Rajiv P. *Int. J. Pharm Pharm Sci.* **7** (6) 169-173, (2015)
9. Kannan S.K. Sundrarajan M. *Bull. Mater. Sci.* **38** 4 945-950, (2015)
10. Hamadneh I. Alhayek H. Al-Mobydeen A. *Egyptian Journal of Chemistry*, **62**(4), 573-581 (2019)
11. Andelman T, Gordonov S, Busto G, Moghe P.V. *Nanoscale Res. Lett.* **5**, 226 (2010)
12. Fowsiya J. Asharani I.V. Mohapatra S. Madhumitha G. *Green process Synth* **8**, 488-495 (2019)
13. Sugden R. Kelly R. Davies S. *Nat Microbiol.* **1**, 16187 (2016)
14. Besinis A. De Peralta T. Handy R.D. *Nanotoxicology*, **8**, 1-16. (2014)
15. Azam A. Ahmed A.S. Oves M. Khan M. Memic A. *Int. J. Nanomed.*, **7**, 3527 (2012)
16. Khalandi B. Asadi N. Milani M. Davaran S. Abadi A. *J.N. Drug Res.* **11**, 70-76 (2017)
17. Feris K. Otto C. Tinker J. Hanna C. *Langmuir*, **26**, 4429-4436 (2009)
18. Haggstrom J.A. Klabsude, K.J. Marchan, G.L. *Nanoscale*, **2**, 399-405 (2010)
19. Nabavizadeh M. Abbaszadegan A. Gholami A. Kadkhoda Z. *J. Microbiol.*, **10** (2017)
20. Abbaszadegan A. Gholami Y. Gholami A. *J. Nanomater.*, **16**, 53(2015)
21. Wang D. Gao Y. Lin Z. Yao Z. Zhang W. *Aquat. Toxicol.*, **154**, 200-206 (2014)
22. Li M. Zhu L. Lin D. *Environ. Sci. Technol.*, **45**, 1977-1983(2011)
23. Tang S. Zheng J. *Adv. Health. Mater.* **1701503** (2018)



  
DR. D. R. THUBE  
RESEARCH GUIDE IN CHEMISTRY  
New Arts, Commerce & Science College  
Parner, Dist. Ahmednagar

### 31. New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes with 6-chloro-5,7-dimethyl-4-oxo-4H-chromene-3-carbaldehydes and its heteroleptic complexes with quinoline-8-ol: synthesis, characterization and antimicrobial activity

Research on Chemical Intermediates  
<https://doi.org/10.1007/s11164-020-04280-y>



#### New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes with 6-chloro-5,7-dimethyl-4-oxo-4H-chromene-3-carbaldehydes and its heteroleptic complexes with quinoline-8-ol: synthesis, characterization and antimicrobial activity

Nitin H. Kolhe, et al. [full author details at the end of the article]

Received: 12 April 2020 / Accepted: 18 September 2020  
© Springer Nature B.V. 2020

#### Abstract

In the present study, the synthesis of ligand 6-chloro-5,7-dimethyl-4-oxo-4H-chromene-3-carbaldehydes by three steps from the substituted phenol. The formed product in the first step was further processed by Fries rearrangement reaction and subsequently Vilsmeier–Haack reaction. Then, its homoleptic and heteroleptic complexes with Mn(II), Co(II), Ni(II) and Cu(II) metal ions by using second ligand quinolin-8-ol were synthesized. The ligand and complexes were characterized by different techniques, such as electron dispersive spectroscopy and elemental analysis (CHN), Fourier transform infrared (FTIR), electronic spectroscopy and magnetic susceptibility, <sup>1</sup>H-Nuclear magnetic resonance spectroscopy and mass spectra of ligand, electron spin resonance (ESR), thermogravimetric analysis, powder X-ray diffraction, scanning electron microscopy (SEM) and molar conductivity. The spectroscopic analysis like NMR and the FTIR shows that the both ligands are bidentate in nature. The UV–visible spectra show the homoleptic complex of Cu(II) shows square planer, while M=Ni(II), Co(II) and Mn(II) shows octahedral in nature. While the complexes with heteroleptic ligands from square planer geometry with Cu(II) and Ni(II) while Co(II) and Mn(II) show octahedral geometries. The geometry was also supported by magnetic susceptibility and FTIR spectra. The ESR spectra of Cu(II) complexes shows both are square planer geometry and the G-value was more than 4 indicating the absence of exchange interaction between Cu(II) metal ions in the solid state. The powder X-ray diffraction was used to determine the crystal system of all the complexes, while supporting to this X-ray diffraction the SEM was also taken for the nanostructure of complexes was developed or not. Then, the solution state conductivity of the complexes shows electrolytic in nature. Further, these complexes were evaluated for its antimicrobial activity by agar

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s11164-020-04280-y>) contains supplementary material, which is available to authorized users.

Published online: 07 October 2020

Springer

well diffusion method and structure–activity relationship. The ligands show antimicrobial activity against *S.typhi*. The Ni(II) does not show antibacterial activity, while complexes Cu(II), Co(II) and Mn(II) shows good activity against the gram-positive and the gram-negative bacteria. The heteroleptic ligand complex (6) of Cu(II) shows higher antifungal activity as compared with Ni(II), Co(II) and Mn(II) complexes.

**Keywords** Chromones derivatives metal complexes · EPR · TGA · Antimicrobial

## Introduction

This is a trend in coordination chemistry to synthesize the heteroleptic ligand complexes. In this study, the bidentate heterocyclic ligands contain donor atom N, O and O, O was selected for synthesis of the complexes. The organic heterocyclic compounds such as flavonoids and the famous ligand quinolin-8-ol. The flavonoids are the naturally occurring heterocyclic compound can be synthesized by a previous reported method [1, 2] and from which the inorganic coordination complexes can be prepared. The substituted chromones were naturally present in different parts of the plants. The most of substituted chromones shows biological activities [3]. The activity included antibacterial, antitumor, antifungal, antioxidant, antiallergic, antiviral, anti-inflammatory and anticancer activities [4, 5]. The chromones are synthesized by the cyclodehydration of 1-(O-hydroxyaryl)- 1,3 diketones or by Vilsmeier–Haack reaction [5]. We are interest in the synthesis of 3-formyl chromones derivatives because of their pharmaceutical and chemical importance [6]. They form coordination complex with transition metal ion. They form attractive intermediates which may lead to form the complexes [7]. The literature survey show that there is work found to be done on chromone metal-chelate complexes but not on the mixed ligands complexes. Therefore, we are interest in the coordination complexes of chromones with transition metal ion like Mn(II), Co(II), Ni(II) and Cu(II) ion as well as its heteroleptic ligand complexes with quinolin-8-ol.

Mixed-ligand complexes have attracted a considerable interest as a result of their vital function in biological processes. Several papers have reported synthesis and spectral characterization of mixed-ligand complexes as well as their potential applications [8, 9]. It was reported that the presence of heterocyclic nitrogen donor ligands including N, N-donor such as 1, 10-phenanthroline or N, O-donor such as 8-hydroxyquinoline or glycine lead to a significant improvement of the biological and pharmacological properties of the complexes [10–17]. The some of the metal-chromone complexes show the antimicrobial activity was checked by well diffusion methods, and the inhibition zone was measured in mm-scale [18–20].

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

## Experimental

### Materials and methods

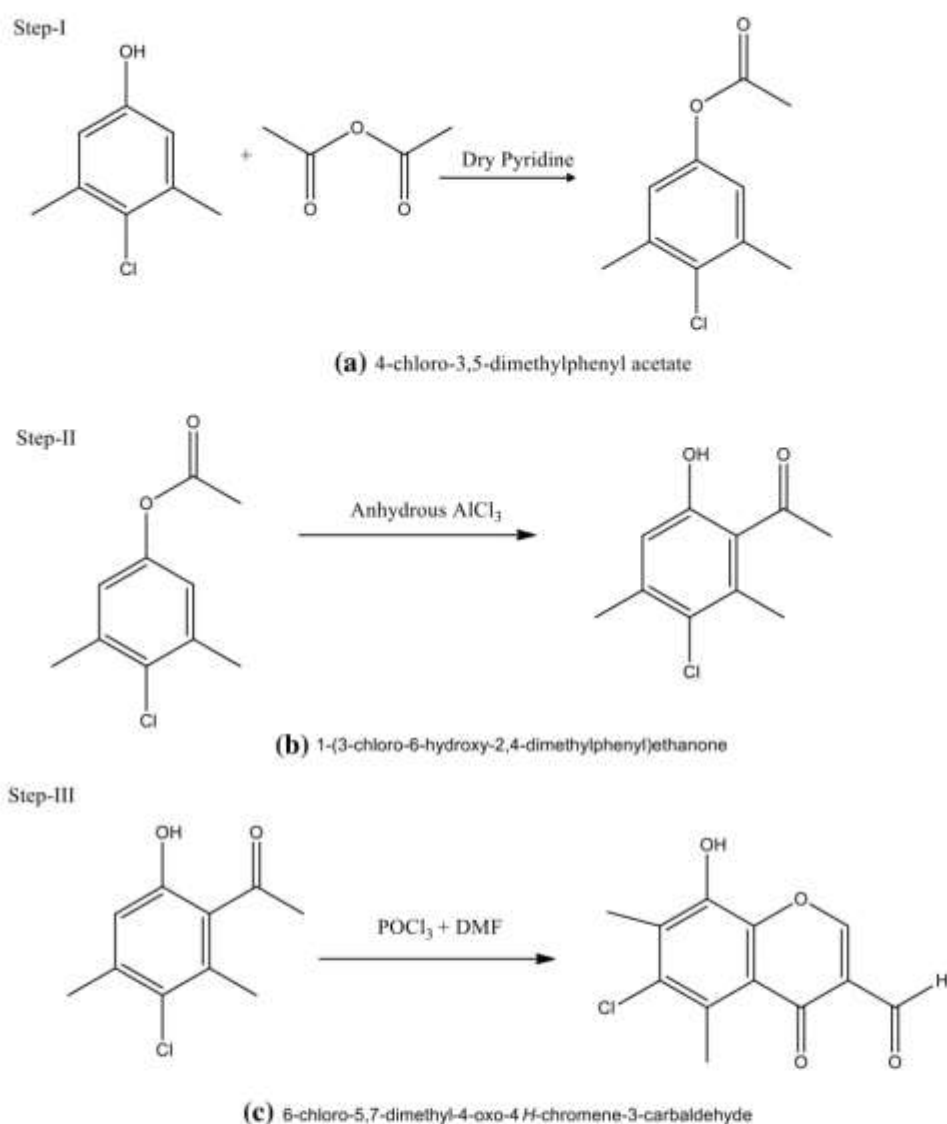
Metal salts like  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ ,  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ ,  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ ,  $\text{MnCl}_2 \cdot 5\text{H}_2\text{O}$  (99.90%, Merck) quinolin-8-ol,  $\text{POCl}_3$  (99.98%, Merck), dry Pyridine, anhydrous  $\text{AlCl}_3$  (99.98%, Merck) ethanol, methanol, DMSO, DMF, chloroform and acetic acid (98.99%, Merck) were used as it is for synthesis of ligand and its metal complexes.

A melting point of the synthesized organic ligands was determined on digital melting point/boiling Point apparatus EQ-730 equiptronics and is uncorrected. Elemental analyses of C, H and N were done on a JEOL C, H and N elemental analyzer at the SAIF, Indian Institute of Technology (IIT-Powai), Mumbai University and the SEM and EDS from department of physics Savitribai Phule Pune University Pune. The electronic spectra for ligands and complexes were recorded on UV-1800 Shimadzu spectrophotometer in the range 200–800 nm. The electronic spectra of all the complexes were taken at  $10^{-3}\text{M}$  concentration in the DMSO and DMF solution. The magnetic susceptibility was recorded on Gouy balance method at room temperature by using  $\text{Hg}[\text{Co}(\text{SCN})_4]$  as the calibrate. The FTIR spectra (KBr Pellets) were measured on IRAffinity-1 Shimadzu FTIR spectrophotometer in the range  $4000\text{--}400\text{ cm}^{-1}$ .  $^1\text{H}$  NMR spectral measurements were performed on Bruker Ascend™ 500 MHz spectrometer. The reported chemical shifts were against TMS; DMSO- $d_6$  solvents were used for chromone derivative ligand at Department of Chemistry, Savitribai Phule Pune University. LC–MS measurements of organic ligand were performed on UHPLC-Ultimate-3000; thermo scientific LC–MS spectrometer at Department of Chemistry, Savitribai Phule Pune University was used for characterization. ESR spectra were obtained from JEOL Japan JES FA200 ESR spectrometer with X-band at room temperature. The ESR spectra obtained from SAIF, IIT Powai University of Mumbai. The thermal analysis was measured from room temperature to  $1000\text{ }^\circ\text{C}$  in air and cobalt complexes in nitrogen atmosphere heated at non-isothermally with heating rate  $10\text{ }^\circ\text{C}/\text{min}$ . Using TGA-50 Shimadzu thermogravimetric analyzer. The powder X-ray diffraction studies of complexes were taken for determination of crystal structure of complexes. The molar conductance of complexes was recorded on an Elico conductivity bridge in DMF  $10^{-4}\text{ M}$  solution using a dip-type conductivity cell fitted with a platinum electrode.

### Synthesis of Ligand: 6-chloro 5, 7 dimethyl-4oxo-4H-chomene-3- carbaldehyde

The ligand 6-chloro 5, 7 dimethyl-4oxo-4H-chomene-3- carbaldehyde was synthesized by the Vilsmeier–Haack reaction [21, 22]. The synthesis of 6-chloro 5, 7 dimethyl-4oxo-4H-chomene-3- carbaldehyde derivative was performing by three steps. The first step is the synthesis of 4-chloro-3, 5, dimethyl phenyl acetate (Scheme 1a) from 1 mol of 4-chloro-3, 5 dimethyl phenols by reacting with 1.15 mol acetic anhydride in the presence of 5 mL dry pyridine by reported method (Schemes 2 and 3).

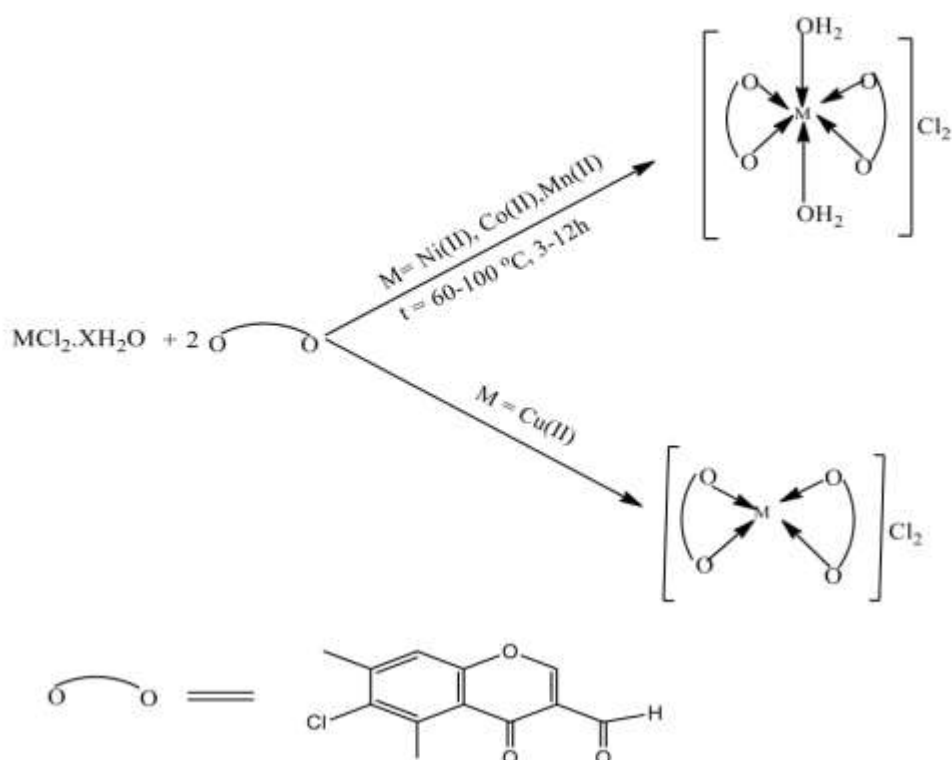
N. H. Kolhe et al.



**Scheme 1** Synthetic route for ligand (L2)

The second step is Fries rearrangement reaction for preparation of acetophenone derivative that is 1-(3-chloro-6-hydroxy-2,4-dimethylphenyl)ethanone (b) from 4-chloro-3,5-dimethylphenyl acetate (a) by using 1.25 mol of anhydrous  $\text{AlCl}_3$  in large one neck round bottom flask attach with air condenser. Then, in adding the 1 mol of aryl acetate rapidly. The exothermic reaction occurs with evolution of HCl gas. After complete evolution of HCl gas, the whole reaction mixture kept in oil bath and reflux it at temperature in between  $140\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$  for 2 h. Then, the reaction mixture allowed standing for overnight. The complex thus formed was broken by adding ice-cold water in round bottom flask. The separated

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

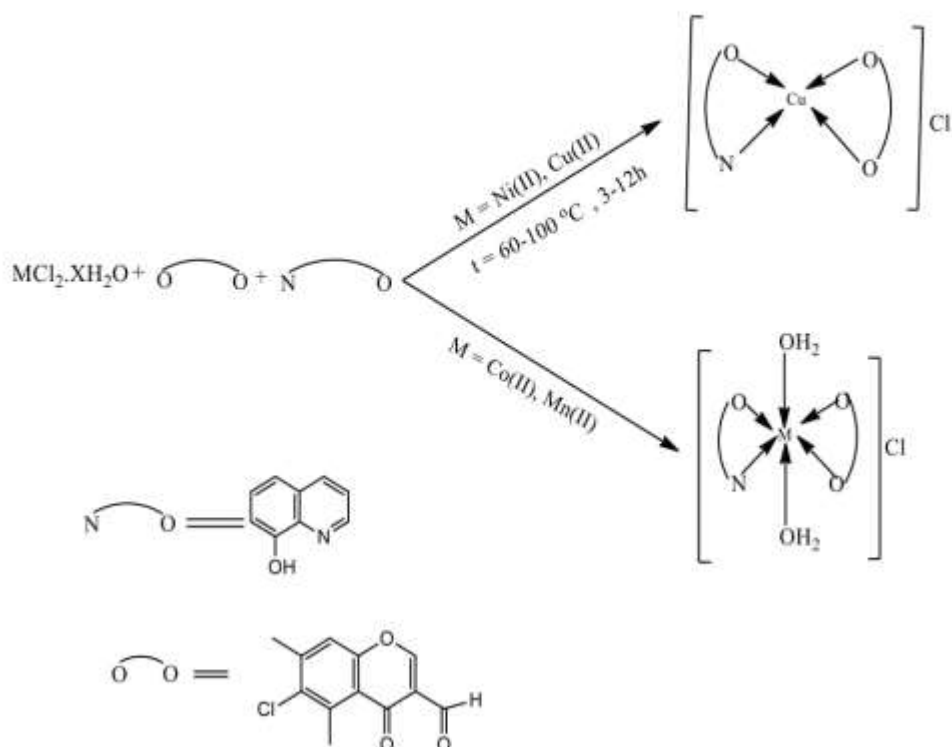


Scheme 2 Synthesis route of M-L2 complexes

product was filtered and recrystallized from aqueous alcohol. This is a Fries reaction (Scheme 1. Step-II (b)) by literature method [23, 24].

The last step is the synthesis of 6-chloro-5,7-dimethyl-4-oxo-4H-chromene-3-carbaldehyde by taking the 25 mL dimethylformide and 15 mL  $\text{POCl}_3$  in round bottom flask with constant stirring by using magnetic needle. The whole reaction mixture was kept in ice bath then adding 15 mL  $\text{POCl}_3$  drop wise. The whole reaction mixture was stirred on magnetic stirrer for about 1 h to get pink formylating complex [25]. Then, 0.05 mol of product (b) dissolved in minimum amount of DMF. Then, it was added into the pink formylating complex maintaining temperature of the mixture below  $20 \text{ }^\circ\text{C}$ . Then, reaction mixture was stirred for 2 h. The reaction mixture was allowed to stand at room temperature for overnight. The reaction mixture was poured into the crushed ice with vigorous stirring. The product (c) was precipitated as yellow solid of 6-chloro-5,7-dimethyl-4-oxo-4H-chromene-3-carbaldehyde, filtered and recrystallized from acetic acid: ethanol (1:1 ratio) (Scheme 1. Step-III (c)).

N. H. Kolhe et al.



Scheme 3 Synthetic route of heteroleptic complexes

### Synthesis of the homoleptic complexes

#### Synthesis of Ni(II), Cu(II), Co(II) and Mn(II) complexes with 6-chloro-5,7 dimethyl-4-oxo-4H-chromene-3-carbaldehyde

**Synthesis of Ni(II) complex:  $[C_{24}H_{22}Cl_4NiO_8]$  (1)** The complex Ni(II) was synthesized by adding methanolic solution of nickel chloride hexahydrate (0.118 g, 1 mol) to a methanolic (10 mL) solution of 6-chloro-4-oxo-4H-chromene-3-carbaldehyde (1) (0.236 g, 2 mol) in the presence of 2–3 drops of acetic acid with vigorous stirring. Then, this solution was reflux at 80–90 °C for 12 h. After 12 h of refluxing, the solution was kept for overnight. The color of the solution change occurs from green to orange. Then, 2–3 drops of distilled water were added the complex get solidify with dark orange colored, after which the orange colored solid was filtered and air dried. The weight of product was 0.427 g, (78.20%).

**Synthesis of Cu (II) complex:  $[C_{24}H_{18}Cl_4CuO_6]$  (2)** The ligand 0.225 g. of 6-chloro-5, 7 dimethyl-3-formyl-chromenes was dissolved in 25 mL acetic acid: methanol (1:1) and was refluxed. To this refluxed ligand solution, 25 mL methanolic solution of  $CuCl_2 \cdot 2H_2O$  (2.02 g, 1 mol) was added drop by drop with continuous stirring, and the resulting reaction mixture was further refluxed for 3 h and allow to stand

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

for overnight. The dark olive green solid was separated out, and it was filtered and washed with methanol. The complex was dried at room temperature in vacuum.

**Synthesis of Co(II) complexes:**  $[C_{24}H_{22}Cl_4CoO_8]$  (**3**) The recrystallized ligand 6-chloro-5-7-dimethyl-4-oxo-4H-chomene-3-carbaldehyde (0.11 g, 2 mol) was dissolved in 10 mL methanol with acetic acid. The cobaltous chloride (0.238 g, 1 mol) was dissolved in 10 mL methanol. The ligand solution was added into Co(II) salt solution with constant stirring. The whole mixture was refluxed for 8 hat temperature 60–80 °C. The color of the solution became dark red. The solution was evaporated up to the near dryness. The complex was filtered and dried in vacuum. The whole reaction was carried out in inert medium.

**Synthesis of Mn(II) complexes:**  $[C_{24}H_{22}Cl_4MnO_8]$  (**4**) The methanolic solution in the presence of acetic acid (10 mL) of 6-chloro- 5-7-dimethyl-4-oxo-4H-chomene-3-carbaldehyde (2 mmol, 0.238 g) was added drop wise to a stirred water–methanol (1:1, 10 mL) solution of Mn(II) salt (1 mmol). The mixture was refluxed with constant stirring for 6 h at 60–80 °C temperature. The solution was cooled overnight at room temperature. The precipitated complex was filtered off, washed several times with cold methanol and dried at room temperature.

**Synthesis of heteroleptic ligand complexes of quinolin-8-ol and 6-chloro- 5-7-dimethyl- 4-oxo-4H-chomene-3-carbaldehyde with Ni (II), Cu (II) and Co (II) metal ions**

**Synthesis of Ni(II) complexes:**  $[C_{21}H_{15}Cl_2NNiO_4]$  (**5**) The mixture of 10 mL methanolic solution of  $NiCl_2 \cdot 6 H_2O$  (0.237 g, 1 mol), and 10 mL methanolic solution in the presence of acetic acid of 6-chloro- 5-7-dimethyl-4-oxo-4H-chomene-3-carbaldehyde (0.236 g, 1 mol) and quinolin-8-ol (0.145 g, 1 mol) was added slowly at temperature 90–100 °C. The time to time methanol was added into the reaction mixture. The pH 8–9 was adjusted by addition of sodium hydroxide. Then, after some time the complexes get solidify. Then, the solution was filter and washed with methanol and dried in air.

**Synthesis of Copper complex:**  $[C_{21}H_{15}Cl_2CuNO_4]$  (**6**) The heteroleptic ligand complex of 6-chloro-5-7-dimethyl-4-oxo-4H-chomene-3-carbaldehyde (0.472 g 2 mol) and quinolin-8-ol (0.290 g, 2 mol) was dissolved in 10 mL hot methanol and acetic acid. The methanolic solution of copper chloride (0.340 g, 2 mol) was added into the ligand solution. Then, whole mixture was refluxed for 4 h to get precipitate of complex. The solution was filtered through Buchner funnel and washed with cold methanol and dried in vacuum.

**Synthesis of Cobalt complex:**  $[C_{21}H_{19}Cl_2CoNO_6]$  (**7**) To a methanolic solution, the dehydrated complex (**3**) was added into the methanolic solution of the quinolin-8-ol. The mixture was refluxed for 10–12 h to get the brown colored solid. The solid was filtrated and washed with methanol and dried into the vacuum. During



the preparation of complex, the nitrogen gas was bubbled in the reaction mixture to prevent the oxidation of Co(II) into Co(III).

**Synthesis of Mn(II) complex:  $[C_{21}H_{19}Cl_2MnNO_6]$  (8)** The 10 mL methanolic: acetic acid solution of L2 (0.238 g, 1 mol) was added with stirring to a 10 mL solution containing Mn(II) metal ion (0.158 g 1 mol) to get brown colored solution. To this resulting solution, a 10 mL methanolic solution of quinolin-8-ol was added with stirring which yielded reddish brown solid. The solid was filtrated, washed with methanol and dried in vacuum.

### Antimicrobial activity study

Antibacterial activity of newly synthesized compounds was tested against the bacterial strains, *Salmonella Typhi* and *Bacillus subtilis* by a agar well diffusion method reported earlier [26]. In this method, petri dishes containing 20 mL of nutrient agar medium were spread with 100  $\mu$ L of bacterial suspension ( $\approx$  1 O.D.). The wells of 9 mm diameter were prepared on the nutrient agar plates with the help of a sterile cork borer. The test compounds were diluted appropriately, and 100  $\mu$ L of each diluted compounds was (100  $\mu$ L) added into different wells, separately. The plates were allowed to diffuse at 4  $^{\circ}$ C for 10 min. Further, all plates were incubated at 37  $^{\circ}$ C for 24 h and observed for zone of growth inhibition. The obtained zones of inhibition were compared with zones of standard antibiotic ciprofloxacin as positive control and DMSO as negative control. The antifungal activity of newly synthesized compounds was tested against the two fungal strains, *Aspergillus niger* and *Alternaria alternata* by a agar well diffusion method reported earlier [27]. The fungal strains were maintained on peptone-dextrose agar slants at 30  $^{\circ}$ C. In this method, standard antifungal agent fluconazole was considered as positive control and DMSO as negative control. All the experiments were carried out in triplicate.

### Result and discussion

The analytical data along with some physical properties of the ligand and its metal complexes are summarized in Table 1.

The elemental analysis of all complexes was analyzed by EDS/EDX spectrum and CHN analyzer. This shows the stoichiometry of complexes matched with percentage of C, H, N and O. The metal, chloride analysis was also done by EDS spectra. Some of the complexes were analyzed by EDS and CHN analyzer (supplementary figure S1).

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

**Table 1** The physical properties and analytical data of the ligand and their metal complexes

Sr. No.	Complexes	Color	Mol. Wt.	M.P °C	%Yield	EDX analysis calculated (found)C, H, N, O analysis						Molar conductance $\Omega^{-1}\text{cm}^2\text{mol}^{-1}$
						C	H	O	N	Cl	M	
<b>L1</b>	$[\text{C}_9\text{H}_7\text{NO}]$	White	145.15	74	-	74.47 (74.50)	4.86 (4.86)	11.02 (11.00)	9.65 (9.58)	-	-	-
<b>L2</b>	$[\text{C}_{11}\text{H}_9\text{O}_3\text{Cl}]$	Yellow	208.59	162 °C	73.46	60.90 (60.84)	3.83 (3.81)	9.55 (9.50)	-	14.98 (14.86)	-	-
<b>1</b>	$[\text{C}_{24}\text{H}_{22}\text{Cl}_4\text{NiO}_6]$	Green	638.93	202 d*	68.12	45.12 (45.10)	3.47 (3.45)	20.03 (20.00)	-	22.03 (22.10)	9.19 (10.11)	88.30
<b>2</b>	$[\text{C}_{24}\text{H}_{18}\text{Cl}_4\text{CuO}_6]$	Dark green	607.74	194d*	70.95	47.43 (47.10)	2.99 (3.02)	15.82 (15.80)	-	23.33 (24.01)	10.46 (11.11)	76.4
<b>3</b>	$[\text{C}_{24}\text{H}_{22}\text{Cl}_4\text{CoO}_6]$	Brown	639.17	113 d*	64.48	45.10 (44.95)	3.47 (3.47)	20.03 (20.19)	-	22.19 (22.10)	9.22 (9.50)	56.10
<b>4</b>	$[\text{C}_{24}\text{H}_{22}\text{Cl}_4\text{MnO}_6]$	Chocolate brown	635.17	167 d*	69.52	45.38 (45.30)	3.49 (3.45)	20.15 (20.14)	-	22.33 (22.19)	8.65 (9.05)	40.32
<b>5</b>	$[\text{C}_{21}\text{H}_{15}\text{Cl}_2\text{NNiO}_4]$	Celery green	474.94	385 d*	69.23	53.11 (53.22)	3.18 (3.16)	13.47 (13.24)	2.95 (2.45)	14.93 (14.04)	12.36 (12.23)	80.21
<b>6</b>	$[\text{C}_{21}\text{H}_{15}\text{Cl}_2\text{CuNO}_4]$	Hunter Green	479.80	193 d*	72.38	52.57 (51.07)	3.15 (3.56)	13.34 (13.64)	2.92 (2.71)	14.78 (13.48)	13.24 (12.89)	33.62
<b>7</b>	$[\text{C}_{21}\text{H}_{19}\text{Cl}_2\text{CoNO}_6]$	Metalllic Bronze	511.21	200 d*	56.60	49.34 (48.53)	3.75 (4.10)	18.78 (18.15)	2.74 (2.55)	13.87 (13.00)	11.53 (11.23)	74.75
<b>8</b>	$[\text{C}_{21}\text{H}_{19}\text{Cl}_2\text{MnNO}_6]$	Brown	507.22	205 d*	64.78	49.73 (48.96)	3.78 (3.70)	18.93 (18.90)	2.76 (2.64)	13.17 (13.12)	10.83 (11.23)	87.61

d\* = decomposition temperature, **L1** = Quinolin-8-ol, **L2** = 6-chloro-5,7-dimethyl-4oxo-4H-chromene-3-carbaldehyde

### Fourier transformer infrared spectra

In order to study the bonding mode of ligand to metal in the complex, FTIR spectrum of the free ligands **L1** and **L2** was compared with the spectra of their metal complexes.

The free ligand **L2** exhibits FTIR band at,  $\nu_{C=O}$  ( $1718\text{ cm}^{-1}$ ) belong to aldehyde group of pyrone ring [28]. The frequency  $1656\text{ cm}^{-1}$  indicates  $\nu_{C=O}$  belong to cyclic carbonyl group which are present to pyrone ring that is cyclic ketone [29]. The frequency  $916\text{--}946\text{ cm}^{-1}$  indicates enone system in resonance with aldehyde and conjugated double bond [30].

In the FTIR spectra of all the complex (**1**)–(**8**), the band of  $\nu_{C=O}$  was shifted to lower frequency by some units in all the complexes indicate bonding toward metal [31]. The another band of frequency  $1656\text{ cm}^{-1}$  was found to decrease by  $2\text{--}56\text{ cm}^{-1}$  unit toward  $1600\text{ cm}^{-1}$ . That was attributed to donation of electron from  $\nu_{C=O}$  group of cyclic ketone. The infrared of prepared complexes has shown bands of  $\nu_{M-O}$  group in the infrared characteristics frequencies [32–34] are given in the Table 2.

In case of heteroleptic ligand complexes (**5**)–(**8**), the  $\nu_{M-N}$  bond frequency is obtained due to the quinolin-8-ol bonded toward the metal through one of the nitrogen and second of the oxygen. The characteristic frequency of  $\nu_{M-N}$  band obtained in between  $635\text{ cm}^{-1}$  and  $825\text{ cm}^{-1}$  depends on the metal complexes, while in complexes (**1**)–(**4**) lies in range  $612\text{--}683\text{ cm}^{-1}$  depends on the metal ions interact with ligands [35].

### Electronic spectra and magnetic studies

The electronic spectra of ligand **L2** were shown the  $26,246.72\text{ cm}^{-1}$  and another band at  $35,211.27\text{ cm}^{-1}$  indicate  $n\text{--}\pi^*$  and  $\pi\text{--}\pi^*$  transition, respectively [29, 30]. The electronic spectrum (Supplementary figure S2) of the complex was measured at  $26\text{ }^\circ\text{C}$  in  $10^{-3}\text{ M}$  concentration DMSO solvent. The electronic spectra for Ni(II) complexes (**1**) and (**5**) shows three bands at  $21,091.26\text{ cm}^{-1}$ ,  $30,374.83\text{ cm}^{-1}$  and  $20,233.49\text{ cm}^{-1}$ ,  $32,412.81\text{ cm}^{-1}$  and  $47,619.05\text{ cm}^{-1}$ , respectively. The (**5**) shows band assignment is due to the  ${}^3A_{2g} \rightarrow {}^3T_{2g}$ ,  ${}^3A_{2g} \rightarrow {}^3T_{1g}$  and  ${}^3A_{2g} \rightarrow {}^3T_{1g}$  (P) transitions. The complex (**1**) shows magnetic moment  $2.92\text{ BM}$  indicates the complex (**1**) is paramagnetic in nature having octahedral geometry. While the complex (**5**) doesn't show magnetic moment, it indicates that the complex (**1**) shows square planer geometry [36, 37].

The electronic spectral data of complex (**2**) showed in the range at  $27,100.27\text{ cm}^{-1}$  due to the  ${}^2B_{1g} \rightarrow {}^2B_{2g}$  transition. While complex (**6**) shows  $26,041.67\text{ cm}^{-1}$  this band was attributed to the transition of electron from  ${}^2B_{1g} \rightarrow E_g$  and the complex (**6**) display another bands at  $32,258.06\text{ cm}^{-1}$  corresponding to the intra-ligand transitions and an expected blue shift was observed compared with the ligand. This is compatible with this complex having square planer geometry. This is supported by magnetic moment values for complex (**2**) and (**6**) were  $1.83\text{ BM}$  and  $1.84\text{ BM}$ , respectively, this indicates that complexes have square planer geometry [38–41].

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

**Table 2** FTIR frequencies of the bands of ligands and its complexes

Sr.No.	Compound/Complexes	$\nu_{\text{H}_2\text{O}}$ $\text{cm}^{-1}$	$\nu_{\text{C=O}}$ (Pyron) $\text{cm}^{-1}$	$\nu_{\text{C=N}}$ $\text{cm}^{-1}$	$\nu_{\text{C-O}}$ $\text{cm}^{-1}$	$\nu_{\text{C=O}}$ $\text{cm}^{-1}$	$\nu_{\text{M-N}}$ $\text{cm}^{-1}$	$\nu_{\text{M-O}}$ $\text{cm}^{-1}$
<b>L1</b>	[C <sub>9</sub> H <sub>7</sub> NO]	-	-	1425 $\text{cm}^{-1}$	1215 $\text{cm}^{-1}$	-	-	-
<b>L2</b>	[C <sub>12</sub> H <sub>9</sub> O <sub>3</sub> Cl]	-	1656 $\text{cm}^{-1}$	-	1310 $\text{cm}^{-1}$	1718 $\text{cm}^{-1}$	-	-
<b>1</b>	[C <sub>24</sub> H <sub>22</sub> Cl <sub>4</sub> NiO <sub>8</sub> ]	3371 $\text{cm}^{-1}$	1654 $\text{cm}^{-1}$	-	1335 $\text{cm}^{-1}$	1715 $\text{cm}^{-1}$	-	639 $\text{cm}^{-1}$
<b>2</b>	[C <sub>24</sub> H <sub>18</sub> Cl <sub>4</sub> CuO <sub>6</sub> ]	3461 $\text{cm}^{-1}$	1648 $\text{cm}^{-1}$	-	1326 $\text{cm}^{-1}$	1750 $\text{cm}^{-1}$	-	641 $\text{cm}^{-1}$
<b>3</b>	[C <sub>24</sub> H <sub>22</sub> Cl <sub>4</sub> CoO <sub>8</sub> ]	3335 $\text{cm}^{-1}$	1616 $\text{cm}^{-1}$	-	1343 $\text{cm}^{-1}$	1742 $\text{cm}^{-1}$	-	612 $\text{cm}^{-1}$
<b>4</b>	[C <sub>21</sub> H <sub>15</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]	3253 $\text{cm}^{-1}$	1600 $\text{cm}^{-1}$	-	1399 $\text{cm}^{-1}$	1742 $\text{cm}^{-1}$	-	683 $\text{cm}^{-1}$
<b>5</b>	[C <sub>21</sub> H <sub>15</sub> Cl <sub>2</sub> CuNO <sub>4</sub> ]	3457 $\text{cm}^{-1}$	1648 $\text{cm}^{-1}$	1512 $\text{cm}^{-1}$	1367 $\text{cm}^{-1}$	1722 $\text{cm}^{-1}$	517 $\text{cm}^{-1}$	825 $\text{cm}^{-1}$
<b>6</b>	[C <sub>21</sub> H <sub>10</sub> Cl <sub>2</sub> CoNO <sub>6</sub> ]	3529 $\text{cm}^{-1}$	1648	1503 $\text{cm}^{-1}$	1458 $\text{cm}^{-1}$	1739 $\text{cm}^{-1}$	436 $\text{cm}^{-1}$	635 $\text{cm}^{-1}$
<b>7</b>	[C <sub>21</sub> H <sub>19</sub> Cl <sub>2</sub> MnNO <sub>6</sub> ]	3502 $\text{cm}^{-1}$	1617 $\text{cm}^{-1}$	1539 $\text{cm}^{-1}$	1467 $\text{cm}^{-1}$	1704 $\text{cm}^{-1}$	508 $\text{cm}^{-1}$	644 $\text{cm}^{-1}$
<b>8</b>	[C <sub>21</sub> H <sub>15</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]	3384 $\text{cm}^{-1}$	1602 $\text{cm}^{-1}$	1476 $\text{cm}^{-1}$	1458 $\text{cm}^{-1}$	1721 $\text{cm}^{-1}$	527 $\text{cm}^{-1}$	752 $\text{cm}^{-1}$

N. H. Kolhe et al.

The complex (3) and (7) is the complex of Co(II) metal ion. These complexes were found to have octahedral geometry. The electronic spectral band occurs at  $27,244.99\text{ cm}^{-1}$ ,  $32,953.27\text{ cm}^{-1}$  and  $38,463.02\text{ cm}^{-1}$ ,  $13,605.44\text{ cm}^{-1}$ ,  $17,032.87\text{ cm}^{-1}$  and  $28,955.29\text{ cm}^{-1}$ . The band observed is assigned to the transition  ${}^4T_{1g}(F) \rightarrow {}^4T_{2g}(F)$ ,  ${}^4T_{1g} \rightarrow {}^4A_{2g}(F)$  and  ${}^4T_{1g}(F) \rightarrow {}^4T_{2g}(P)$ , respectively, it is suggesting that both the Co (II) complexes are octahedral geometry. The result of electronic spectra was supported by magnetic moment values for complex (3) and (7) were 4.92 BM and 5.05 BM, respectively [42–45].

The spectrum for complex (4) and (8) shows two bands at  $29,585.80\text{ cm}^{-1}$  and  $34,843.21\text{ cm}^{-1}$ , respectively, which may be assigned to  ${}^6A_{1g} \rightarrow {}^4E_g(G)$  and the  ${}^6A_{1g} \rightarrow {}^4E_g(D)$  transition and is suggestive of octahedral geometry. The magnetic moment of Mn(II) complexes (4) and (8) measured on Gouy balance methods at room temperature. The value for complex (4) and (8) was found about 5.86 BM and 5.93 BM this result was supported to electronic spectrum and possible structures [46].

### ${}^1\text{H}$ spectra of ligand

The NMR spectra of the free ligand L2 have been recorded in DMSO- $d_6$ . The ligand exhibits aromatic and aldehyde proton. The spectrum shows all proton signals was singlet. The signal for the aldehyde proton appeared at  $\delta$  10.32 ppm. The other signals are occurs at  $\delta$  8.4(S, 1H), 7.27(S, 1H), while the two methyl groups attached to the 3-formylchromenes moiety were appeared at  $\delta$  2.51(S 3H) and  $\delta$  2.99 (S, 3H) the

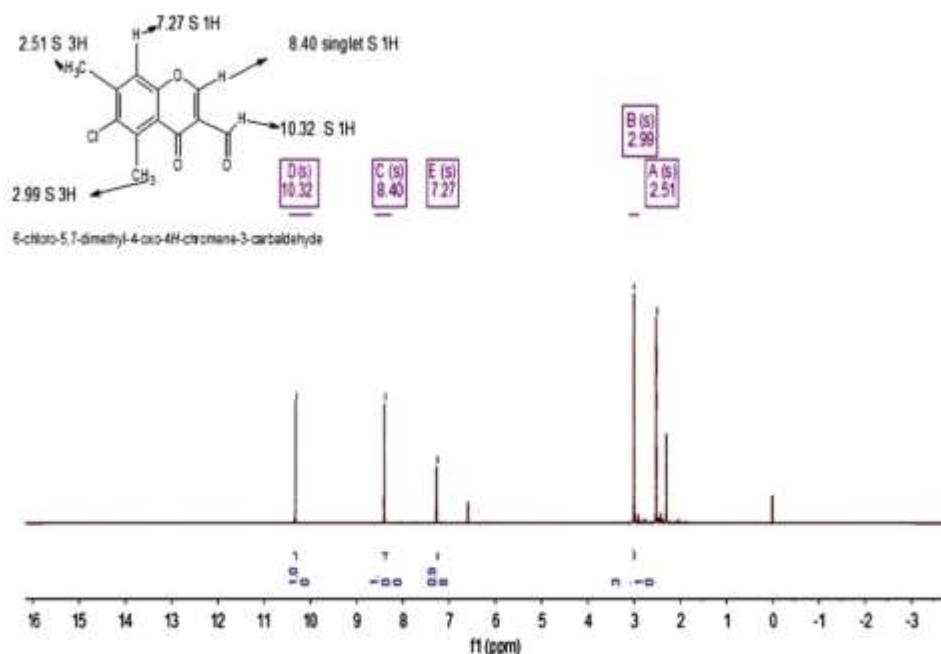


Fig. 1 NMR spectra of ligand (L2)

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

second methyl proton get deshielded due to resonance effect. The NMR spectrum is shown in Fig. 1.

### Mass spectra of ligand

The mass spectra of the 6-chloro-5-7-dimethyl-4oxo-4H-3-carbaldehyde chromone **L2** revealed the molecular ion peak at  $m/z$  237 [M+H], which is match with the chemical formula weight (236.00) for the ligand and supports the formation of the compound. The LC-MS spectra of **L2** are shown in (Supplementary figure S3).

### ESR spectra for complexes (2) and (6)

The room temperature ESR spectra of Cu(II) complexes (2) and (6) in solid state shows broad signal without hyperfine lines. They exhibit axial signal with  $g_{av}$  values 2.23 and 2.11, respectively, for the complexes (2) and (6) [47]. The  $g_{av}$  values are greater than free ion  $g$  value (2.0023), it indicates that the Cu(II) ions have axial symmetry with all the principal axes aligned parallel. Also, these higher  $g_{av}$  values of the complexes, indicating that complexes are partially covalent bond character in nature, and the ESR spectral values suggested that the complexes have square planar geometry [48].

The complex (2) and (6) have G-value were found to be 4.3466 and 4.1973, respectively. The G-values obtained for complex (2) and (6) are greater than 4, indicating the absence of exchange interaction between Cu(II) metal ions in the solid state. [49–51]. The ESR spectra of complexes are showed in Fig. 2.

### Thermogravimetric analysis of complexes

In the present work, thermal analysis was carried out to obtain information about the thermal stability of the prepared complexes and decide whether the water or

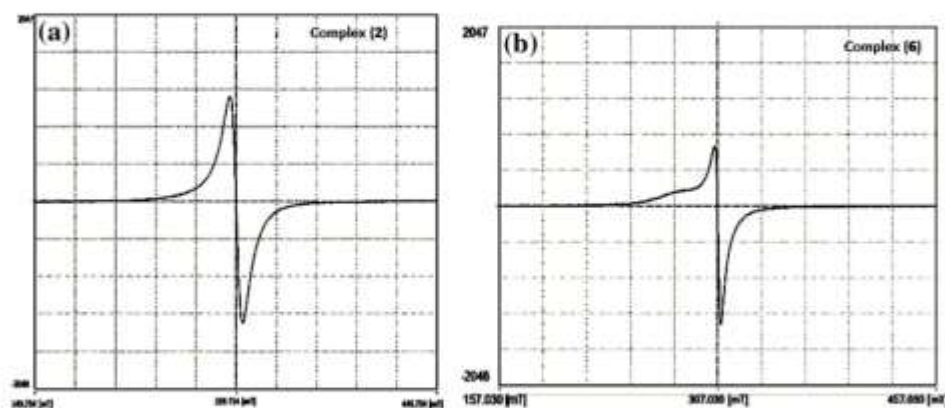
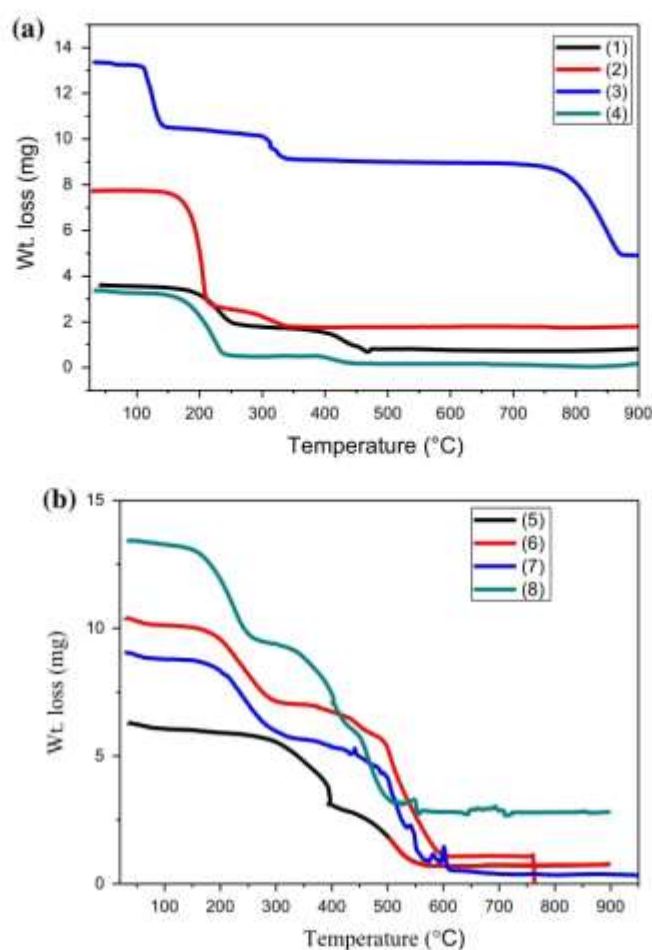


Fig. 2 ESR spectra of copper complexes (2) a. and for (6) b complexes



**Fig. 3** Thermogram of complexes **a.** (1)–(4) and **b.** (5)–(8)

solvent molecules are outside or inside the inner coordination sphere of the metal [52, 53]. The TG curves for all the metal complexes shown are in Fig. 3a complexes (1)–(4) and Fig. 3b complexes (5)–(8). The thermogravimetric analysis was done by non-isothermally with heating rate 10 °C/min up to the temperature 1000 °C. The sample undergoes some changes in air atmosphere. Metal complexes decompose continuously with evolution of gases and finally formation of respective metal oxides [54].

The TG curve of complex (1) shows that, decomposition occurs into two steps. In the first step, the chromone ligand (L2), water and chloride species were found to loss, the % weight loss was found to be 45.38%, which was attributed to theoretical % weight loss 46.19% in the temperature range 202–249 °C. The second decomposition step occurs in temperature range 429–471 °C, the % wt. loosened to be 23.30%, which matches with wt. loss 24.34% and was attributed to loss of quinolin-8-ol and formation of NiO residue.

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

The complex (2) is stable up to 190 °C. The first step show loss of 65.884% which is attributed with calculated % Wt. loss 67.68% and is equivalent to two molecules of  $[C_8H_8ClO]$  and two CO from ligand in metal-ligand complex at 190–209 °C. In second step, the % Wt. loss was 9.632% was attributed with calculated % Wt. loss 10.28% indicate the loss of  $2[C_3H_4O]$  molecules at 288.19–329.45 °C. The final decomposition product was CuO residue. The CuO residue stable up to the 1000 °C shown in Fig. 3. complex (2).

The TG curve of Co(II) complex (3) was carried out in  $N_2$  atmosphere. The complex shows two decomposition steps. The first step is accompanied by mass loss 20.43% and the second step 73.23% at temperature 113–124 °C and 307–665 °C, respectively. In the step-I, the loss of coordinated water, chloride ions, is corresponding to theoretical mass loss (19.43%). And last step was breaking of the chromones ligand, which was also match with theoretical mass loss 74.87%. The final product obtained in this complex was CoO.

The result of complex (4) shows a good agreement with the theoretical formula as suggested from the analytical data. This complex decomposes in three steps. In the first step, estimated wt. loss 3.798% (calculated mass loss 5.60%) may be attributed to the loss of two coordinated water molecules in the temperature range 167.00–200 °C. The second step is in the temperature range 236.77–415.88 °C, with an estimated mass loss 82.021% (calculated mass loss 84.80%). This was corresponding to the loss of organic chromone ligand present in the complex. The final step was horizontal plateau was observed in the temperature greater than 586 °C with estimated mass loss 15–13% for the formation of black residue of  $MnO_2$ .

The complex (5) decomposes in one step process. The procedural decomposition temperature was started at 385 °C and end with 396 °C. The theoretical percent weight loss 81.56%. This was attributed to the loss of quinolin-8-ol and chromone moiety. The practically Wt. loss is 82.49%. The remaining residue was found to be of NiO.

The Cu(II) complex (6) undergoes two step decomposition. The % wt. loss in first step was found to be 28.57%, and theoretically it was 28.43% in at temperature range 193–275 °C. This was attributed to loss of quinolin-8-ol ligand and further decomposition occurs continuously up to the temperature 553 °C. In this the wt. loss, it was found to be 64.65% is match with 65.01%. This result was attributed to loss of chromone ligand and formation of chocolate brown powder of copper oxide [55].

The complex (7) decomposes in only one step. The decomposition starts at temperature 200 °C and stop at the temperature 604 °C. Theoretically, the % wt. loss was 89.66% due to loss of both the ligands and two coordinated water molecules. The practically % wt. loss was found to be 91.095%. The complex get decomposed and formation of cobalt oxides residue [56].

The Mn(II) complex (8) is thermally stable up to the temperature 202 °C. The first decomposition step was started by percentage wt. loss 27.13, which is attributed to % wt. loss 26.76 corresponding to loss of N, O-donor ligand. Then, further the thermogram was continuous up to the temperature 551.74 °C by loss of remaining organic part of the complex. The % wt. loss was 68.87% which was match with the calculated wt. loss 69.87%. The formation of final product was  $MnO_2$  residue.





**Table 3** Powder X-ray diffraction pattern for complexes (1)–(8)

Complex	(1) [C <sub>2</sub> H <sub>22</sub> Cl <sub>4</sub> NiO <sub>6</sub> ]	(2) [C <sub>2</sub> H <sub>16</sub> Cl <sub>4</sub> NiO <sub>6</sub> ]	(3) [C <sub>2</sub> H <sub>22</sub> Cl <sub>4</sub> CoO <sub>6</sub> ]	(4) [C <sub>2</sub> H <sub>22</sub> Cl <sub>4</sub> MnO <sub>6</sub> ]	(5) [C <sub>2</sub> H <sub>16</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]	(6) [C <sub>2</sub> H <sub>16</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]	(7) [C <sub>2</sub> H <sub>16</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]	(8) [C <sub>2</sub> H <sub>16</sub> Cl <sub>2</sub> NNiO <sub>4</sub> ]
JCPDS No.	43-1973	42-1923	45-1708	83-2179	13-0739	42-1745	25-1625	46-1871
Formula weight	638.93	607.74	639.17	635.17	505.98	510.83	542.25	538.25
Crystal color	Green	Dark green	Brown	Chocolate brown	Celery green	Hunter green	Metallic bronze	Brown
Temperature(K)	298	298	298	298	298	298	298	298
Wavelength (Å)	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54
Radiation	CuKα	CuKα	CuKα	CuKα	CuKα	CuKα	CuKα	CuKα
Crystal system	Monoclinic (P)	Tetragonal	Monoclinic (P)	Orthorhombic(P)	Monoclinic (P)	Monoclinic (P)	Monoclinic (P)	Tetragonal
Space group	P2 <sub>1</sub> /c(14)	P2 <sub>1</sub> /c(14)	P2 <sub>1</sub> /c(14)	Pbam(62)	–	P2 <sub>1</sub> /c(14)	P2 <sub>1</sub> /c(14)	–
A	0.7806	–	0.5948	1.3060	2.0561	0.7806	1.1204	–
C	1.2891	1.0465	0.9911	1.2870	2.0935	1.2891	1.4263	0.8847
Z	–	–	2	4	–	4	2	–
a (Å)	11.88(3)	9.448	7.4725(7)	12.45	11.00	6.978(1)	7.91(7)	15.18
b (Å)	15.22(4)	18.646	12.5635(14)	9.534	5.35	12.71(2)	7.06(14)	15.18
c (Å)	19.623(6)	9.018	12.4516(14)	12.27	11.230	23.10(5)	10.07	13.43
α (°)	90	90	90.00	90	90	90	90.00	90
β (°)	90	113.62	102.80(9)	90	106	97	101.3	90
γ (°)	90	90	90.00	90	90	90	90.00	90
ab	0.7757	0.5067	0.9911	0.9855	2.0935	1.8166	1.4263	0.9855
cb	0.6056	0.4836	0.5948	0.7657	2.0561	0.5488	1.1204	0.7657
Volume	3549.47	1455.62	1139.90	1456	1455.62	2034.44	551.45	1456

N. H. Kothari et al.

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

### Powder X-ray diffraction study

The powder XRD pattern (Supplementary figure S4) of all the homoleptic and heteroleptic complexes was recorded over the  $2\theta=20-80^\circ$  range [57, 58]. The all metal complexes exhibit crystalline nature. This XRD study also one of the evidence about formation of metal-ligand complexes. The XRD unit cell parameter such as crystal nature, bravis lattices, diffraction angles, cell length and volume is illustrated in Table 3. The complexes (1) to (4) shows sharp peak (Fig. 5) as compared with the heteroleptic ligand complexes (5)–(8). The heteroleptic ligand complexes shows broad peak indicating the formation of nanocrystalline nature of the complexes.

### Scanning electron microscopy

The external surface structure of all the complexes has been illustrated by scanning electron microscopy.

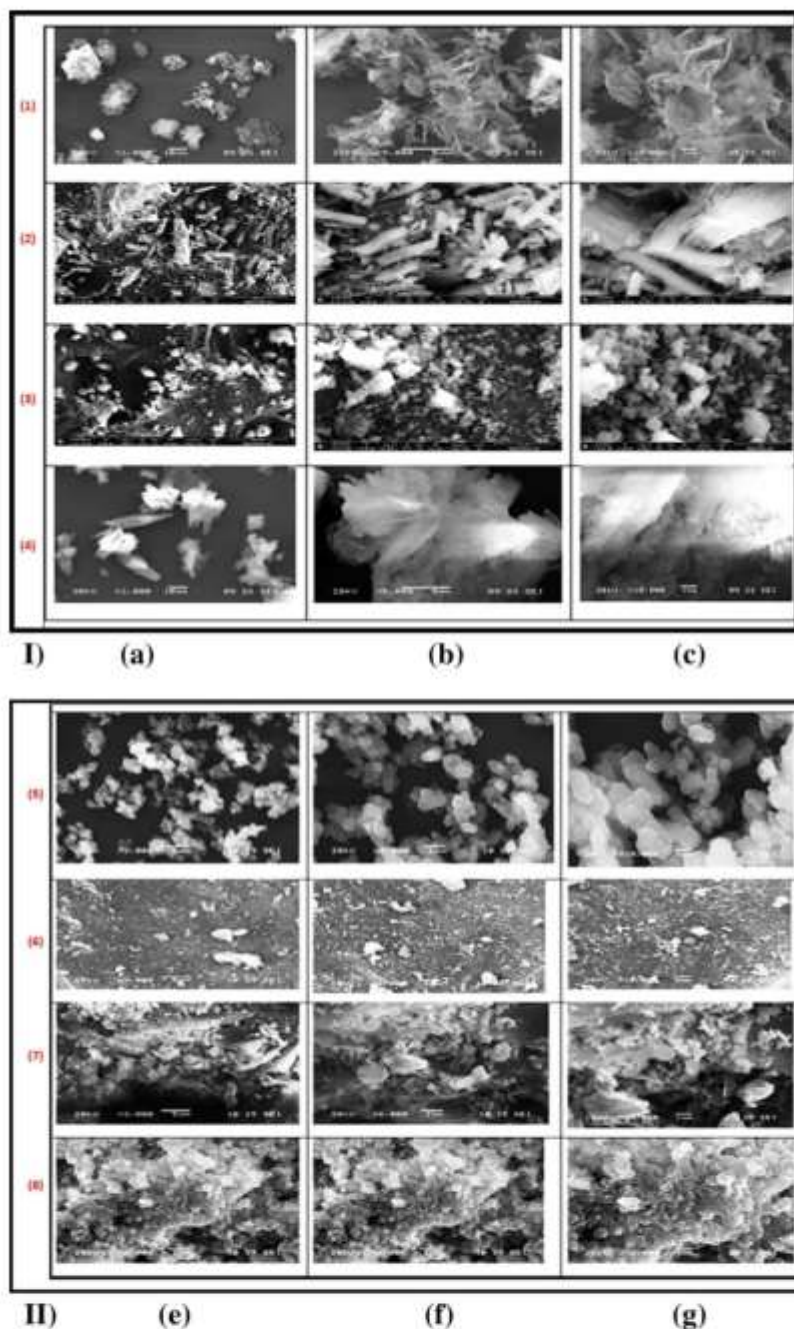
The SEM micrographs of all eight complexes are shown in Fig. 4 The complex (1)–(4) shows flower, foil, mushroom and ice-stone like morphology, respectively [59, 60]. While its heteroleptic metal complexes of chromones derivatives changes the morphology in case of complex (5)–(8). The micrograph of complexes shows spherical ball shape, sheet like, rock and the rough rock-type morphology. The grain size of heteroleptic ligand metal complexes (5)–(6) was determined from Scherer's equation [54]. This was found 5.03 nm, 4.43 nm, 5.4254 and 42.31 nm, respectively. It was clearly indicate that formation of nanocrystalline complexes [61, 62].

### Molar conductance

The molar conductance of the complexes is measured in DMSO because of the all complexes are soluble in it. The concentrations  $10^{-3}$  M of all complexes were made at 25 °C. The observed conductance values are moderate for the all complexes, it indicate that the complexes were electrolytic in nature (Table 1).

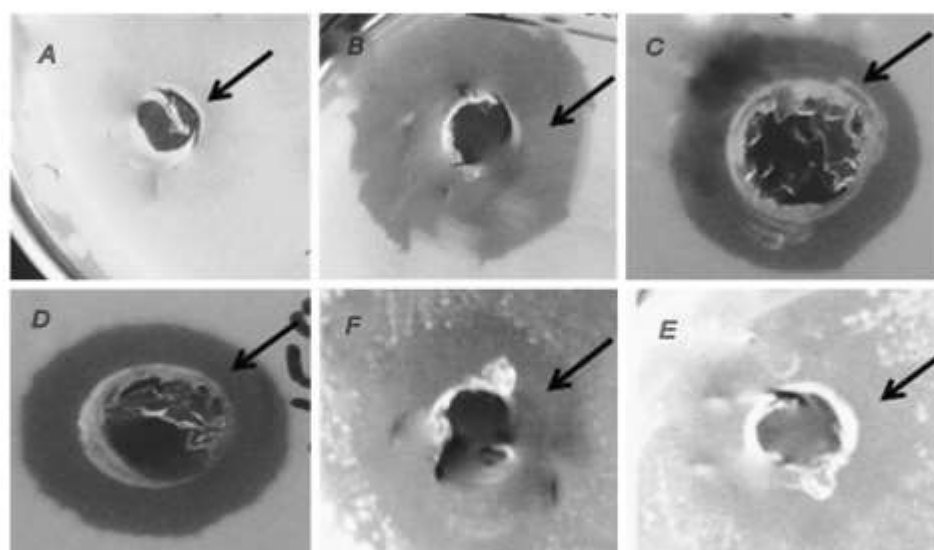
### Antimicrobial activity

The antibacterial activity of newly synthesized compounds was tested against the two bacterial strains, *S. typhi* and *B. subtilis*. A representative Fig. 5 and Table 4 show maximum zone of growth inhibition of L1 on nutrient agar plates. This indicates that L1 has highest antibacterial activity against both gram-positive and gram-negative bacteria when compared with its zone of inhibition with other compounds. In contrary, L2 complex (2), (3), (4), (6) and (7) have moderate antibacterial activity when compared with control. Similar antibacterial activity of silver and gold nanomaterials is reported earlier [63]. It was also seen that complex 5 and 8 did not showed any antibacterial activity. Thus, the study revealed that variation in antibacterial activity might be due to varying in size and chemical nature of compounds. Similarly, antifungal activity of these compounds was tested against two fungi, *A. niger* and *A. alternata* as shown in Table 4. The order of compounds for its antifungal



**Fig. 4** SEM images of the all (1–8) complexes with morphography. (I) For complex(1)–(4) in the scale of (a) The left hand side picture is 10  $\mu\text{m}$  scale, (b) The middle picture is 5  $\mu\text{m}$  and (c) The right hand side picture is 1  $\mu\text{m}$  in scale. (II) For complex(5)–(8) in the scale of (e) The left hand side picture is 5  $\mu\text{m}$  scale, (f) The middle picture is 2  $\mu\text{m}$  and (g) The right hand side picture is 1  $\mu\text{m}$  in scale

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...



**Fig. 5** A representative images of antimicrobial activity of **L1** with (a) control [without **L1**] (b) *S. typhi*; (c) Antifungal activity of complex (5) against *A. Alternaria* (d, e) Antibacterial activity of complex (6) & (7) against *S. typhi* (f) Antifungal activity of complex (8) against *A. Alternaria*

**Table 4** Antimicrobial activity of ligands and metal complexes

Complex/compound	Diameter of zone of inhibition (mm)			
	<i>B. Substilis</i>	<i>S. Typhi</i>	<i>A. niger</i>	<i>A. alternata</i>
<b>L1</b>	32 ± 0.81	30 ± 0.75	35 ± 0.91	35 ± 0.91
<b>L2</b>	15 ± 0.25	13 ± 0.21	30 ± 0.80	30 ± 0.75
(1)	00	00	15 ± 0.20	18 ± 0.20
(2)	15 ± 0.15	14 ± 0.18	18 ± 0.21	25 ± 0.25
(3)	16 ± 0.16	16 ± 0.15	22 ± 0.25	22 ± 0.25
(4)	15 ± 0.15	12 ± 0.10	27 ± 0.75	30 ± 0.84
(5)	00	00	30 ± 0.72	28 ± 0.65
(6)	18 ± 0.16	15 ± 0.15	37 ± 0.82	30 ± 0.84
(7)	20 ± 0.17	16 ± 0.18	32 ± 0.81	24 ± 0.15
(8)	00	00	30 ± 0.81	28 ± 0.81
Ciprofloxacin	40 ± 0.93	35 ± 0.71	-	-
Fluconazole	-	-	42 ± 0.95	36 ± 0.61

activity against *A. niger* was observed as follow: complex (6) > L1 > (7) > L2, complex (5), (8) > (4) > (3) > (2) > complex (1). Thus, it was seen that complex (6) shows maximum antifungal activity against the fungus, *A. niger*. The order of compounds for its antifungal activity against *A. alternata* was observed as follow: L1 > L2, complex (4 and 6) > complex (3 and 8) > (2) > (7) > (3) > complex (1). Thus, study revealed that L1 shows highest antifungal activity against the fungus, *A. alternata* as

shown in Table 4. Similar antifungal activity was also seen with metal nanomaterials reported earlier [64, 65].

### Structure–activity relationship

Several structures of flavonoids were identified which possessing antifungal, antiviral and antibacterial activity reported earlier. Many high-quality investigations carried out to understand the relationship between flavonoid structure and antibacterial activity. These investigations are in close agreement. Several flavonoid compounds showed inhibition of DNA gyrase enzyme. Many other flavonoid compounds revealed inhibition of cytoplasmic membrane function and energy metabolism. The lipophilic nature of these compounds may cause rupture of cell membrane, resulting in a collapse of vital cell functions and, consequently the cell death [66, 67]. Flavonoid-metal ions complexes penetrate more easily through cell wall due to its protein denaturation potential [68]. The 8-hydroxyquinon compound showed efficient antimicrobial activity against the gram-positive bacteria and diploid fungi reported earlier. The compound has lower lipophilic in nature get easily adsorb on the bacterial cell wall contain hydrophilic polysaccharides and charged amino acids in their peptidoglycan [69]. The electron microscopic study also revealed that quinolin-8-ol compound disrupt the bacterial cell walls which caused the cell lysis and cell death [70]. The quinolin-8-ol has metal chelating property, they form different metal complexes [71]. These metal complexes have similar structures and geometries. Thus, complex formation with such metals modulates the antimicrobial activity reported earlier [72, 73].

### Conclusion

The heteroleptic ligand transition metal complex of 6-chloro-5-7-dimethyl-4oxo-4H-chromene-3-carbaldehydes and quinolin-8-ol with Mn(II), Co (II), Ni (II) and Cu (II) metal ions found to be new and unreported. All the complexes were characterized by on spectral, thermal, X-ray diffraction and a number of microanalytical techniques. The composition of complexes was analyzed by C, H, O elemental analysis and EDS. It was found to be calculated % of atoms match with experimental analysis. The FTIR shows the carbonyl oxygen of Pyron and aldehyde carbonyl oxygen donate the electron to the metal and form metal-ligand complex as well as the formation of heteroleptic ligand complexes. The electronic spectra and magnetic susceptibility were suggested that the geometry and magnetic moment of particular complexes depend upon metal ions. The thermogravimetric studies indicate that the decomposition the complex and the final product were the metal oxide of corresponding to those metal complexes.

The powder XRD shows the complexes were nanocrystalline in nature. The XRD result was supported by the SEM micrograph. All the complexes were electrolytic in nature. The antimicrobial activity against *S.Typhi* shown by both the ligands. The Ni(II) does not show antibacterial activity, while complexes Cu(II), Co(II) and

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

Mn(II) shows good activity against the gram-positive and the gram-negative bacteria. The heteroleptic ligand complex (6) of Cu(II) shows higher antifungal activity as compared with Ni(II), Co(II) and Mn(II) complexes.

**Acknowledgements** Authors are thankful to Principal, Prof. Dr. P. B. Buchade, MES, Abasaheb Garware College and the Principal, Dr. B. H. Zaware, New Arts Commerce and Science College Ahmednagar for support and providing a laboratory facility.

## References

1. N.S. Joshia, B.K. Karale, C.H. Gill, S.B. Bhirud, *J. Heterocycl. Chem.* **41**(4), 541 (2004)
2. N.R. Guz, F.R. Stermitz, J.B. Johnson, T.D. Beeson, S. Willen, J. Hsiang, K. Lewis, *J. Med. Chem.* **44**, 261 (2001)
3. Z.H. Chohan, M. Arif, A. Rashid, *J. Enzyme Inhib.* **23**(6), 785 (2008)
4. C.K. Ghosh, A. Ray, A. Patra, *J. Heterocycl. Chem.* **38**, 1459 (2001)
5. A. Lazarenkow, J. Nawrot-Modranka, E. Brzezinska, U. Krajewska, M. Rożalski, *Med. Chem Res.* **21**, 1861 (2012)
6. V.Y. Sosnovskikh, V.S. Moshkin, M.I. Kodess, *Tetrahedron Lett.* **49**, 6856 (2008)
7. L.A. Cate, T.L. Lemke, *J. Pharm. Sci.* **63**, 1736 (1974)
8. R.A. Ammar, A.M. Alaghaz, M.E. Zayed, L.A. Al-Bedair, *J. Mol. Struct.* **1141**, 368 (2017)
9. M. Shebl, M.A. Ibrahim, S.M.E. Khalil, S.L. Stefan, H. Habib, *Spectrochim. Acta A* **115**, 399 (2013)
10. S. Khadem, R.J. Marles, *Molecules* **17**, 191 (2012)
11. K.L. Haas, K.J. Franz, *Chem. Rev.* **109**(10), 4921 (2009)
12. I.P. Ejidike, P.A. Ajibade, *Rev. Inorg. Chem.* **35**(4), 191 (2019)
13. Q. Liu, X. Qiang, Y. Li, Z. Sang, Y. Li, Z. Tan, Y. Deng, *Bioorg. Med. Chem.* **23**, 911 (2015)
14. M. Grazul, E. Budzisz, *Coord. Chem. Rev.* **253**, 2588 (2009)
15. P. Kavitha, K. Laxma Reddy, *Arab. J. Chem.* **9**(5), 640 (2016)
16. A. Novel, *Tetrahedron Lett.* **13**, 1183 (1974)
17. G. Pratviel, J. Bernadou, B. Meunier, *Angew. Chem. Int. Ed.* **34**, 746 (1995)
18. H.S. Selem, A.A. Emara, M. Shebl, *J. Coord. Chem.* **58**, 1003 (2005)
19. M. Pitić, C. Boldron, G. Pratviel, *Adv. Inorg. Chem.* **58**, 77 (2006)
20. J. Devi, J. Yadav, N. Singh, *Res. Chem. Intermed.* **45**, 3943 (2019)
21. K. Fries, G. Finck, *Chem. Ber.* **41**(3), 4271 (1908)
22. K. Fries, W. Pfaffendorf, *Chem. Ber.* **43**(1), 212 (1910)
23. W.L. Archer, *Curr. Org. Synth.* **4**, 331 (1953)
24. F. Millikan, E.E. Pickett, *Phytopathology* **55**, 89 (1964)
25. S.C. Nayak, P.K. Das, K.K. Sahoo, *Chem. Pap.* **57**(2), 91 (2003)
26. N.G. Kozlov, F.S. Pashkovskii, K.N. Gusak, E.V. Koroleva, A.B. Tereshko, *Russ. J. Org.* **40**(4), 555 (2004)
27. J. Sahoo, S.K. Paidesetty, *J. Taibah Univ. Med. Sci.* **12**, 115 (2017)
28. N. Raman, V. Muthuraj, S. Ravichandran, A. Kulandaisamy, *J. Chem. Sci.* **115**(3), 161 (2012)
29. S.S. Jadhav, N.H. Kolhe, A.E. Athare, *Int. J. Pharma Bio Sci.* **4**(3), 45 (2013)
30. P.J.F. Griffiths, G.P. Ellis, *Spectrochimica Acta A* **28**, 707 (1972)
31. D. Agnieszka, M. Liliana, *J. Mol. Struct.* **985**, 233 (2011)
32. M.S.A. Begum, S. Saha, A. Hussain, A.R. Chakravarty, *Indian J. Chem.* **48**, 9 (2009)
33. A. Maithub, S.S. Hudere, M.M. El-ajaily, *J. Micro Chem.* **81**, 191 (2005)
34. K.R. Seddon, *Coord. Chem. Rev.* **89**, 1 (1988)
35. N.H. Kolhe, S.S. Jadhav, *Res. Chem. Intermed.* **45**(3), 973 (2019)
36. C. Festus, A.C. Ekennia, A.A. Osowole, L.O. Olasunkanmi, D.C. Onwudiwe, O.T. Ujam, *Res. Chem. Intermed.* **44**, 5857 (2018)
37. N.K. Gondia, J. Priya, S.K. Sharma, *Res. Chem. Intermed.* **43**, 1165 (2017)
38. P. Tharmaraj, D. Kodimunthiri, C.D. Sheela, C.S. Shanmuga Priya, *J. Coord. Chem.* **62**(13), 2220 (2009)

39. R. Haddad, E. Yousif, A. Ahmed, Springer plus **2**, 510 (2013)
40. N. Raman, S. Sobha, Spectrochim. Acta, Part A **85**, 223 (2012)
41. E. Yousif, Y. Farina, K. Kasar, A. Graisa, K. Ayid, Am. J. Appl. Sci. **6**(4), 582 (2009)
42. N.S. Youssef, E.A. El-Zahany, M.M. Ali, Phosphorus Sulfur Silicon Relat. Elem. **185**, 2171 (2010)
43. C.D. Sheela, C. Anitha, P. Tharmaraj, D. Kodimunthiri, J. Coord. Chem. **63**, 884 (2010)
44. J.H. Pandya, R.N. Jadeja, K.J. Ganatra, J. Saudi Chem. Soc. **18**, 190 (2016)
45. M.A. Khattab, M.S. Soliman, Trans. Met. Chem. **8**, 285 (1983)
46. S. Sarkar, S. Biswas, M. Liao, T. Kar, Y. Aydogdu, F. Dagdelen, G. Mostaf, A.P. Chattopadhyay, G.P.A. Yap, R.-H. Xie, A.T. Khan, K. Dey, Polyhedron **27**, 3559 (2008)
47. Y. Nishida, K. Hayashida, S. Kida, J. Coord. Chem. **10**(1), 101 (1980)
48. D. Kivelson, R. Neiman, J. Chem. Phys. **35**, 149 (1961)
49. B.J. Hathaway, D.E. Billing, Coord. Chem. Rev. **5**, 1949 (1970)
50. M.V. Angelusiu, S.F. Barbuceanu, C. Draghici, G.L. Almajan, Eur. J. Med. Chem. **45**, 2055 (2010)
51. E. Richards, D.M. Murphy, M. Che, Res. Chem. Intermed. **45**, 5763 (2019)
52. M. Valko, P. Pelikan, S. Biskupic, M. Mazur, Chem. Pap. **44**(6), 805 (1990)
53. H.F. El-Shafiy, M. Shebl, J. Mol. Struct. **1156**, 403 (2018)
54. S. Chandraleka, S. Chandramohan, Afr. J. Pure Appl. Chem. **8**(10), 162 (2014)
55. Dziewulska-Kulaczewska, J. Therm. Anal. Calorim. **101**(3), 1019 (2010)
56. M. Salavati-Niasari, Z. Fereshteh, F. Dava, Polyhedron **28**, 1065 (2009)
57. M. Bal, G. Ceyhan, B. Avar, M. Kose, A. Kayraldiz, M. Kurtoglu, Turk. J. Chem. **38**, 222 (2014)
58. M. Morad, T. M. Habeebullah, I. Althagafi, B. H. Asghar, A. A. Bayazeed, T. M. Bawazeer, A. M. Al-Solimy, and N. El-Metwaly, Res. Chem. Intermed. (2020)
59. L. Almazroia, R.K. Shah, N.M. El-Metwaly, T.A. Farghaly, Res. Chem. Intermed. **45**, 1943 (2019)
60. H.Y. Zhang, X. Chen, L.J. Yao, S.Z. Chen, X.J. Sun, Res. Chem. Intermed. **46**, 521 (2020)
61. F. Rahaman, B.H.M. Mruthyunjayaswamy, Complex Met. **1**(1), 88 (2014)
62. A.S. Munde, A.N. Jagdale, S.M. Jadhav, T.K. Chondhekar, J. Serb. Chem. Soc. **75**(3), 349 (2010)
63. B.B. Mahapatra, R.R. Mishra, A.K. Sarangi, J. Saudi Chem. Soc. **20**(6), 635 (2016)
64. A. Bankar, B. Joshi, A. Ravikumar, S. Zinjarde, Colloids Surf. A **368**, 58 (2010)
65. L.N. Sharada, S.N.T. Sunitha, M. Sabha, T.L. Viveka, Y. Aparna, M. Prasad, Res. Chem. Intermed. **46**, 3341 (2020)
66. A. Bankar, B. Joshi, A. Ravikumar, S. Zinjarde, Colloids Surf. B **80**, 45 (2010)
67. T. Cushnie, A. Lamb, Int. J. Antimicrob. Agents **26**(5), 343 (2005)
68. D. Trombeta, F. Castelli, M.G. Sarpietro, V. Venuti, M. Cristani, C.S. Daniele, G. Mazzanti, G. Bisignanano, Antimicrob. Agents Chemother. **49**, 2474 (2005)
69. G.R. Andrade, M. Batistote, A.A. Cavalheiro, A. Neves, D.C.M. Rodrigues, Rev. Bras. Farmacogn. **24**, 309 (2014)
70. R.V. Goering, H.M. Dockrell, M. Zuckerman, P.L. Chiadini, I.M. Roitt, *The bacteria. Mims's Medical Microbiology*, 5th edn. (Elsevier, China, 2013), p. 7
71. B.R.D. Short, M.A. Vargas, J.C. Thomas, S.O. Hanlon, M.C. Enright, J. Antimicrob. Chemother. **57**(1), 104 (2006)
72. W. Levinson, W. Rohde, P. Mikelens, J. Jackson, A. Antonyj, T. Ramakrishna, Ann. N. Y. Acad. Sci. **284**, 525 (1977)
73. S. Shah, A.G. Dalecki, A.P. Malalasekera, C.L. Crawford, S.M. Michalek, O. Kutsch, J. Sun, S.H. Bossmann, F. Wolschendorf, Antimicrob. Agents Chemother. **60**, 5765 (2016)

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

New Mn(II), Co(II), Ni(II) and Cu(II) homoleptic complexes...

---

### Affiliations

**Nitin H. Kolhe<sup>1,2</sup> · Shridhar S. Jadhav<sup>2</sup> · Dilip R. Thube<sup>3</sup> · Sushma J. Takate<sup>2</sup> ·  
Ashok V. Bankar<sup>4</sup> · Sanjay T. Moharekar<sup>2</sup> · Hari R. Pawar<sup>1</sup> ·  
Shubhangi S. Moharekar<sup>2</sup>**

✉ Nitin H. Kolhe  
kolhenitin18@gmail.com

<sup>1</sup> Department of Chemistry and Research Centre, MES, Abasaheb Garware College, Pune  
Affiliated to Savitribai Phule Pune University, Pune 411004, India

<sup>2</sup> Department of Chemistry and Biotechnology, New Arts Commerce and Science College,  
Ahmednagar 414001, India

<sup>3</sup> Department of Chemistry, New Arts Commerce and Science College,  
Parner, Ahmednagar 414302, India

<sup>4</sup> Department of Microbiology, MES Abasaheb Garware College, Pune 411004, India



## C. 2019-20

## 1. A Geographical Study of rainfall Distribution in Ahmednagar District, State of Maharashtra

I J R B A T, Issue (Special-15), Feb 2020: 108-112  
A Double-Blind Peer Reviewed & Refereed Journal



e-ISSN 2347 – 517X  
Original Article

INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY  
© VMS RESEARCH FOUNDATION [www.ijrbat.in](http://www.ijrbat.in)

## A GEOGRPHICAL STUDY OF RAINFALL DISTRIBUTION IN AHMEDNAGAR DISTRICT, STATE OF MAHARSHTRA

<sup>1</sup>Dattatray Ghungarde, <sup>1</sup>Shivaram Korade and <sup>2</sup>Jyotiram More

<sup>1</sup>Research Student, Shri. Dhokeshwar College Sci. College, Takali-Dhokeshwar, Tal- Parner, Dist- Ahmednagar.

<sup>2</sup>Head and Research Guide, New Arts, Comm. & Sci. College, B. J. S. College Wagholi, Tal Haweli, Dist- Pune

### ABSTRACT:

Climate plays an important role in the development of any region. Rainfall and temperature are the two important climatic factors which determine the climatic condition of any place. Ahmednagar district is a drought-prone area and it is situated in the central part of Maharashtra state. Intergovernmental Panel on Climate Change (IPCC, [5]) reports, frequency of droughts as well as extreme events will be increase and rainfall pattern will also change which is a key factor influencing economic growth of the regions, especially in the country like India where the 70 percent people are directly or indirectly depends on agriculture. But agriculture is hanging on Monsoon, erratic in nature. It also has great variations in spatiotemporally, those fluctuations extremely damaging agriculture, food security, health and many more. Therefore, the present study has been conducted in order to help farmers, researchers, economists, and policymakers to make fast decisions for better planning propose with variations of rainfall.

**Key words:** - Climate, Rainfall distribution, Variability.

### INTRODUCTION:

Climate plays an important role in determining the agricultural, industrial and economic growth of any region. Climate includes factors like Temperature, Rainfall, Pressure, Wind, Humidity, Precipitation, etc. Temperature and Rainfall are the most important factors which directly affect the climate condition of any region. There is a slow and steady increase in the temperature which has a direct impact on rainfall. Rainfall is the cheapest source of water provided it is timely and adequate in quantity. But rainfall in the greater part of India is uncertain and highly unevenly distributed. Rainfall is the major parameter influencing the agriculture activity of man. In India agricultural economy entirely depends on the amount of rainfall received during monsoon season. Rainfall is the dominant single weather element influencing the intensity and location of the farming system and the farmer's choice of enterprise. It also becomes a climatic hazard to farming when it is characterized by

scantiness, concentration, intensity, variability, and unreliability.

Such a study would help in the selection of crops and in short-range weather forecasting. In order to obtain an optimum yield from agriculture, it requires proper knowledge about the agro-climatic situation that helps for cropping patterns and crop management.

### STUDY AREA:

The present study deals with the geographical perspectives of the rainfall distribution in Ahmednagar district. Ahmednagar is the largest district of Maharashtra State with a geographical area of 17418 sq. km. which is 5.66% of the area of Maharashtra State. It lies between 18° 2' to 19° 9' N latitude and 73° 9' to 75° 5' E longitude with covering 14 tehsils. The population of district is 4543157 (2011) and Out of total workers 75. 42% are engaged in agriculture. The district has 1256500 ha Net Cropped Area (NCA) out of 330000 ha area (26.27 %) is under canal and well

Arts, Commerce & Science College Sonai, Dist. Ahmednagar (MS) India.

[ICCCBCE-2020]

irrigation and remaining about 926500 ha. (73.73 %) the area is rain-fed.

Therefore, agricultural operations mainly depend on south-west Monsoon, but rainfall in the district is highly erratic. The average annual rainfall in the district is 447 mm (2017). The climate of the district is hot and dry, the average of temperature 90c to 410c. The district is mostly in the rain shadow region to the east of Western Ghats. From the western border of the district, the rainfall decreases rapidly towards the east. About 77% of the annual rainfall in the district is received during the south-west monsoon season, September is the rainiest month and remaining months receiving unevenly with showing monthly as well as annual rainfall variability.

#### OBJECTIVES:

Present paper has an attempt to make an assessment of the rainfall variability of Ahmednagar District and to identify the assured rainfall zone in the study region.

#### DATABASE AND METHODOLOGY:

The study is based on the rainfall data collected from Indian Meteorological Department for twenty-five years, for the period 1993 to 2017. For the data analysis following formula has used. Presentation of result chloroplasts cartographic method is used. CV = Coefficient of variability of rainfall, SD = Standard deviation of rainfall, X = Mean of rainfall

$$C.V. (\%) = \frac{SD}{X} \times 100$$

CV = Coefficient of variability of rainfall, SD = Standard deviation of rainfall, X = Mean of rainfall.

The present study is based on secondary data. Secondary data will be collected from social economic review, district census handbook of Ahmednagar district. The data has been obtained

from the related articles, research papers, reports, policies and plan documents of Government of India and Maharashtra. Some data has been obtained from websites of Govt. of India and Govt. of Maharashtra, Ahmednagar, Nic. in, was undertaken to know the environmental status. The rainfall data for 14 stations in and around the study area were collected and analysed. Rainfall conditions were studied season wise and Annual Rainfall was computed and used to draw the maps.

#### RESULTS AND DISCUSSION:

Table No. 1 indicates the mean annual rainfall of the study region. The present study analyzed rainfall conditions of Ahmednagar district and demarked district in low, medium and high rainfall zones. Coefficient of Variation (CV) has been calculated, it was highly variable running between 23.93 to 40.43 percent during 1993 to 2017. There are 14 rain gauge stations located in different places in the study area, and these stations measure the precipitation throughout the year. The lowest rainfall (below 500 mm) observed in most parts of Shirampur, Nevasa, Shrigonda, Parner, Sangamner, and Kopargaon tehsil Due to the scarcity of water most of sectors are affecting especially agriculture. Medium rainfall (500 - 600 mm.) zone covers a large area including Nagar, Rahuri, Shevgaon, Pathardi, Karjat, and Rahata tehsil. Akole and Jamkhed tahsil has experienced high rainfall (above 600 mm) but a concentration of rainfall within only South-West Monsoon while remaining months is hot and dry, is creating a water scarcity problem. (Map No. 2).

#### RAINFALL DISTRIBUTION:

The distribution of rainfall in Ahmednagar district is uneven, therefore the coefficient of variation (CV) is also varied (Fig.2).

The coefficient of variation (CV) is defined as the ratio of the standard deviation to the mean. The coefficient of variation has been calculated, it running between 23.93percent to 42.43 percent from 1993 to 2017. The highest variations in rainfall were observed in Akole tahsil (42.43 %), that clearly shows that trends and the pattern of rainfall are highly changing during the last 25 years, damaging the agriculture, health, business; the lowest variations was observed in Nevasa tehsil (23.93%). Study also shows that one tahsil covered by 'high', three tahsil is 'medium' and ten tehsils is 'low' variation.

**CONCLUSION:**

Mean annual rainfall and variability of rainfall is not uniform in all parts of the Ahmednagar District. Jamkhed Tehsil received the highest (621mm) mean annual rainfall; whereas Kopargaon tehsil has received the lowest (428mm) mean annual rainfall. Rainfall variability affected agriculture practices in Ahmednagar District. There is a need for artificial water supply for agriculture development and increase agriculture production.

**REFERENCES:**

- Biswas B. C. and Sarkar S. (1995) Weekly Rainfall probability By Gamma Distribution Model over West Bengal, *Journal of Hydrology*, Vol. 1. No. 1&2.
- A Study of Rainfall Characteristics of Satara District, Maharashtra State. *The Deccan Geographer*, Vol.46, No. 2, PP-39-48.
- Korade. Shivaram More Jyotiram (2013) A Spatio Temporal Study of Rainfall Distribution In Ahmednagar District. *ISRJ vol.3, Issue-1* PP-37-40.
- Singh R. Ramkrishan Y. Purohit R. (1991) Rainfall Characteristics Analysis of Katch (Gujarat) Region of India, *Annals of Arid Zone* Vol.30, No.2, PP-93-100.
- Indian Metrological Department, Pune
- IPCC (2007): Climate change 2010: Synthesis Report. Cambridge University Press, Cambridge.

## 2. Geographical Study of Crop Diversification pattern in Ahmednagar District 2000-01 to 2015-16(M.S.)

Peer Reviewed International Research Journal of Geography  
 Maharashtra Bhugolshastra Sanshodhan Patrika  
 ISSN : 0971-6785 (Impact Factor 4.567 Renew (IIFS)) Vol. 37, No.1, Jan-Jun. 2020, pp 66-75



### “Geographical Study of Crop Diversification pattern in Ahmednagar District 2000-01 to 2015-16 (M.S)”

Dattatray Ghungarde

Joytiram More

#### Abstract

Varieties of crops are grown in the world where agriculture is traditionally practiced and most people work in the same business year after year. If the area of cultivable land is limited, the tendency of the farmers is to take various crops. There is competition of each crop for the area. 'The sharper the competition, the higher is the number of crops. On the contrary, there is no competition which means that there is a tendency towards Monoculture or Specialization' (Husain M. 1979). Supporters of the Green Revolution believe that, the contribution of inputs of irrigation, fertilizers, pesticides, improved seed and biotechnology contributes to crop diversity. However, in traditional farming, it is found that the farmers adopt crop diversification through their self-sufficiency mind-set even in adverse conditions like rain, drought and hail.

Therefore, the study of cropping diversification pattern is necessary for agricultural development and planning. The cropping pattern defines as the proportion of area under different crops at a point of time, whereas change in cropping pattern refers to change in area under different crops at two different points of time. The technique of crop diversification is a one of tools for understand cropping pattern in present study. Jasbir Singh's crop diversification method (1976) is applied to identify spatio-temporal changes in cropping pattern. Periodic maps showing crop diversity and special crops guide planners for agricultural development.

The main objective of present study is to identify crop diversification pattern in Ahmednagar district during 2000-01 and 2015-16. Tehsil is taken as basic unit of investigation. The study is based on secondary sources of data which is collected from socio-economics review and statistical abstracts of Ahmednagar district.

**Key Words:** Agriculture, Cropping Pattern, Crop Diversification.

#### Introduction:

Land is the most important natural resource of a country and it is base for agricultural production. Cropping pattern means the proportion of area under various crops at a point of time. Cropping pattern is a dynamic concept as it changes over space and time. The cropping patterns of a region are closely influenced by the geoclimatic, socio-cultural, economic, historical and political factors (Husain M. 1996).

Crop diversification means rising of a variety of crops involving intensity of competition amongst field crops for cultivable land. "Keener the competition, higher the magnitude of the crop diversification and lesser the competition the greater will the trend towards specialization of monoculture farming where emphasis is on one or two crops" (Singh 1976). Crop diversification is a concept which is opposite to crop specialization. The farmers all over the world, especially in the developing country, try to grow several crops in their holdings in an agricultural year. "The combination of natural and economic factors also helps Crop diversity. Agriculture is believed to be stable due to Crop diversity. If a farmer plants more than one crop in a season in one region, one crop is not very profitable or damaged due to weather adversity, but the other crop does not cause complete loss to the farmer. Crop diversity is one way to reduce the risk of farm business (Salunke, 2015). The level of crop diversification depends on the geo-climatic, socioeconomic conditions and technological development in a region. In general, higher is the level of agricultural technology, lesser is the degree of diversification. Moreover, the rich farmers prefer to specialize in agricultural enterprise while the

Dattatray Ghungarde, Joyliram More

poor and subsistent farmers are generally more interested in diversification of crops. The diversification in agriculture is also practiced with a view to avoid risk and uncertainty due to climate change (Husain M. 1996).

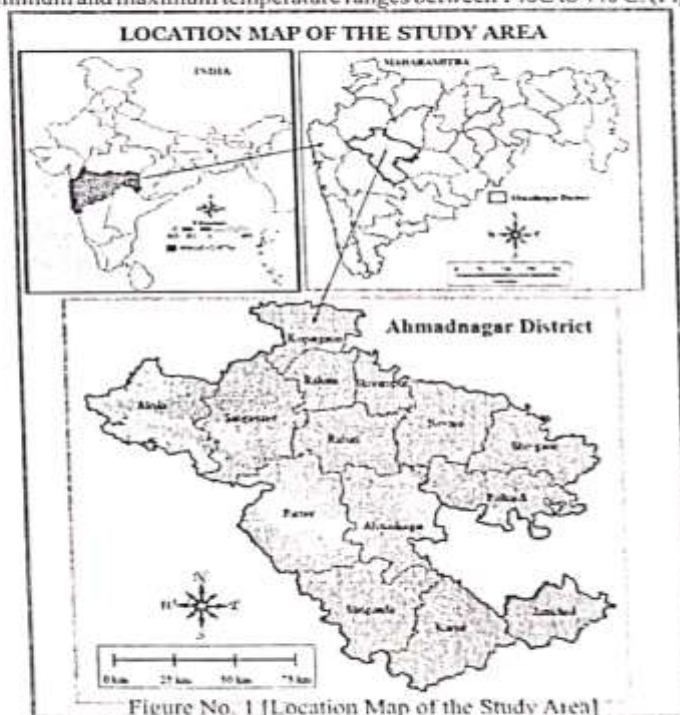
Agricultural development is depends on crop diversification pattern. The study of crop diversification pattern is important for agricultural planning. Changing pattern of crop diversification is a reliable index to understand agricultural development in study region. It will help in identifying weaker areas for agricultural planning.

**Objectives:**

1. To define regions of crop diversification in Ahmednagar district.
2. To identify spatio-temporal changes in crop diversification in Ahmednagar district.

**Study area:**

Geographically Ahmednagar district is the largest district in the state of Maharashtra. The total geographical area of the district is 17048 Sq. Km, which is 5.66 % of states land. It is divided into 14 tehsil with a total of 1585 villages. The total population of the district is 4543159, out of which 80 % is in rural areas. The district is situated in the central part of the state; the Geographical location of the district is 18021N to 19091N latitude and 730.9 E to 750.5 E longitudes. The district lies on the elevated table land of the Deccan trap, which has a general slope from west to east. The western subdivision of Akola is the highest part of the district. The district receives an average annual rainfall of 566 mm. The minimum and maximum temperature ranges between 140C to 440 C. (Figure No. 1)



67

Dattatray Gihungarde, Joytiram More

**Database and Methodology:**

To fulfil the objectives, data has been collected from secondary sources i.e. socio-economic abstract of Ahmednagar district. The statistical data extracted on the basis of the sources referred of Ahmednagar district, during 2000-01 and 2015-16. Tehsil is taken as basic unit of investigation.

In the present study the main aim is to identify spatio-temporal change in cropping pattern of Ahmednagar District. For this, Jasbir Singh's (1976) crop diversification technique is used. The crops having more than 5% area are considered for calculation of crop diversification index. Formula of crop diversification index (CDI) is as follows,

$$CDI = \frac{\text{Percentage of total harvested area under 'X' crop}}{\text{Number of 'X' crop}}$$

Whereas, 'X' crops are those which individually have occupied 5% or more area of the total harvested area.

**Result and Discussion:**

The percentage wise variations in spatial area under various crops are presented in the Annexure 1 (Year 2000-01) and Annexure 2 (Year 2015-16). The table (Table No.1) shows the crop diversification regions which have been identified according to range of crop diversification index (CDI).

1. Area of high crop diversification (below 15)
2. Area of medium crop diversification (15 to 20)
3. Area of low crop diversification (20 to 25)
4. Area of very low crop diversification (above 25)

Table No. 1 Crop Diversification Pattern (2000-01 and 2015-16)

Sr. No.	Crop Diversification Class	CDI Value	Name of the Tehsil : 2000-01	%	Name of the Tehsil : 2015-16	%
1	High	Below 15		0.00	Akola, Sangamner, Kopargaon, Rahta, Shrirampur, Newasa, Rahuri	50.00
2	Medium	15-20	Kopargaon, Rahta, Shrirampur, Newasa, Shevgaon, Nagar	42.86	Shevgaon, Pathardi, Shrigonda	21.42
3	Low	20-25	Akola, Sangamner, Rahuri, Shrigonda	28.57	Nagar, Parner	14.29
4	Very low	Above 25	Pathardi, Parner, Karjat, Jamkhed	28.57	Karjat, Jamkhed	14.29

Source - Compiled by Researcher

Dattatray Ghungarde, Joytiram More

The table (Table No. 2) presents the pattern of crop diversification in the year 2000-01.

Table No. 2 Pattern of Crop Diversification in Year 2000-01

Sr. No.	Name of the Tehsil	Index of Crop diversification(CDI)	Crops in Competition for Diversification	Area in hectares	Area in %
1	Akola	21.83	Ri+Bj+Oc+Fd	79694	87.30
2	Sangamner	22.96	Wh+Jr+Bj+Su	101521	91.85
3	Kopargaon	15.12	Wh+Jr+Bj+Pu+Su+Fr&vg	59816	90.71
4	Rahta	15.80	Wh+Jr+Bj+Pu+Su+Fd	51237	94.83
5	Shrirampur	16.85	Wh+Jr+Bj+Pu+Su	40709	84.26
6	Newasa	18.35	Wh+Jr+Bj+Pu+Su	101346	91.78
7	Shevgaon	15.50	Jr+Bj+Pu+Su+Co+Os	83862	92.98
8	Pathardi	30.16	Jr+Bj+Pu	88011	90.48
9	Nagar	18.57	Jr+Bj+Oc+Pu+Os	111531	92.87
10	Rahuri	20.72	Wh+Jr+Bj+Su	58158	82.86
11	Parner	28.21	Jr+Bj+Pu	121568	84.64
12	Shrigonda	21.81	Wh+Jr+Pu+Su	98530	87.23
13	Karjat	29.04	Jr+Bj+Pu	97367	87.12
14	Jamkhed	30.66	Jr+Bj+Os	69067	91.99
	District	17.07	Wh+Jr+Bj+Pu+Su	1110682	85.33

(Source: Compiled by Researcher)

It is observed from the table (Table No. 2) that in year 2000-01 various crops are involved in the competition for the diversification. More the number of crops present per tehsil, more was the crop diversification can be observed in the respective tehsil. It can also be observed from the crop diversification index value. For example, in Kopargaon tehsil the six crops namely wheat, jowar, bajara, pulses, sugarcane, fruits and vegetables were in competition for diversification. Therefore, it is observed that the Kopargaon tehsil had more crop diversification as compared to other tehsils in the district. It is observed from the CDI value (i.e. 15.12). Similarly, the farmers of Rahata, Shirampur, Newasa, Shevgaon and Nagar had more tendencies towards crop diversification rather than monoculture or specialisation. It is noticed that the CDI value for the overall district was 17.07. It represents that in year 2000-01, the Ahmednagar district shows medium crop diversification pattern.

The table (Table No. 3) presents the pattern of crop diversification in the year 2015-16.

Dattatray Gihungarde, Joytiram More

Table No. 3 Pattern of Crop Diversification in Year 2015-16

Sr. No.	Name of the Tehsil	Index of Crop diversification(CDI)	Crops in Competition for Diversification	Area in hectares	Area in %
1	Akola	11.88	Ri+Wh+Bj+Oc+Pu+Su+Fr&vg+Os	40551	95.07
2	Sangamner	12.81	Wh+Jr+Bj+Pu+Su+Fr+vg+Fd	91034	89.68
3	Kopergaon	12.50	Wh+Bj+Oc+Pu+Su+Co+Os	66134	87.51
4	Rahta	13.17	Wh+Jr+Bj+Oc+Pu+Su+Os	51318	92.14
5	Shrirampur	14.13	Wh+Jr+Oc+Pu+Su+Os	45237	84.77
6	Newasa	14.27	Wh+Jr+Pu+Su+Co+Fd	84731	85.57
7	Shevgaon	18.18	Jr+Bj+Pu+Su+Co	65823	90.91
8	Pathardi	15.59	Wh+Jr+Bj+Pu+Su+Co	81685	93.55
9	Nagar	22.56	Wh+Jr+Pu+Fr&vg	114471	90.26
10	Rahuri	11.86	Wh+Jr+Bj+Pu+Su+Fr&vg+Co+Fd	53930	94.87
11	Parner	23.59	Wh+Jr+Pu+Fr&vg	93570	94.34
12	Shrigonda	18.49	Wh+Jr+Pu+Su+Fr&vg	98014	92.45
13	Karjat	26.33	Wh+Jr+Su	81865	78.97
14	Jamkhed	29.66	Jr+Pu+Co	85019	88.99
District		12.57	Wh+Jr+Bj+Pu+Su+Fr&vg+Co	1037207	87.97

(Source: Compiled by Researcher)

[Note: Ri: Rice, Wh: Wheat, Bj: Bajara., Oc: Other cereals, Pu: Pulses, Su: Sugarcane, Fr&vg: Fruits and vegetables, Os: Oil seeds, Fd: Fodder, Co: Cotton]

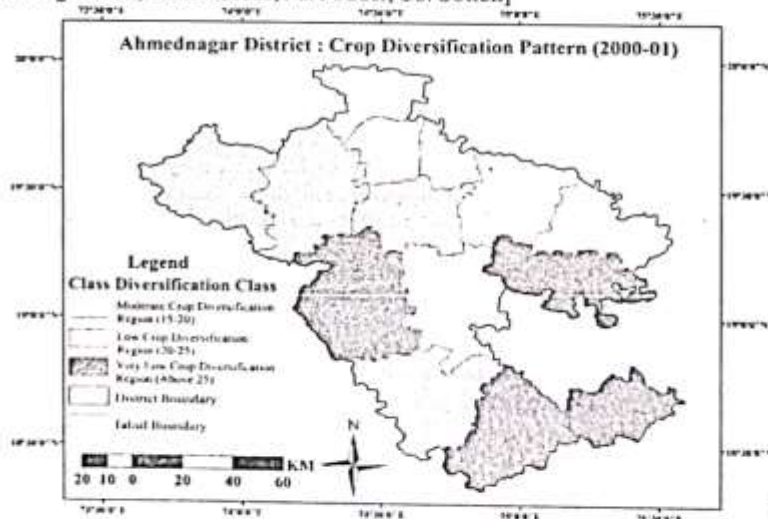


Fig. 2 Crop Diversification Pattern (2000-01)



Dattatray Ghungarde, Joytriam More

Table No. 3 Pattern of Crop Diversification in Year 2015-16

Sr. No.	Name of the Tehsil	Index of Crop diversification(CDI)	Crops in Competition for Diversification	Area in hectares	Area in %
1	Akola	11.88	Ri+Wh+Bj+Oc+Pu+Su+Fr&vg+Os	40551	95.07
2	Sangamner	12.81	Wh+Jr+Bj+Pu+Su+Fr+vg+Fd	91034	89.68
3	Kopergaon	12.50	Wh+Bj+Oc+Pu+Su+Co+Os	66134	87.51
4	Rahta	13.17	Wh+Jr+Bj+Oc+Pu+Su+Os	51318	92.14
5	Shrirampur	14.13	Wh+Jr+Oc+Pu+Su+Os	45237	84.77
6	Newasa	14.27	Wh+Jr+Pu+Su+Co+Fd	84731	85.57
7	Shevgaon	18.18	Jr+Bj+Pu+Su+Co	65823	90.91
8	Pathardi	15.59	Wh+Jr+Bj+Pu+Su+Co	81685	93.55
9	Nagar	22.56	Wh+Jr+Pu+Fr&vg	114471	90.26
10	Rahuri	11.86	Wh+Jr+Bj+Pu+Su+Fr&vg+Co+Fd	53930	94.87
11	Pamer	23.59	Wh+Jr+Pu+Fr&vg	93570	94.34
12	Shrigonda	18.49	Wh+Jr+Pu+Su+Fr&vg	98014	92.45
13	Karjat	26.33	Wh+Jr+Su	81865	78.97
14	Jamkhed	29.66	Jr+Pu+Co	85019	88.99
	District	12.57	Wh+Jr+Bj+Pu+Su+Fr&vg+Co	1037207	87.97

(Source: Compiled by Researcher)

[Note: Ri: Rice, Wh: Wheat, Bj: Bajara, Oc: Other cereals, Pu: Pulses, Su: Sugarcane, Fr&vg: Fruits and vegetables, Os: Oil seeds, Fd: Fodder, Co: Cotton]

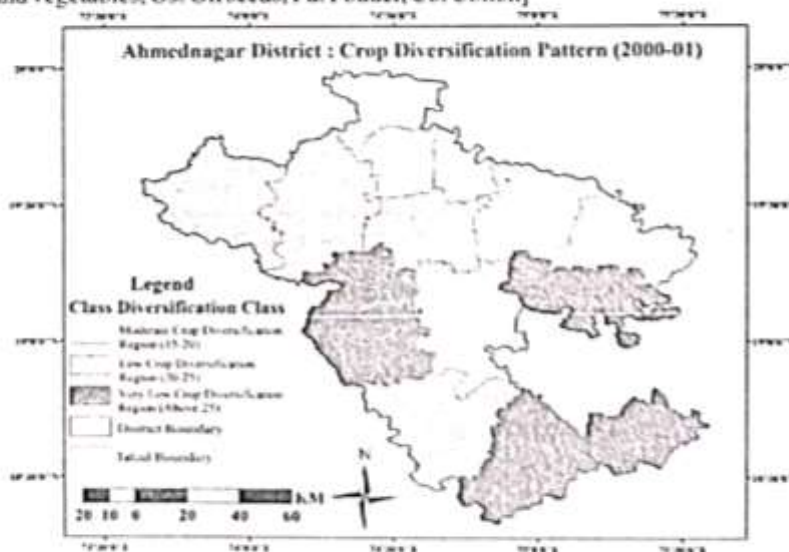


Fig. 2 Crop Diversification Pattern (2000-01)

ray Ghungarde, Joytiram More

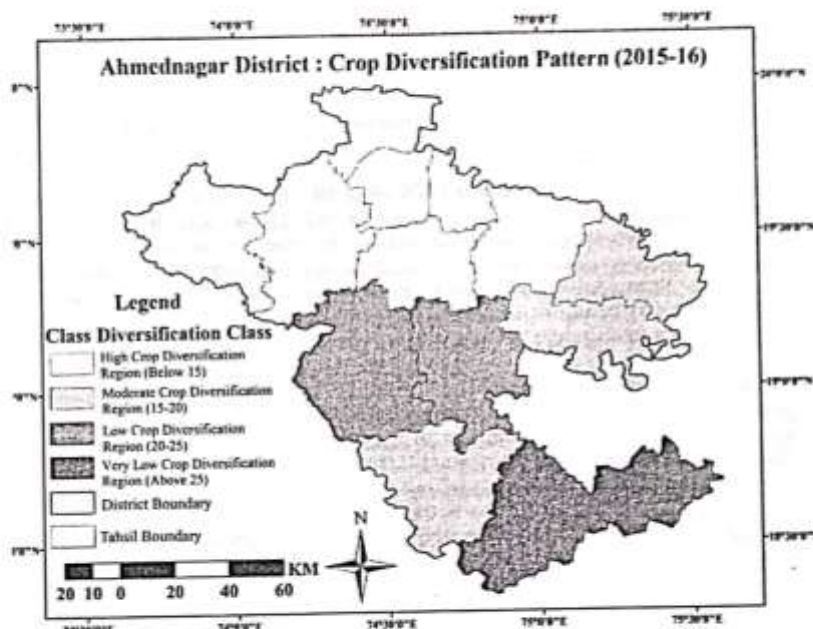


Fig. 3 Crop Diversification Pattern (2015-16)

It is observed from the table (Table No. 3) that, variety of crops has been grown in the district in 2015-16 as compared to 2000-01. The tehsils Akola and Rahuri have highest number (8) of crops in competition namely rice, wheat, bajara, other cereals, pulses, sugarcane, fruits and vegetables, cotton, fodder and oilseeds. The newly introduced crops in the year 2015-16 are Fruits and vegetables and cotton in the district. It can be seen from the above table that, the overall CDI value of district is decreased in year 2015-16, as compared to year 2000-01. It represents that the Ahmednagar district is under high crop diversification pattern in year 2015-16.

**Crop Diversification Analysis:**

The crop diversification means growing of multiple crops from the same land. For this use the formula of Jasbir Singh (1976), crop diversification index values worked out and shown in the table (Table No. 1) and the figure (Figure No. 2) and also figure (Figure No. 3) for the year 2000-01 and 2015-16 respectively. The crop diversification regions in the district has been designated and interpreted as below.

**High Crop Diversification Region (CDI below 15):** In year 2000-01, it is observed that none of the tehsils have noticed high diversification of crops in district. However, in year 2015-16, seven tehsils (62%) has been observed under high diversification region viz, Akola, Sangamner, Kopergaon, Rahta, Rahurampur, Newasa and Rahuri. The main crops cultivated in the tehsils were wheat, bajara, other

Dattatray Ghungarde, Joytiram More

D.

cereals, pulses, sugarcane, fruits and vegetables, cotton, fodder and oilseeds. The rice crop is cultivated only in the Akola tehsil. It is observed that, these tehsils have high degree of diversification due to inputs to irrigation, fertilizers, pesticides, improved seed and biotechnology etc. This diversification is mostly due to the extension of canal irrigation. So the farmers of these tehsils have changed their attention from food grains to cash crops such as sugarcane, fruits and vegetables, cotton and oilseeds.

**Moderate Crop Diversification Region (CDI 15 to 20):** In the year 2000-01, six tehsils viz, Kopergaon, Rahta, Shrirampur, Newasa, Shevgaon and Nagar were belongs to moderate diversification region occupying 42.86% tehsils in the district. The major crops cultivated were wheat, bajara, other cereals, pulses, sugarcane, fruits and vegetables, cotton, fodder and oilseeds. However, in the year 2015-16 three tehsils viz, Shevgaon, Pathardi are Shrigonda are observed in moderate diversification category occupying 21.42% tehsils of the district. Due to the growth of area under irrigation, the area under cash crops has increased in these tehsils.

**Low Crop Diversification Region (CDI 20 to 25):** In the year 2000-01 four tehsils viz, Akola, Sangamner, Rahuri and Shrigonda comprising 28.57% tehsils are observed under low crop diversification region. However, in the year 2015-16, only two tehsils viz, Nagar and Parner are observed under this category which contributes 14.29% tehsils of the district.

**Very Low Crop Diversification Region (CDI above 25):** In the year 2000-01, four tehsils viz, Pathardi, Parner, Karjat and Jamkhed occupying 28.57% tehsils are observed in very low crop diversification region. However, in year 2015-16, only two tehsils viz, Karjat and Jamkhed are observed under this region which contributes 14.29% tehsils of the district. The main reason behind the low and very low crop diversification is the limited irrigation facilities, very scanty rainfall and poor soil quality. Therefore, mainly food grain crops are grown in these tehsils like wheat, jowar, pulses etc.

#### **Conclusion:**

The spatio-temporal changes in crop diversification of Ahmednagar district is drawn by using Jasbir Singh's crop diversification method. The results of crop diversification index shows that the tehsils are shifting towards diversification rather than specialisation due to development in agricultural technologies. The highest diversification is found in Akola, Sangamner, Kopergaon, Rahta, Shrirampur, Newasa and Rahuri tehsil in 2015-16 whereas lowest diversification was observed in Parner, Karjat and Jamkhed tehsil. The newly introduced crops in the year 2015-16 are Fruits and vegetables and cotton in the district. The considerable change in diversification is observed in the tehsil Akola, Sangamner and Rahuri as they shifted from low to high level of diversification. It is interesting to note that Pathardi tehsil is shifted from very low to moderate level of crop diversification. The Crop Diversity Index is helps in understanding the relationship between the number of crops and their relative importance. Periodic maps showing crop diversity and special crops guide planners for agricultural development. This study is important for planners and researchers for sustainable agricultural development.

73

Annexure No. 1  
Tehsil wise index of crop diversification in Ahmednagar district (2000-01)

Name of Tehsil	Area under different crop (Area in %) 2000-01												CDI Index
	Rice	Wheat	Jowar	Bajara	Other cereals	Pulses	Sugarcane	Fruits & Vegetables	Cotton/Fibre	Oilseed	Fodder	spices	
Akola	10.35	1.81	0.05	26.48	6.09	3.24	2.88	3.61	0.00	1.31	45.38	0.02	21.81
Sangmer	0.00	5.54	9.64	68.10	0.42	3.49	8.37	2.55	0.39	0.18	0.54	0.18	22.96
Kopergaon	0.04	8.90	19.37	41.25	0.97	7.88	8.05	5.23	0.87	2.60	4.51	0.30	15.12
Rahla	0.02	11.38	22.91	40.75	0.99	6.00	8.53	3.12	0.71	0.07	5.25	0.27	13.80
Shrirampur	0.04	16.55	24.39	18.22	1.07	7.95	16.13	4.11	1.88	4.44	3.84	0.35	16.85
Newasa	0.00	10.03	24.98	30.24	2.05	7.90	18.58	1.96	0.80	1.41	0.81	0.59	18.15
Shevgaon	0.00	4.77	30.26	37.53	0.29	7.80	8.82	0.85	5.05	5.52	0.88	0.29	15.50
Pathardi	0.00	1.50	32.97	52.43	1.15	5.08	2.79	3.59	0.13	1.71	0.43	0.22	30.16
Nagar	0.17	5.68	50.91	15.26	8.73	11.50	0.39	1.02	0.04	6.47	1.65	0.19	18.97
Rahuri	0.00	18.85	15.90	23.88	1.55	4.54	22.23	4.58	0.43	0.99	4.81	0.24	20.72
Parner	0.06	1.19	51.47	23.98	0.55	9.18	1.13	4.68	0.03	8.15	2.27	0.31	28.23
Shrigonda	0.00	10.84	61.54	3.44	0.49	8.26	6.59	4.33	0.02	3.08	1.10	0.31	21.81
Karjat	0.00	2.62	70.10	7.99	0.23	8.82	2.32	1.38	0.04	4.45	1.55	0.30	29.84
Jamkhed	0.00	1.76	60.52	15.49	0.85	2.82	0.29	0.42	0.03	11.58	0.67	1.10	30.66
Total	0.75	6.45	38.67	28.85	1.98	6.84	6.68	2.74	0.64	3.37	4.87	0.32	17.07

(Source: Computed by researcher)

74

Annexure No. 2  
Tehsil wise index of crop diversification in Ahmednagar district (2015-16)

Name of Tehsil	Area under different crop (Area in %) 2015-16												CDI Index
	Rice	Wheat	Jowar	Bajara	Other cereals	Pulses	Sugarcane	Fruits & Vegetables	Cotton/Fibre	Oilseed	Fodder	Spices	
Akola	25.82	8.88	0.91	7.87	5.84	12.54	12.58	9.30	0.00	12.54	4.03	0.00	11.88
Sangmer	00.00	17.30	18.51	31.81	4.88	9.62	8.08	5.88	1.64	3.84	6.92	0.00	12.81
Kopergaon	00.00	11.17	4.64	5.91	31.87	8.81	31.81	1.87	5.07	25.25	1.88	0.00	14.50
Rahla	00.00	11.18	8.89	8.24	6.91	12.35	17.64	1.36	1.75	17.91	4.75	0.00	14.17
Shrirampur	00.00	15.80	14.88	2.81	4.31	13.17	18.02	4.75	4.49	15.79	4.35	0.00	14.14
Newasa	00.00	14.75	9.82	3.02	2.32	11.00	28.45	4.81	13.41	3.12	7.11	0.00	14.27
Shevgaon	00.00	3.11	19.71	7.01	0.34	7.78	15.88	1.37	10.80	0.29	1.88	0.00	14.18
Pathardi	00.00	7.31	31.39	11.88	00.00	5.96	7.09	4.06	14.88	1.60	0.38	0.00	13.19
Nagar	00.00	6.69	67.01	1.08	1.04	9.18	1.52	6.94	0.06	1.71	1.84	0.00	22.56
Rahuri	00.00	18.89	16.91	4.81	2.21	17.81	6.31	7.18	5.21	1.91	5.78	0.00	15.10
Parner	00.00	8.26	48.49	2.85	0.87	8.75	00.00	7.89	0.00	0.79	1.87	0.00	13.19
Shrigonda	00.00	8.80	54.57	1.82	2.18	6.98	12.75	9.54	1.35	0.04	2.38	0.00	14.43
Karjat	00.00	6.55	63.79	4.27	4.47	4.99	6.44	3.44	2.14	0.13	1.18	0.00	19.11
Jamkhed	00.00	1.11	60.58	1.90	0.85	24.51	0.87	0.42	17.89	7.47	1.34	0.00	29.84
Total	0.81	9.22	37.75	1.29	1.13	9.81	18.88	5.20	7.62	4.73	6.22	0.00	12.57

(Source: Computed by researcher)

District: Ahmednagar, Agronomy Major

Dattatray Ghungarde, Joytiram More


**References:**

- District Social and Economic Review, Ahmednagar District 2007-08.
- District Social and Economic Review, Ahmednagar District 2016.
- Singh, Jasbir (1976): *An Agricultural Geography of Haryana*, Vishal Publications, Kurukshetra. Pp. 129-143.
- Bhatia, S.S. (1967): *Pattern of Crop Concentration and Diversification in India*, *Economic Geography*.
- More, K.S. (1980): *Changing Pattern of Agricultural land use in Kolhapur District (Maharashtra), (1950-51 to 1974-75)*, unpublished Ph. D. Thesis to Shivaji University, Kolhapur.
- Husain, M. (1979): 'Agricultural Geography', *Inter-India Publications*, New Delhi, Pp. 77-79.
- Husain, M. (2002): 'Systematic Agricultural Geography', *Rawat Publications*, New Delhi, Pp. 241-244.
- Singh, Jasbir & Dillon, S.S (1984): *Agricultural Geography*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, Pp.235-238.
- Salunke Vijaya (2015): *Agricultural Geography*; diamond publication, Pune, Pp. 64-65.
- Kadam M. D. & Shinde S. D. (June 2018): "Crop diversification region in Sina river basin: Maharashtra", *Peer Reviewed International Research journal of Geography- Maharashtra Bhugolshastra Sanshodhan Patrica*. Vol 35, No. 1, Pp. 98-103.


**\*Dattatray Ghungarde**  
Assistant Professor and Research Student,  
Department of Geography,  
New Arts, Commerce & Science College,  
Parner, Dist.-Ahmednagar

**\*\*Joytiram More**  
Head and Research Guide,  
Department of Geography,  
BJS's ASC College, Wagholi, Pune

## 3. Methods of Cashless transactions



ISSN 2349-638x  
Impact Factor 5.707



ICSSR, New Delhi Sponsored  
National Level Seminar in Interdisciplinary subject



## FINANCIAL LITERACY AND DIGITAL PAYMENT SYSTEM IN INDIA

Kisan Shikshan Prasarak Mandal, Borgaon (Kale), Tq.& Dist. Latur  
Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

# VASANTRAO KALE MAHAVIDYALAYA

DHOKI, TQ. & DIST. OSMANABAD. (MS)

Saturday, 28<sup>th</sup> December 2019

Organized By


**Department of Economics**

**Vasanttrao Kale Mahavidyalaya, Dhoki**

Tq. & Dist. Osmanabad (MS).

**Pri. Dr. Haridas Fere**  
Chief Editor

**Dr. Balasaheb Maind**  
Editor



National Seminar on Financial Literacy and Digital Payment System In India Organizer :- Vasantao Kale Mahavidyalaya , Dhoki			28 <sup>th</sup> Dec. 2019
Sr.No.	Name of Author	Title of paper	Page No.
1.	Dr. Jayakumar A. Sindhe	Financial Literacy And Digital Payment System In India	1
2.	Prof. Dr. Ram Solankar	Challenges and Difficulties of Electronic Payment Systems	5
3.	Dr. MahadeoYadav	Financial Inclusion And Its Relationship With Financial Literacy	8
4.	Dr. Savitri Kulkarni	Impact Of Digital Payment System On Social Life	11
5.	Dr. S. H. Kadekar	Digital Payment System: Importance, Advantages and Difficulties	14
6	Shivasharanappa	Digital Payment System Advantages And Difficulties	18
7	Mr. Sahebagouda B. Dr. Shivaraj Datturaya	A Study On Impact Of Digital Payment System On Business In India	21
8	G. S. Deshmukh	Impact Of Cashless Transactions On Indian Economy	27
9	Dr. Kanchan M. Sananse	A study of National Initiative on Financial Literacy	29
10	Dr. Prakash Ratanlal Rodiya	Digital Payment System In India	32
11	Mr. Ashok A chavan Dr. P.M . Kalyankar	Digital Payment System Methods And Probabilistic Challenges	36
✓ 12	Dr. Deepak Pandharinath Sontakke	Methods of Cash less Transactions	40
13	Mr. Shahu D. Ovhal	Digital India: Challenges And Opportunities	42
14	Mahesh Kashinath Dr. Jayakumar A Sindhe	Digital Payment System: Advantages And Difficulties	46
15	Dr. S.G. Birajdar Dr. R. V. Varshetti	Impact Of Digital Payment System On Indian Economy	50
16	Shashikant V. Mundhe	A Comparative Analysis Of Use Of Digital Payments System In Urban Semi Urban And Rural Areas In India	52
17	Dr. Onkar Balkrishna Khiste	Digital Banking in india Nature & Importance	55
18	Dr. Renuka D. Badvane ( Bhavsar)	To study on Impact of Digital Payment System on Social life in India	57
19	Dr. Ambad Ramdhan Fakirrao	Importance Of Digital Payments In India	59
20	Prof. Dr. Shankar Ambhore Dr. P.K. Waghmare	Cashless Economy – Challenges and Opportunities in India	61

Aayushi International Interdisciplinary Research Journal (ISSN 2349-638x) Impact Factor: 5.707 Peer Reviewed Journal <a href="http://www.aiirjournal.com">www.aiirjournal.com</a> Mob. 8999250451	A
--	---

National Seminar on Financial Literacy and Digital Payment System In India Organizer :- Vasanttrao Kale Mahavidyalaya , Dhoki	28 <sup>th</sup> Dec. 2019
--	-------------------------------

**Methods of Cash less Transactions**

**Dr. Deepak Pandharinath Sontakke**

Head Dept. of Economics

New Arts Commerce & Science College, Parner Dist. Ahmednagar

**Introduction:**

A digital transaction means a transaction which is took place without any paper. Purchasing goods from e-commerce websites, signing of business contracts online, or even buying movie tickets through your smartphone app fall under the umbrella of digital transactions. Such operations are accurate, quicker, convenient, and certainly easier. A cashless transaction is an automated or online operation that may take place between two people, business, or organisations. Many are unwilling to accept that there are benefits to a cashless transaction simply because they cannot navigate their way around digital devices, or are just happier to transact using cash. Read on about an array of cashless transactions that simplify day-to-day trading.

**Objective of Study:**

Present study is undertaken for finding out the challenges and remedies of cash less transactions.

**Research Methodology:**

Secondary data is used in present study, which is collected from different secondary sources. E.g. Books, Journals, New papers, Magazines and websites.

**Findings:**

It's safe to say that cashless transactions have revolutionized the financial outlook of India. Utilizing mobile phones to make payments instead of opting for the traditional modes of payment has increased tremendously since demonetisation. When the business operations of most SMEs came to a standstill during demonetisation, the businesses that had shifted to cashless transactions managed to curb losses.

**Types/ Methods of Cash less Transactions-  
Cheques and Demand Drafts**

A cheque is one of the safest and oldest methods of cashless payment. A cheque is issued to a person or business for a specific amount. This cheque is deposited in the receiver's bank, and the money is received through a payment processed by a clearinghouse. A demand draft is safer than a cheque because it cannot be defaulted or dishonoured, unlike a cheque. The DD is signed by a banker to ensure that sufficient funds are available for a successful transaction. The disadvantage of cheques and DDs are that they are time-consuming because a person has to visit the bank and then wait for the cheque or DD to clear.

**Debit and Credit Cards**

Debit and credit cards have caught on as a method of cashless trading. A debit card is considered by many to be safer because you are transacting with money in your account. The risk with a credit card is overspending. Debit and credit cards can be used to make purchases online as well as over-the-counter at a store.

**UPI Applications**

UPI stands for Unified Payment Interface. UPI has changed the way we transact. At the core of a UPIs functionality is the fact that our mobile numbers are registered with our respective banks and linked to our accounts. A virtual payment address helps to send or receive money without entering any bank related information. Merchants would need to have a current account to receive UPI payments. UPI applications that are currently popular are BHIM, PhonePe, Google Pay/ Tez, ICICI Pocket, and SBI Pay.

**Mobile Wallets**

Mobile wallets have become a convenient way of making payments without cash. Once you load money into your mobile wallet, you can use it wherever it is accepted. The most popular mobile wallet that is trending is Paytm. The disadvantage with mobile wallets is that it isn't linked to your account. Once you load the money into your mobile wallet, you can only spend it with a merchant who accepts payment through the said app.

**Neft & Rtg**

National Electronic Fund Transfer and Real Time Gross Settlement are electronic payment systems that allow convenient fund transfer between bank accounts. Both facilities are maintained by the RBI (Reserve Bank of India). The facilities can be used to transfer money only within India. The RTGS transfer window is from 8 am to 4.30pm on weekdays and bank working days. NEFT settlements happen in deferred batches between 8 am to 7 pm on bank working days. There is no facility for 'stop payment' instructions in case of either systems and the payments made are irrevocable.

Aayushi International Interdisciplinary Research Journal (ISSN 2349-638x) Impact Factor 5.707 Peer Reviewed Journal www.aiirjournal.com Mob. 8999250451	40
--	----

Net  
ban  
mis  
ser  
Git  
dec  
wo  
Elk  
esp  
dis  
set  
me  
ma  
Cl  
lat  
as  
Se  
or  
ca  
ev  
R  
sy  
pt  
ba  
in  
T  
rr  
rr  
tr  
lk  
a  
U  
o  
e  
F  
t  
t  
c  
v  
l  
l



**Net Banking**

Net banking is an alternative to using your debit or credit card. The user needs to login to their net banking account to approve a payment. Net banking gives you the flexibility of transacting even if you have misplaced your debit card or lost it. You can use internet banking to make utility payments, purchase goods and services online, or send and receive money.

**Gift Cards or Vouchers**

Gift vouchers are a handy way of going cashless and are a great gift idea because the receiver can decide what they would like to purchase with the voucher. Stores also give out discounts on gift vouchers which work well for the purchaser as well.

**Electronic Clearance Service**

ECS stands for Electronic Clearance Service. It is a convenient method to make bulk payments, especially to pay off your utility services, equated monthly installments, and for financial institutions to disburse payments like pensions, salaries, or dividend interest. ECS can be used for both debit as well as credit services. Authorisation has to be provided to your bank for periodic debits or credits to be made. It is a safe method because instructions can be given regarding maximum sum to debit, validity period for the said mandate, or purpose of the transaction.

**Challenges before Cashless transactions-**

Steps towards cashless societies around the world seem to have taken significant steps forward in the last couple of years, with acceptance of non-cash payments becoming more widespread and technologies such as contactless aiming to make transactions more streamlined.

**Security and privacy concerns**

An increasing worry for many is the security of cashless solutions. In today's environment, with both organized criminal gangs and nation-states always coming up with new ways of attacking digital systems, non-cash solutions may well be more exposed. At the same time, there are also privacy concerns that come with every transaction having a digital footprint, whereas cash is more anonymous.

**Resilience**

Another issue if a country does not offer a cash payment option is what to do should the supporting systems be unavailable. While the latest infrastructure solutions will offer very high levels of availability, 100 percent uptime is never a guarantee. If this connectivity should fail, having cash as a reliable backup option will be essential, especially if natural disasters such as flooding, earthquakes or hurricanes knock out critical infrastructure

**Tracking spending**

Cash also has a key advantage over alternatives when it comes to issues such as budgeting and monitoring spending. When notes physically leave your hand as part of a transaction, this tends to register much more than when paying by card or other means. In fact, when using digital payments, it can be very easy to lose track of how much you are spending and could leave people approaching the end of the month with a much lower balance than they think, simply because they cannot see in front of them how much money they have available.

**Unwilling consumers**

Regardless of how effective public education campaigns may be, there will always be a certain number of consumers who are resistant to the change, often with very good reasons. These are often thought of as more elderly citizens who are not as tech-savvy as their younger peers. But while there may be some truth in this, people of all ages still prefer to deal in cash for a variety of reasons, and their wishes must be respected.

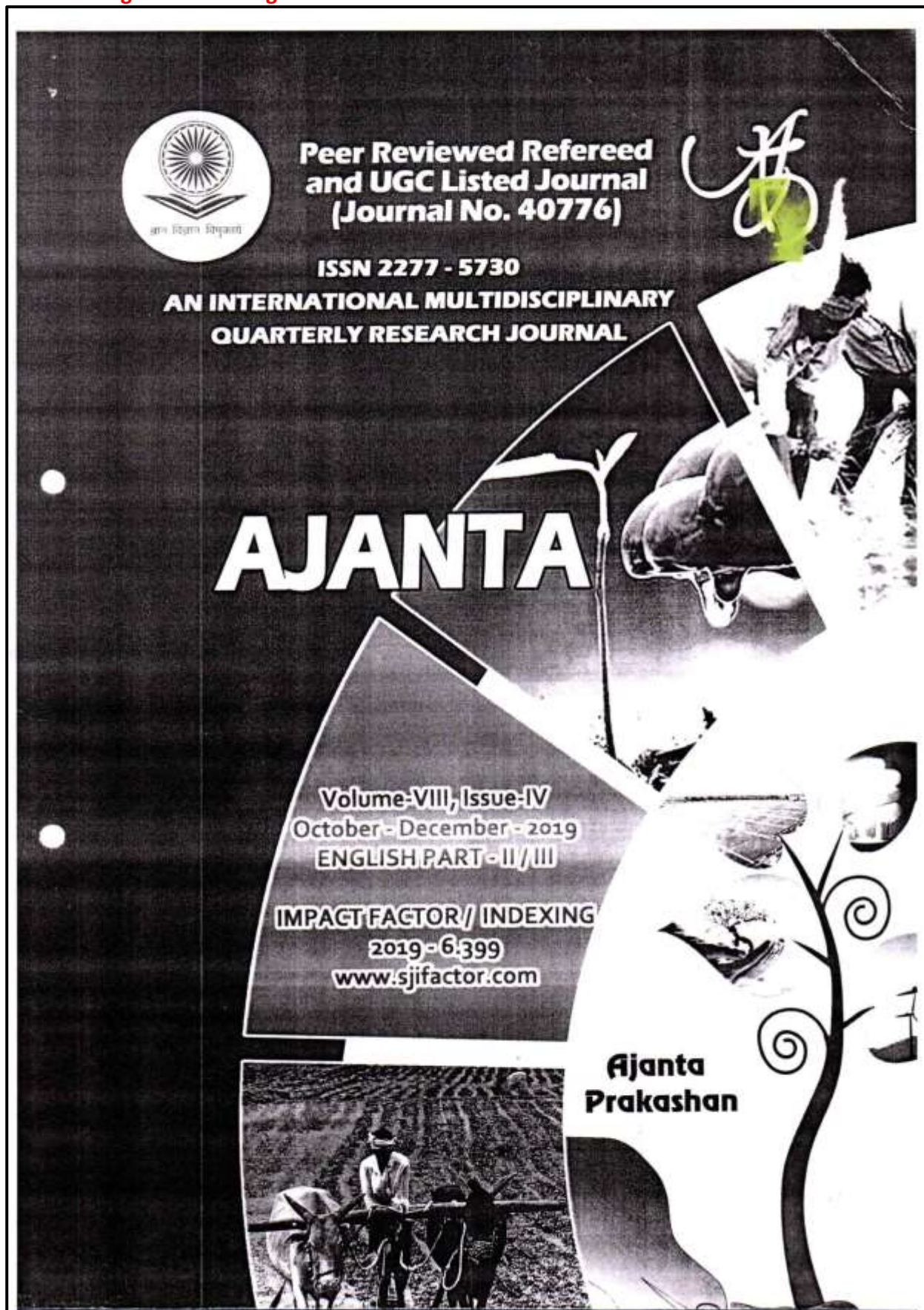
**Loss of control**

Many of the concerns about moving away from cash essentially come down to consumers feeling as though they are in less control of their finances. Whether it's being able to physically feel notes and coins in their wallet or purse, or worries about putting their faith in the systems of private companies or governments, cash gives people a sense of comfort and security that can't be matched by other alternatives. This means that, while non-cash payments may become the norm for many transactions in the coming years, there must always be a place for notes and coins.

**References:**

1. Books on 'Journey Towards Cash less India' - By Jayant Parikshit
2. Books on 'Demonetization: India's Cash less Economy' - By B. Chakryavarti
3. [www.wikipedia.com](http://www.wikipedia.com)
4. [www.rbi.com](http://www.rbi.com)

4. Challenges of Indian Agriculture Sector



VOLUME - VIII, ISSUE - IV - OCTOBER - DECEMBER - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

❧ CONTENTS OF ENGLISH PART - III ❧

Sr. No.	Name and Author Name	Page No.
1	A Comparative Study of Reaction Abilities among Lawn Tennis, Tabel Tennis, Squash and Soft Tennis Players <b>Rahul K. Ugalmugle</b>	1-6
2	Post-Harvest Fungal Diseases of Vegetables and Fruits in Area of Basmath <b>V. S. Maske</b>	7-11
3	Impact of Heavy Metal, Cadmium on Protein Metabolism in Freshwater Fish Oreochromis Mossambica <b>S. S. Baad</b>	12-21
4	Challenges of Indian Agriculture Sector <b>Dr. Deepak Pandharinath Sontakke</b>	22-26

VOLUME - VIII, ISSUE - IV – OCTOBER - DECEMBER - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

---

## 4. Challenges of Indian Agriculture Sector

**Dr. Deepak Pandharinath Sontakke**

Head Department of Economics, New Arts Commerce & Science College,  
Parnar Dist. Ahmednagar.

---

### Abstract

India is known as an agricultural country, the agriculture sector play an important role in the Indian economy. The contribution to gross domestic product is around one sixth. It provide employment near about 55 to 60 per cent of Indian work force, any issues or problem raised in agriculture sector it affect the Indian economy, it means it is the most inclusive growth sector of the Indian economy. Now a day Indian agriculture sector faces so many challenges and these challenges are emerging demand, impact of climate change, inadequate facility, storage facility, land issues, agricultural credit availability, price and yield losses.

### Introduction

India is a second largest country in terms of population and seventh largest country in terms of area in the world. The important point is that near about 70 per cent population living in rural area and near about 60 per cent of its workforce in agriculture. It shows that India remain a predominantly agrarian economy, but day to day the share of agriculture sector in the gross domestic products is falling, in 1990-91 agriculture sector 30 per cent share in GDP and in 2011-12 less than 15 per cent share in GDP<sup>1</sup>. This trend is not good for development process of any country because the agriculture sector is a backbone of development. During last one and a half decade several challenges have surfaced in Indian agriculture which is becoming more and more severe with the passage of time. The growth rate has turned lower than the growth in population dependent on agriculture implying that per capita income in agriculture is falling this is considered a major factor for large scale rural distress and large number of suicidal deaths by farmers in various parts of the country. Today's agriculture sector faces many challenges due to land and water scarcity and pressure on natural resources. There is a mismatch between population growth and cultivatable land and this creates great challenge to the whole society. The cultivation of land is decreasing due to the industrialization, high growth of population and other reasons. Population growth and losses are the main problem of country, Due to

VOLUME - VIII, ISSUE - IV – OCTOBER - DECEMBER - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

### Comparisons of Yields in Main Commodities

In India the yield of crops is very low as compare to the various countries in the world; this is because of the Indian farmers not adopting new techniques in farming. Some of the other reasons also affect the crop yield like weather conditions, availability of water, types of land etc.<sup>3</sup> following table shows the comparisons of yields in main commodities.

**Comparisons of Yield in Main Commodities (Metric Tonnes per Hectare)**

Sr. No.	Rice/Paddy		Wheat		Maize		Cotton		Major Oilseeds	
	Country	Yield	Country	Yield	Country	Yield	Country	Yield	Country	Yield
1.	Egypt	9.8	U.K.	7.7	USA	9.1	China	11.1	Germany	4.0
2.	USA	7.8	France	7.5	France	7.5	Brazil	10.9	USA	2.6
3.	Korea	6.7	China	4.2	Germany	6.6	USA	9.5	Argentina	2.5
4.	Japan	6.4	India	2.7	China	4.9	Uzbekistan	7.9	Brazil	2.4
5.	India	2.9	Pakistan	2.3	India	1.1	India	4.6	India	0.8
6.	World	3.9	World	2.8	World	1.1	World	7.3	World	1.8

**Source:** Indian Agriculture: Challenges and Prospects, IMA India, 2009, Page No. 16.

Above table reveals that in India rice, wheat, maize, cotton and major oilseeds yield is very low against the world yield in same crop. This is because of Indian farmers not use scientific methods of farming in their land. It also is happened not aware Indian farmers about scientific technologies of farming, seed quality, chemical fertilizers and Pesticides.

### Challenges of Agriculture Sector

Indian agricultural sector suffering from many challenges, these challenges creates many problems. Following are the some major challenges of Indian agriculture sector.

- 1. Emerging Demand:** The population in India is a second highest population in the world and it is increased day by day. There is a mismatch between population growth and cultivatable land and this creates great challenge to the whole society. The cultivatable land decreases due to urbanization and industrialization. The per capita monthly consumptions of cereals has declined from 14.80 kg. in 1983-84 to 11.35 kg. in 2009-10 in the rural area of the country. In the urban area, it has decline from 11.30 kg. in 1983-84 to 9.37 kg.in 2009-10. It shows the variations of monthly consumptions in the country.<sup>4</sup>
- 2. Impact of Climate Change:** Now a day's climate pattern is changes, this is a major challenge for agriculture sector. The climate change affects the food grain production, food security and livelihoods unlike other sectors. The agriculture sector largely

VOLUME - VIII, ISSUE - IV – OCTOBER - DECEMBER - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 6.399 (www.sjifactor.com)

8. **Yield Loss:** This is a major challenge of agriculture sector yield loss is an important risk, weather, pests and disease of plants spurious quality of input could be the possible reasons. The risk is real because even today crop loss can adversely affect the consumption requirements of many farmer households price shocks are also matter of concern.<sup>8</sup>

#### Conclusions

1. Variations shows in per capita per day food grain availability.
2. Yield of main commodities in India is very low against the world.
3. Day to day the food grain demand is increases but the food grain availability is decreases.
4. Food grain storage and irrigation facility is not adequate.
5. In Indian agriculture sectors land issue, price issue, agricultural credit availability and yield loss are increasing.

#### References

1. Ministry of Agriculture (February, 2012), Indian Agriculture: Performance and Challenges, page No. 1.
2. Directorate of Economics and Statistics (January 2015), Agriculture Situation in India, Ministry of Agriculture, GOI, Page No. 7.
3. Mohan Akhil (2009), Indian Agriculture: Challenges and Prospects, IMA India, Page No. 16.
4. Ministry of Agriculture (February 2012), Indian Agriculture: Performance and Challenges, Page No. 17.
5. Mr. Bagi (2013), Status of Agriculture in India, Page No. 26.
6. Dev Mahendra, (2009), Challenges for Revival of Indian Agriculture, Agricultural Economic Research Review, Page No. 30.
7. Biru Birendra and Barpujari Indrani (2014), Jan Sunwai on The Present Agrarian Crisis A Report, Page No. 10.
8. Mishra Sujit (Sept. 2007), Risk, Farmer Suicides and Agrarian Crisis in India: Is There A way out?, Indira Gandhi Institute of Development Research, Mumbai, Page No. 12.
- ∴

## 5. Phase change under heat treatment during synthesis of alpha Al<sub>2</sub>O<sub>3</sub> Nanoparticles by sol Gel method



Dhawale Vijaya Pandurang et al., IJSRR 2019, 8(2), 550-555

Research article

Available online [www.ijsrr.org](http://www.ijsrr.org)

ISSN: 2279-0543

### *International Journal of Scientific Research and Reviews*

#### **Phase Changes Under Heat Treatment During Synthesis of $\alpha$ -Al<sub>2</sub>O<sub>3</sub> Nanoparticles by Sol Gel Method**

**Dhawale Vijaya Pandurang<sup>1\*</sup>, Mohite Kakasaheb Chandrakant<sup>2</sup>, and Kulkarni Satish Damodar<sup>3</sup>**

<sup>1</sup> New Arts Commerce and Science College, Parner, Ahmednagar- 414 302, M.S. INDIA  
E-mail: [vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com)

<sup>2</sup>C.T. Bora College Shirur, Dist. Pune- 412 210, M.S. INDIA  
E-mail: [kemohite@gmail.com](mailto:kemohite@gmail.com)

<sup>3</sup>New Arts Commerce and Science College, Ahmednagar- 414 001, M.S. INDIA  
E-mail: [satishdkulkarni@gmail.com](mailto:satishdkulkarni@gmail.com)

#### **ABSTRACT**

In the present study,  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles synthesized using alcoholic solution of AlCl<sub>3</sub>, 25% NH<sub>3</sub> and Polyvinyl alcohol (PVA). PVA act as a capping agent. All these chemicals were inexpensive raw materials. Stable crystalline phase of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles occurred at a temperature 1100<sup>o</sup>C. During heat treatment, stable  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> can be obtained through the series of phase transformations from boehmite,  $\gamma$ ,  $\delta$ ,  $\theta$  to  $\alpha$ - phase of Al<sub>2</sub>O<sub>3</sub>. Crystalline nanoparticle formation of the dried sol was investigated using x-ray diffractometry (XRD). XRD shows crystal size increases from 25 nm to 32 nm when calcination temperatures increases from 500<sup>o</sup>C to 1100<sup>o</sup>C. It was shown that crystal size increases during the heat treatment. The morphology of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles was studied using Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), along with energy- dispersive X-ray analysis (EDAX). TGA and DTA shows, 77% weight loss and phase transformations. Synthesized  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles were applied in waste water treatment as an adsorbent.

**KEYWORDS:** Sol-gel method, phase change, heat treatment, calcination.

#### **\*Corresponding Author:**

**Dhawale V. P.**

Associate Professor

Post Graduate Department of Physics,

New Arts Commerce and Science College,

Parner, Ahmednagar, 414 302- India

E-mail: [vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com)

Mob. No. +91 9822725739

*IJSRR, 8(2) April. – June., 2019*

Page 550

## 1. INTRODUCTION

Alumina ( $\text{Al}_2\text{O}_3$ ) is the most important ceramic materials used for fabrication of catalyst, catalyst supports, adsorbent materials, coatings and for industrial applications.<sup>1</sup> In the present work an alumina nanopowder is synthesized by sol-gel method using low cost aluminum chloride ( $\text{AlCl}_3$ ), ammonia ( $\text{NH}_3$ ) and polyvinyl alcohol (PVA). Sol-gel method is most convenient method to produce ceramic nanoparticles. It consist of formation of sol from alkoxides or organometallic precursors. In this, suspended particles polymerized at low temperatures and thus generated wet gel is then dried and heat treated.<sup>2</sup> However long gelation time is the drawback of sol-gel route.<sup>3</sup>  $\text{Al}_2\text{O}_3$  exists near about fifteen distinct crystallographic phases and it can undergo a variety of transitions until the most stable corundum structure  $\alpha\text{-Al}_2\text{O}_3$  forms at high temperatures.<sup>4</sup> During the thermal treatment, stable  $\alpha\text{-Al}_2\text{O}_3$  phase can be obtained through the following series of phase transformations before conversion to  $\alpha\text{-Al}_2\text{O}_3$ .



The aim of the present paper is to study phase changes through TGA, DTA and XRD obtained at different temperatures.

## 2. EXPERIMENTAL SECTION

$\alpha\text{-Al}_2\text{O}_3$  nanoparticles were synthesized by using aluminum chloride as a precursor, 25% ammonia and polyvinyl alcohol (PVA). Alcoholic solution 0.5 M  $\text{AlCl}_3$  was prepared, 25%  $\text{NH}_3$  was added drop by drop till resulting solution turned to a white sol, PVA was added until it becomes a transparent sticky gel. The gel was allowed to mature for 24 hours at room temperatures and heat treated at  $100^\circ\text{C}$  for 24 hours. The dried gel was divided into 4 parts and were heat treated at  $500^\circ\text{C}$ ,  $700^\circ\text{C}$ ,  $900^\circ\text{C}$  and  $1100^\circ\text{C}$  for 4 hours respectively.

## 3. RESULTS AND DISCUSSION

### 3.1. SEM/TEM and EDAX of $\text{Al}_2\text{O}_3$ nanoparticles

SEM image of the  $\text{Al}_2\text{O}_3$  NPs gives the distribution pattern and size of the nanoparticles (Fig. 1A, B). The TEM micrograph shows slight agglomeration with spherical morphology and their average particle size were 77.7 nm (Fig. 1C, D). The SAED pattern of  $\text{Al}_2\text{O}_3$  NPs shows that the rings are composed of dots suggesting the crystalline nature of these particles (Fig. 2E). The quantitative analysis of the  $\text{Al}_2\text{O}_3$  nanoparticle was done using EDAX spectroscopy measurement and it shows Al and O as the major components of aluminium oxide nanoparticles in the heads as shown in figure 2(F).



*Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555*

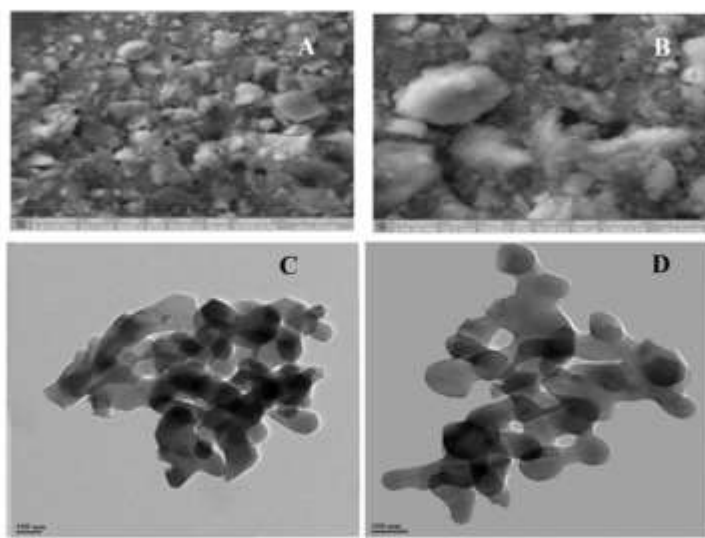


Figure 1. Scanning electron micrographs (SEM) (A, B) and Transmission electron micrographs (TEM) of  $\text{Al}_2\text{O}_3$  nanoparticles (C, D).

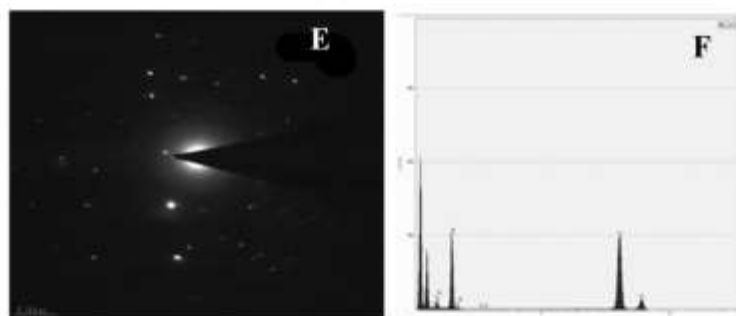
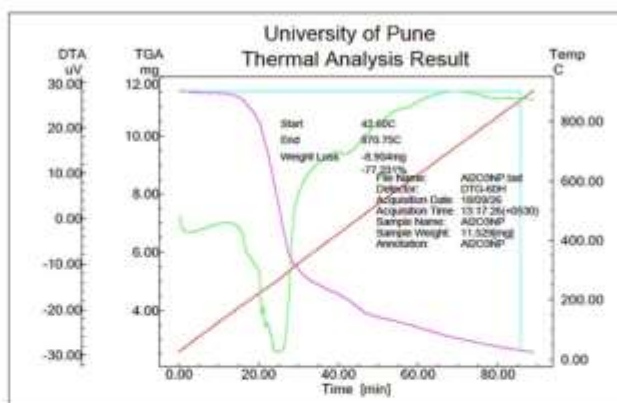


Figure 2. Selected area electron diffraction pattern (E) and EDAX of  $\text{Al}_2\text{O}_3$  nanoparticles (F).

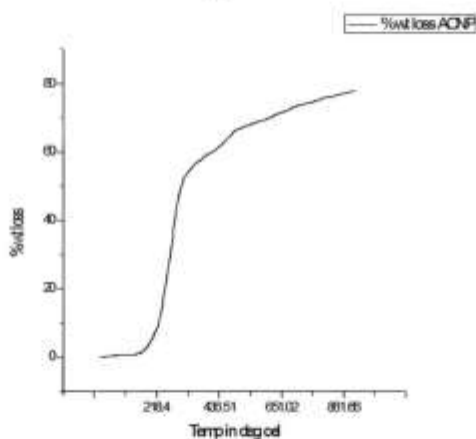
### 3.2. Thermal analysis

The % weight loss with temperature of TGA curve shows that nanoparticle formation temperature is  $762^\circ\text{C}$  and transition temperature  $800^\circ\text{C}$  with one step weight loss of 77%. The DTA curve shows endothermic reaction attributed to moisture loss and to hydroxyl loss from the decomposition of hydrated aluminum chloride and aluminum hydroxide (Graph 1a,b). The endothermic effects at about  $800^\circ\text{C}$  and  $900^\circ\text{C}$  may be due to the transformations of polymorphous enantiotropy  $\gamma\text{-Al}_2\text{O}_3$  in  $\alpha\text{-Al}_2\text{O}_3$ . Transformation temperature  $\gamma\text{-Al}_2\text{O}_3$  to  $\alpha\text{-Al}_2\text{O}_3$  is less than  $1000^\circ\text{C}$  shows small crystallite size and degree of crystallinity characteristic of the nanopowder.<sup>2</sup>

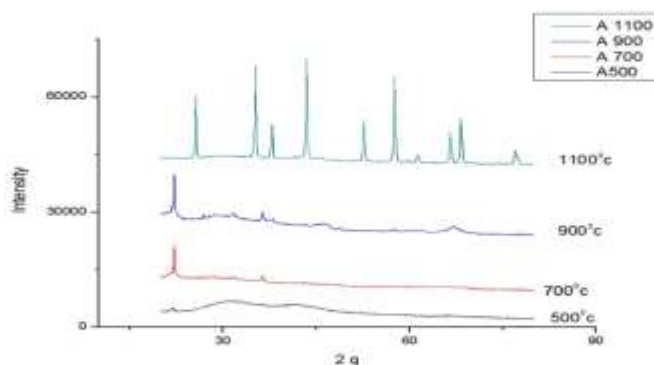
Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555



Graph 1(a). Thermal analysis (DTA and TGA) of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles obtained by Sol-gel method, calcined at 1100°C temperature for 4h

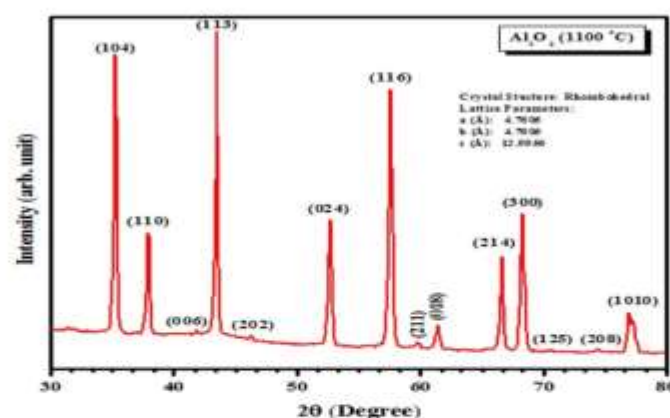


Graph 1(b). The % weight loss of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles



Graph 2. XRD Patterns of dry gel calcined for 4 h at different temperatures

Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555



Graph 3. X-ray Diffraction pattern of  $\alpha$ - $\text{Al}_2\text{O}_3$  nanoparticles

### 3.3. XRD analysis

Graph 2 shows the comparable XRD patterns of powders prepared by different calcination temperatures from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ . X-ray diffraction images for the powders obtained from precursors  $\text{AlCl}_3$  and dried at 24 hours after maturation of 24 hours, heat treated for four hours from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$  separately. It shows that thermal treatment leads to its decomposition with the formation of a mixture of  $\gamma$ - $\text{Al}_2\text{O}_3$  phase (JCPDS - 47-1308) and  $\alpha$ - $\text{Al}_2\text{O}_3$  phase (JCPDS file-71-1678).<sup>6</sup>

XRD at temperatures  $500^\circ\text{C}$  and  $700^\circ\text{C}$ , shows there are 4-5 broad peaks in the pattern for the sample sol-gel sample which are difficult to index according to the JCPDS data indicating that the powder is possibly amorphous. Powder at this temperature shows the existence of organic materials and confirms XRD pattern, where these compounds have prevented particles from forming crystal structure. However, the diffraction peaks are a little sharper and attributed to  $\gamma$ - $\text{Al}_2\text{O}_3$  for the sol-gel sample.<sup>7</sup> All diffraction peaks exhibit high degree of broadness due to formation of nanocrystals. The characteristic peaks of  $\gamma$ - $\text{Al}_2\text{O}_3$  is improved for the sol-gel sample with increasing calcination temperature upto  $1000^\circ\text{C}$ .<sup>8</sup> The diffraction peaks of  $\delta$  and  $\gamma$  are very close to each other, in fact overlapping in some positions. It can indicate that  $\gamma$ - $\text{Al}_2\text{O}_3$  co-exists with  $\delta$ - $\text{Al}_2\text{O}_3$ .<sup>9</sup> Increasing temperature of heat treatment upto  $1100^\circ\text{C}$  for four hours results in the formation of only  $\alpha$ - $\text{Al}_2\text{O}_3$  (JCPDS file-71-1683) (Graph 3). At  $1100^\circ\text{C}$  single phase  $\alpha$ - $\text{Al}_2\text{O}_3$  is completely formed. The diffraction pattern is extremely sharp indicating the existence of highly crystalline material which is shown by the curve at temperature  $1100^\circ\text{C}$ . Average crystal size calculated from Debye scherrer formula was found to be increasing from 25 nm to 32 nm of dried gel when calcination temperature increases from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ .

#### 4. CONCLUSION

The sol-gel synthesis of  $\alpha$ - $\text{Al}_2\text{O}_3$  was relatively simple and easy method. The resulting  $\alpha$ - $\text{Al}_2\text{O}_3$  powder were characterized by X-ray diffraction, differential thermal analysis and thermo gravimetric analysis (DTA, TGA). Applying heat treatment at temperatures up to  $1100^\circ\text{C}$  for 4 hours  $\alpha$ - $\text{Al}_2\text{O}_3$  powder was obtained at nanometric scale having rhombohedral structure. Its crystal size ranges from 25 nm to 32 nm after calcinations of dried gel from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ .  $\alpha$ - $\text{Al}_2\text{O}_3$  nanopowder have superior properties as compared to the powder obtained in larger particle size and it can be used as a effective adsorbent in waste water treatment.

#### ACKNOWLEDGEMENT

Smt. Dhawale V.P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under Faculty Development Program.

#### REFERENCES

1. Mirjalili F, Abdullah LC, Mohamad Het al. Process for nano-alpha-alumina powder. ISRN Nanotechnology, 2011; 2011: 1-5.
2. Rogojan R, Andronescu E, Ghitulica Cet al. Synthesis and characterization of alumina nanopowder obtained by sol-gel method. UPB Sci. Bull Series B., 2011; 73: 67-76.
3. Gomez H and Ozcan O. Low temperature synthesis of nanocrystalline  $\alpha$ - $\text{Al}_2\text{O}_3$  by a tartaric acid gel method. Mater Sci. Eng. A., 2008; 475:20-33.
4. Naoufal Bahlawane and Tadahikon Watanabe. New sol-gel Route for the preparation of pure  $\alpha$ -alumina at  $950^\circ\text{C}$ . J. Am. Ceram. Soc., 2000; 83(9): 23- 26.
5. Arami H, Mazloumi M, Khalifehzadeh K et al. Bundles of self-assembled boehmitenanano strips from a surfactant free hydrothermal route. Journal of Alloys and Compounds, 2008; 461(1-2): 551–554.
6. Hongyu Liu, Guiling Ning, Zhihong Gan et al. A simple procedure to prepare spherical  $\alpha$ -alumina powders. Materials Research Bulletin, 2009; 44(4): 785-788.
7. Rajaeiyan A and Bagheri-Mohagheghi MM. Comparison of sol-gel and co-precipitation methods on the structural properties and phase transformation of  $\gamma$  and  $\alpha$ - $\text{Al}_2\text{O}_3$  nanoparticles, Adv. Manuf. 2013; 1:176–182. DOI 10.1007/s40436-013-0018-1.
8. Banerjee S and Sujatha P. Effect of citrate to nitrate ratio on the decomposition characteristics and phase formation of alumina. J. Therm Anal Calorim., 2007; 90:699–706.
9. Zhan X, Honkanen M, and Leva E. Transition alumina nanoparticles and nanorods from boehmitenanoflakes. J. Crystal Growth, 2008; 310:3674–3679.

## 6. Phytotoxicity and stimulatory impact of Silver Nanoparticles on seeding growth of moth bean

1107

Environment and Ecology 37 (3B) : 1107–1113, July–September 2019  
Website: environmentandecology.com ISSN 0970-0420

### Phytotoxicity and Stimulatory Impact of Silver Nanoparticles on Seedling Growth of Moth Bean

Dhawale V. P., K. C. Mohite, S. D. Kulkarni

Received 17 April 2019; Accepted 20 May 2019; Published on 10 June 2019

**Abstract** Silver nanoparticles (AgNPs) are one of the most widely used nanoparticles and expected to enter natural ecosystem. We have investigated the effects of AgNPs on plant growth parameters such as % Germination, root length, shoot length, biomass, seedling vigor index (SVI) of an important pulses, moth beans (*Vigna aconitifolia*). Three concentrations of AgNPs viz. 50, 100, 150 mg/L were used to test the growth parameters. Among the treatments, application of 100 mg/L concentration of AgNPs proved best by giving the highest values for percent seed germination, root length, shoot height and seedling vigor index. A significant negative influence on biomass and root length was observed for all seeds in compared to those of control germination. Application of 150 mg/L AgNPs concentrations decreased mean germination time in comparison to control. Overall, this study has shown that direct exposure of germinating seeds to AgNPs may cause phytotoxicity and underscores the need

for eco-responsible disposal of wastes and sludge containing nanoparticles.

**Keywords** Phytotoxicity, Silver nanoparticles, Moth bean, Seedling growth.

#### Introduction

Distinct properties of nanomaterials (Å 100 nm) such as large surface area to volume ratio, small size and high reactivity enable them to find applications in various industrial sectors and our daily lives (Handford et al. 2014). There has been rising demand for nanotechnology-based products in recent years. Nanotechnology has many applications in the field of agricultural research, such as in reproductive science and technology disease prevention and various other plant treatments, the transfer of agricultural and food waste to energy and other helpful by-products through enzymatic nanobioprocessing and various other plant treatments using nanocides (Carmen et al. 2003). Silver nanoparticles, is one of the most commonly used in the field of agriculture due to their antimicrobial and safety potential associated with human and environmental use. Silver nanoparticles have been used to create new consumer products, drugs, various food and other medical products.

Efficient seed germination and early seedling establishment are important processes in commercial agriculture. Rapid and uniform seedling emergence leads to successful plant establishment. Some reports have shown that both positive and negative impact on seed germination and seedling growth. Unique properties of nanoparticles can be used to improve

Dhawale V. P\*,  
Post Graduate, Department of Physics, New Arts Commerce and Science College, Parner, Ahmednagar 414302, India

K. C. Mohite  
Post Graduate, Department of Physics, C.T. Bora College, Shirur, Pune 412210, India

S. D. Kulkarni  
Post Graduate, Department of Environmental Science, New Arts Commerce and Science College, Ahmednagar 414001, India  
e-mail: vjaya.dhawale2009@gmail.com  
\*Corresponding author

1108

seed germination and crop performance. Gubbins et al. (2011) demonstrated that AgNPs could inhibit the growth of *Lemna minor*. Only few studies on vascular plants showed that AgNPs have deleterious effects on plant growth (Stampoulis et al. 2009). Pulate et al. (2011), Patilola et al. (2012) found that nanoparticles have different levels of toxicities which may be size and shape dependent and have ability of penetrate the cell walls. Phytotoxicity studies reported both positive and negative effects of nanoparticles on higher plants as seed germination, cell division, root elongation, growth and metabolic processes (Carlson et al. 2008). Lin and Xing (2007) evaluate phytotoxicity of five types of metallic nanoparticles in six plant species and showed that seed germination was not affected except for the inhibition of nanoscale zinc oxide on *Zea mays* and nanoscale zinc on *Lolium multiflorum*. They found that inhibition of root growth varied significantly among nanoparticles and plants and that it was partially correlated to nanoparticle concentrations. Kumar et al. (2011) investigated that AgNPs had cytotoxic and genotoxic impacts on *Allium cepa* meristems.

*Vigna aconitifolia*, commonly known as moth beans is a popular Indian crop cultivated as a forage and cover crop. It is also grown in Pakistan, United States, Thailand, Australia and other parts of Asia. Moth beans are an excellent source of proteins and other essential minerals and vitamins. These are considered to be effective in the prevention of constipation heart diseases, high blood pressure, high cholesterol, osteoporosis and low energy.

Rapid and uniform seedling emergence leads to successful plant establishment, as a deep root system is formed before the upper layers of the soil dry out, harden or reach supra-optimal temperatures (Chen and Arora 2013). The unique properties of nanoparticles can be used to improve seed germination and crop performance. This use of the positive impacts of nanoparticles may be useful approach to decrease use of chemical agents in agriculture that would help to lower environmental pollution. Poor seed germination is a common occurrence in pulses and there are no studies on the effects of nanoparticles on *Vigna aconitifolia*. This study was therefore carried out to investigate possible phytotoxicity and/or beneficial

stimulatory effects of AgNPs concentrations on moth bean seed and seedling growth.

## Materials and Methods

### Nanoparticle preparation

The sol-gel method was used for preparation of silver nanoparticles. silver nitrate ( $\text{AgNO}_3$ , 99.9%) and sodium oleate ( $\text{C}_{18}\text{H}_{33}\text{NaO}_2$ , 99%) were purchased from Molychem and Modern industries respectively. It was used without further purification, 1M silver nitrate ( $\text{AgNO}_3$ ) and 1M sodium oleate ( $\text{C}_{18}\text{H}_{33}\text{NaO}_2$ ) solution in deionized water were prepared. Sodium oleate was added in silver nitrate solution and stirred at 20°C on a magnetic stirrer for 2 h. After that filtered by Whatmann filter paper, dried mixture and heated in furnace at 300°C for 4 h (Kim et al. 2004).

### Preparation of nanoparticles suspension

Nanoparticles stock suspensions (1000 mg/L) was prepared by pre-weighed AgNPs in deionized water (DI-water) and dispersed by ultrasonic vibration (100 W, 40 kHz) for 30 min. For further stabilization of nanoparticle suspension, 10% (v/v) polyethylene glycol (PEG-400) a dispersant was added (Zhang et al. 2007). The suspensions were sonicated again for at least 1 min before use.

### Seeds germination and exposure

Seeds of moth bean (*Vigna aconitifolia*) were purchased from the local market. The seeds were stored in dark under room temperature. All the seeds were checked for their viability by suspending them in deionized water. The seeds which settle to the bottom were selected for further study. Seeds were immersed in 10% sodium hypochloride for 10 minutes to ensure surface sterility (USEPA 1996). After rinsing three times with DI-water, seeds were soaked in deionized water (control) and different concentrations of AgNPs suspension solution. To investigate the promotory and inhibitory effects of nanomaterials on moth bean, three concentrations (50, 100, 150 mg/L) were prepared. Seeds were soaked in each suspensions (50, 100, 150 mg/L) for 2 h. One piece of a moisture germination paper was into each 100 mm × 15 mm

petri dish. In each petri dish 5 ml of test medium of AgNPs (50, 100 and 150 mg/L) were added. Seeds were then transferred onto the moisture germination paper, with 10 seeds per dish and 1 cm of larger distance between each seed (Yang and Watts 2005). Petri dishes were covered and sealed with tape and allowed to germinate. All concentrations of AgNPs and the control were tested at the same time to ensure uniform conditions of light and temperature across all tests. Seeds were considered germinated when the radical showed at least 2 mm in length (ISTA 2009). The dry weight of seedling was recorded and expressed in gram after oven drying at 70°C for 72 h.

Germination percentage was calculated when no further germination took place. Mean germination time was calculated based on Mathews and Khajeh-Hosseini (2007) (Eq. (1)).

$$MGT = \frac{\sum FX}{\sum F} \quad (1)$$

Where  $F$  is the number of seeds newly germinated at the time of  $X$  and  $X$  is the number of days

from sowing. After germination, the length of roots and shoots for all treatments and related controls (untreated) were measured.

For the germination rate and root and shoot growth investigation, seeds were allowed to germinate for 10 days. Seed germination and percent (FGP) of each treatment was calculated. Seedling root length and shoot length was measured. A seed was considered to have germinated when radical emerged from the seed coat according to the following equation (Ellis and Robert 1981, Ruan et al. 2002).

$$FGP = \frac{\text{No. of germinated seeds after 4 days}}{\text{Total number of germinated seeds}} \times 100$$

Germination Index (GI)

Germination index was calculated according to the following equation

$$GI = \frac{\text{Germination percentage of each treatment}}{\text{Germination percentage in the control}} \times 100$$

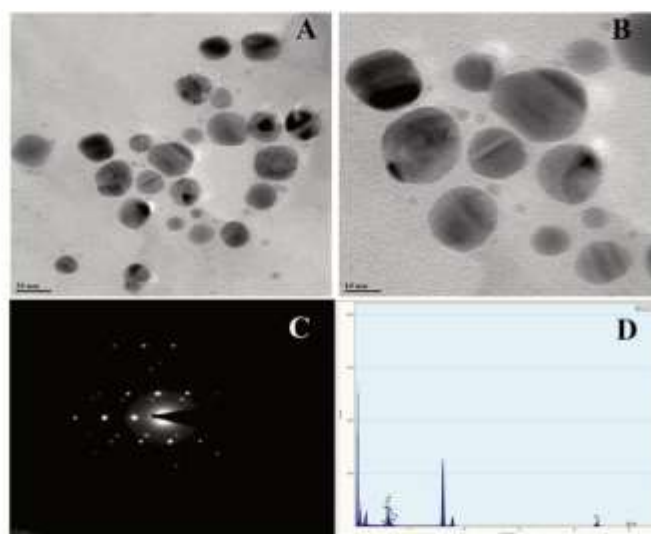


Fig. 1. Transmission electron micrographs (TEM) (A, B), selected area electron diffraction pattern (C) and EDAX of Ag nanoparticles (D).

1110

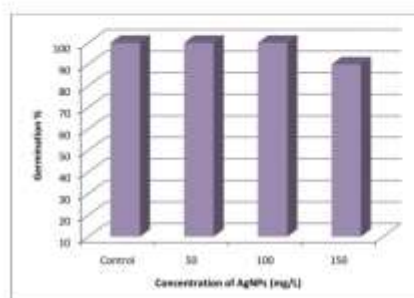


Fig. 2. Effect of different concentrations of AgNPs on germination percent of *Vigna acuminifolia*.

#### Seedling Vigor Index (SVI)

It was calculated according to the following formula

$$SVI = \frac{\text{Average shoot length}}{\text{Average root length}} \times \text{Germination percentage}$$

#### Results and Discussion

The transmission electron microscopy (TEM) image Figure 1 (A, B), selected area electron diffraction (SAED) pattern of AgNPs and EDAX are shown in Figure 1 (C, D). The TEM micrographs indicated that the AgNPs shows spherical morphology and their average particle size were found to be 17.3 nm by ImageJ software EDAX spectrum shows the chemical composition of AgNPs. Result indicates the presence of Ag as the main element. This analysis confirms that AgNPs are effectively composed of Ag with no contamination. The SAED pattern of AgNPs shows that the rings are composed of dots suggesting the crystalline nature of these particles.

The effect of AgNPs on germination of moth beans at 50, 100 and 150 mg/L concentration was examined. The obtained data clearly revealed slightly negative effects on seed germination percent as compared to the control (untreated) (Fig. 2). These results indicating that AgNPs had insignificant toxicological effect on seed germination. This may be due to the selective permeability of seed coats that does not allow nanoparticle material to pass through it (Lin and

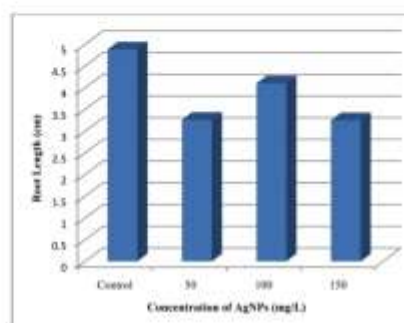


Fig. 3. Effect of different concentrations of AgNPs on root length of *Vigna acuminifolia*.

Xing 2007, Wierzbicka and Obidzinska 1998). These findings agree with recent reports stating that seed germination for different species was not affected by  $n\text{Al}_2\text{O}_3$  (Yang and Watts 2005, Lee et al. 2010). Burklew et al. (2012) have been stated that the seed coat of tobacco seeds were most likely permeable to the  $\text{Al}_2\text{O}_3$  nanoparticles, therefore the germination rate was not affected.

Regarding root growth exposure to AgNPs has a marked reduction in root length where the highest average growth was 4.1 cm after treatment with 100 mg/L concentration as compared to the control (4.88 cm). However minimum root length was observed in 3.25 cm in 150 mg/L AgNPs concentration (Fig. 3). These findings are consistent with other studies which reported that exposure of some seeds to several nanomaterials significantly reduced root growth (Yin et al. 2012). Dietz and Herth (2011) stated that nanoparticles may have to penetrate cell walls of plasma membranes of epidermal layers in root to intervascular tissues explaining why to root exposure was strong. Seed coats, which can have selective permeability play a very important role in protecting the embryo from harmful external factors. The process of seed germination and a root growth is rapid and widely used acute phytotoxicity test owing to sensitivity, simplicity, low cost and suitability for unstable chemicals. Pollutants as nanoparticles could penetrate root system causing obviously growth inhibition, may not affect seed germination if they cannot



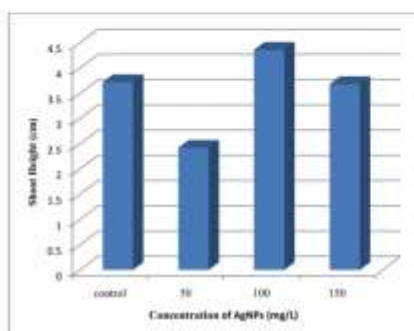


Fig. 4. Effect of different concentrations of AgNPs on shoot height of *Vigna aconitifolia*.

pass through seed coats. This may explain that seed germination in this study was not greatly affected by nanoparticles.

Seeds with high vigor is important for crop production because it cannot significantly enhance seedling establishment but also improve the capability to compete against weeds at seedling stage. Huang et al. (2004) stated that seedling vigor is the ability of seed to rapidly from water or soil mainly reference to seed germination rate and early seedling growth. A significant reduction on SVI of various nanoparticle concentration was observed as compared to control

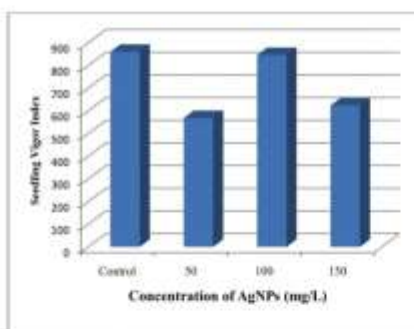


Fig. 5. Effect of different concentrations of AgNPs on seedling vigor index of *Vigna aconitifolia*.

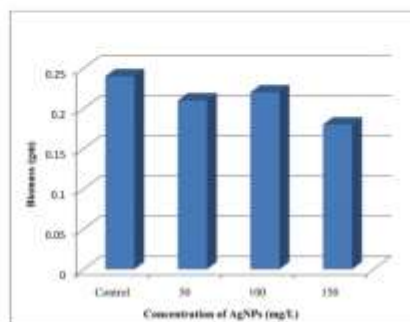


Fig. 6. Effect of different concentrations of AgNPs on biomass of *Vigna aconitifolia*.

(Fig. 5). Highest seedling vigor index was produced in 100 mg/L AgNPs concentration which was 486 followed by 623.7 and 568 in 150 mg/L and 50 mg/L AgNPs concentrations respectively.

Shoot, root and biomass was significantly affected by AgNPs concentrations. Application of AgNPs in 50 mg/L concentration greatly decreased shoot height (2.42 cm) compared to control seeds (3.72 cm). The highest shoot length (4.36 cm) was observed in 100 mg/L concentration showing significant positive effect (Fig. 4). The greatest biomass was found in 100 mg/L AgNPs concentration (0.22 g). Application of 150 mg/L AgNPs concentration greatly decreased biomass (0.18 g) compared to the control seeds (0.24 g), but at the concentrations of 100 mg/L (0.22 g) did not demonstrate a marked reduction in biomass (Fig. 6). It is probable that increasing the concentration of AgNPs induced aggregation of particles and resulted in clogging of pores that interrupted water uptake by seeds. In addition, application of 100 mg/L concentration of AgNPs increased moth beans seedling root length, shoot height and biomass. However, a significant decrease was observed at 150 mg/L concentration of AgNPs. It seems that AgNPs could stimulate process of seed germination just like water and oxygen uptake results in, improved seed germination percentage but in later growth stages seedling might respond as different. Lin and Xing (2007) confirmed the phytotoxicity of nano-Al and Al<sub>2</sub>O<sub>3</sub> significantly affected root elongation of rye

1112

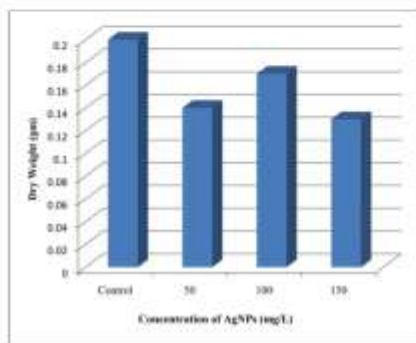


Fig. 7. Effect of different concentrations of AgNPs on dry weight of *Vigna acouitifolia*.

grass and corn respectively whereas nano-Al facilitated root growth in radish and rape. Barnea et al. (2009) stated that although root length and weight are not standardized in toxicity tests, they may be helpful to compare the toxicity effects after seed exposure to nanoparticles since low values can be related to non-acute toxicological effects.

Significant reduction in dry weight was observed as compared to control, the results are graphically illustrated in Fig. 7. In general, lower mean germination time shows the earlier germination. In the present study moth bean seeds were exposed to 50, 100 and 150 mg/L AgNPs concentrations. The results revealed that seeds in 50 and 100 mg/L AgNPs concentrations obtained the lowest mean germination

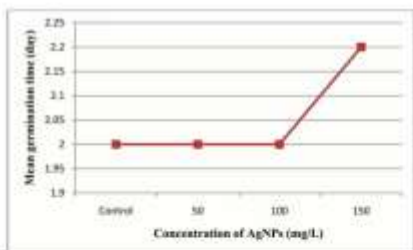


Fig. 8. Effect of different concentrations of AgNPs on mean germination time of *Vigna acouitifolia* seed.

time (2 d) same as that of control. However higher AgNPs concentration (150 mg/L) did not improve mean germination time (Fig. 8). Zheng et al. (2005) stated that the considerable effect of nanosized TiO<sub>2</sub> in spinach germination in tests was probably because of small particle size, which allowed nanoparticles to penetrate the seed during the treatment period, exerting its enhancing function during growth. Feizi et al. (2013) observed that the mean germination time in 40 ppm concentration of nanosized TiO<sub>2</sub> treatment reduced by 31.8% and of bulk TiO<sub>2</sub> treatment (40 ppm concentration) reduced by 21% in comparison with the control.

**Conclusion**

Seed germination and seedling growth is a rapid and widely used phytotoxicity test owing to sensitivity, simplicity, low cost and suitability for unstable chemicals. Seed coat play an important role in protecting the embryo from harmful external factors. Pollutants as nanomaterials may not affect seed germination but could penetrate root system causing obviously root growth inhibition. Our findings indicate that germination percentage was not adversely affected after all treatments whereas root growth, shoot height, biomass and seedling vigor index have negative impact after treatment with the various concentrations of AgNPs as compared to the control. It was observed that low and higher AgNPs concentrations have more adverse effects as compared to intermediate concentration on seedling growth (100 mg/L).

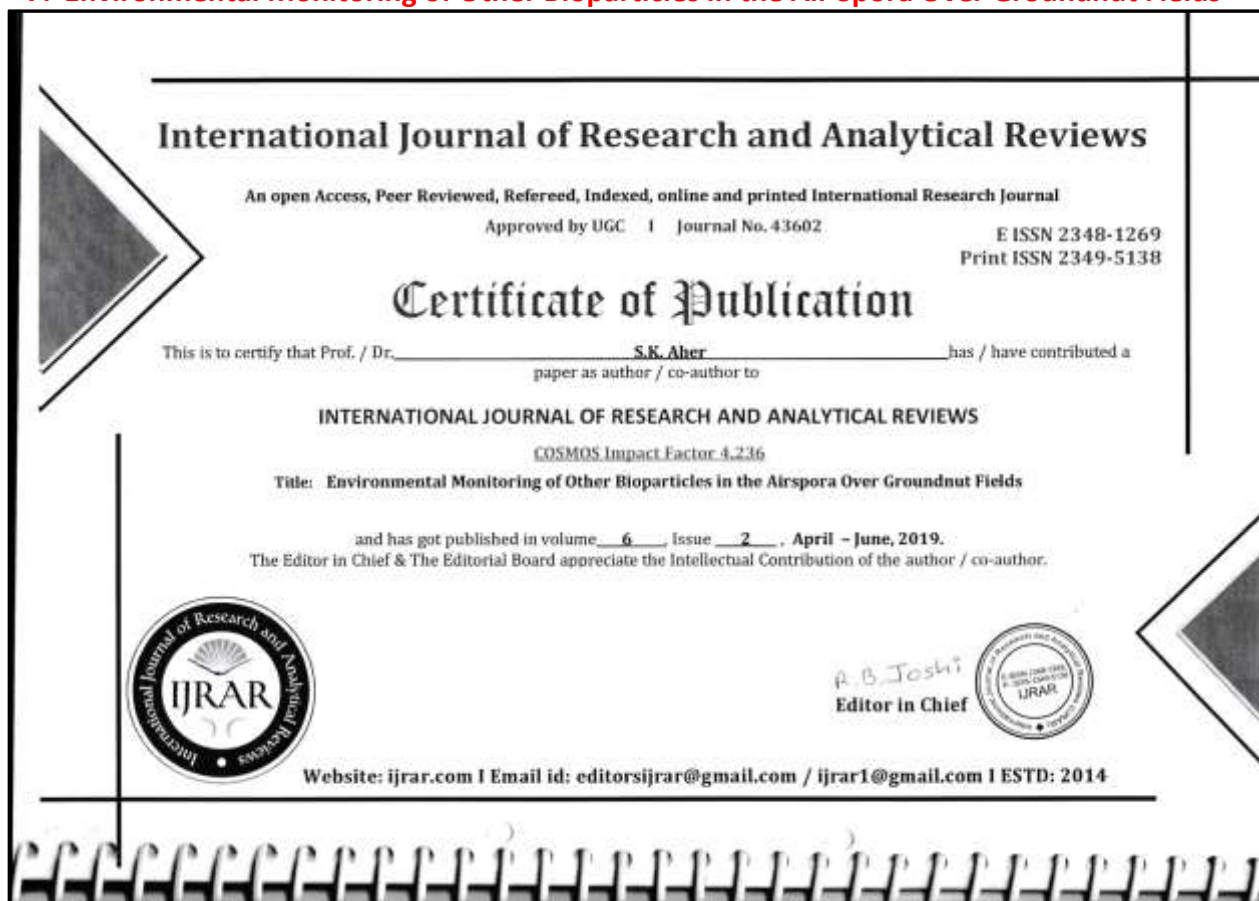
Overall, the study demonstrates the adverse effects of AgNPs on seedling growth, which underscores the necessity of taking remedial measures in the disposal of wastes and sludge containing the nanoparticles and calls for further research for assessing the potential impacts of manufactured nanoparticles on agriculture and environmental systems.

**Acknowledgement**

Smt Dhawale V.P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under faculty improvement program.

## References

- Barnea R, Casals E, Colón J, Font X, Sánchez A, Puentes V (2009) Evaluation of the ecotoxicity of model nanoparticles. *Chemosphere* 75 : 850–857.
- Burklew CE, Ashlock J, Winfrey WB, Zhang B (2012) Effects of aluminum oxide nanoparticles on the growth, development, and microRNA expression of tobacco (*Nicotiana tabacum*). *PLoS ONE* 7 (5) : e34783.
- Carlson C, Hussain SM, Schrand AM, Brayditch-Stolle LK, Hess KL, Jones R, Schlager JJ (2008) Unique cellular interaction of silver nanoparticles : Size dependent generation of reactive oxygen species. *J Physical Chem* 112 (43) : 13608–13619.
- Carmen IU, Chithra P, Huang Q, Takhistov P, Liu S, Kokini JL (2003) Nanotechnology : A new frontier in food science. *Food Technol* 57 : 24–29.
- Chen K, Arora R (2013) Priming memory invokes seed stress-tolerance. *Environm Experim Bot* 94 (1) : 33–45. DOI : org/10.1016/j.envexpbot.2012.03.005
- Dietz KJ, Herth S (2011) Plant nanotoxicology. *Trends in Pl Sci* 16 : 582–589. doi: 10.1371/journal.pone.0047674
- Ellis RH, Robert EH (1981) The quantification of aging and survival of orthodox seeds. *Seed Sci Technol* 9 : 373–409.
- Feizi H, Kamali M, Jafari L, Moghaddam R (2013) Phytotoxicity and stimulatory impacts of nanosized and bulk titanium dioxide on fennel (*Foeniculum vulgare* Mill). *Chemosphere* 91 : 506–511.
- Gubbins EJ, Batty LC, Lead JR (2011) Phytotoxicity of silver nanoparticles to *Lemna minor* L. *Environm Poll* 159 : 1551–1559.
- Handford CE, Dean M, Henchion M, Spence M, Elliott CT, Campbell K (2014) Implications of nanotechnology for the agric-food industry : Opportunities, benefits and risks. *Trends food Sci Technol* 40 (2) : 226–241.
- Huang Z, Yu T, Su L, Yu SB, Zhang ZH, Zhu YG (2004) Identification of chromosome regions associated with seedling vigor in rice. *Yi Chuan Xue-Bao* 31 : 596–603.
- ISTA (2009) ISTA rules. International Seed Testing Association. Zurich, Switzerland.
- Kumar N, Shah V, Walker YK (2011) Perturbation of an arctic soil microbial community by metal nanoparticles. *J Hazard Mater* 190 : 816–822.
- Lee CW, Mahendra YS, Zdrofow YK, Li YD, Tsai YY-C, Braam J, Alvarez PJJ (2010) Developmental phytotoxicity of metal oxide nanoparticles to *Arabidopsis thaliana*. *Environ Toxicol Chem* 29 : 669–675.
- Lin D, Xing B (2007) Phytotoxicity of nanoparticles : Inhibition of seed germination and root growth. *Environ Poll* 150 : 243–250.
- Matthews S, Khajeh-Hosseini M (2007) Length of the lag period of germination and metabolic repair explain vigor differences in seed lots of maize (*Zea mays*). *Seed Sci Technol* 35 : 200–212.
- Patilola AK, Berry A, May L, Tehounwou PB (2012) Genotoxicity of silver nanoparticles in *Vicia faba* : A pilot study on the environmental monitoring of nanoparticles. *Int J Environ Res Public Hlth* 9 (5) : 1649–1662.
- Palate PV, Gharde MJ, Deshmukh VR (2011) Cytological effects of the biological and chemical silver-nanoparticles in *Allium cepa* L. *Int J Innovat Bio-Sci* 1 : 32–35.
- Ruan S, Xue Q, Tylkowska K (2002) The influence of priming on germination of rice (*Oryza sativa* L.) seeds and seedling emergence and performance in flooded soil. *Seed Sci Technol* 30 : 61–67.
- Stampoulis D, Sinha SK, White JC (2009) Assay-dependent phytotoxicity of nanoparticles to plants. *Environ Sci and Tech* 43 : 9473–9479.
- US Environmental Protection Agency (USEPA), Ecological effects test guidelines : Seed germination/root elongation toxicity test. OPPTS 850. 4200. EPA 712-c-96- 154, Washington, DC, Salama, 1996.
- Wierzbicka M, Obidzinska J (1998) The effect of lead on seed inhibition and germination in different plant species. *Pl Sci* 137 : 155–171.
- Yang L, Watts DJ (2005) Particle surface characteristics may play an important role in phytotoxicity of alumina nanoparticles. *Toxicol Letters* 158 : 122–132.
- Yin L, Benjamin PC, Bonnie MM, Justin PW, Emily SB (2012) Effects of silver nanoparticle exposure on germination and early growth of eleven wetland plants. *PLoS ONE* 7 : 47674.
- Zhang LL, Jiang YH, Ding YL, Povey M, York D (2007) Investigation in to the antibacterial behavior of suspensions of ZnO nanoparticles (ZnO nanofluids). *J Nanoparticle Res* 9 : 479–489.
- Zheng L, Hong F, Lu S, Liu C (2005) Effect of nano-TiO<sub>2</sub> on strength of naturally aged seeds and growth of spinach. *Biol Trace Element Res* 105 : 83–91.

**7. Environmental Monitoring of Other Bioparticles in the Air Spora Over Groundnut Fields**

## Environmental Monitoring of Other Bioparticles in the Airspora Over Groundnut Fields

S.K. Aher\*

Associate Professor, Department of Botany, New Arts Commerce and Science College Parner,  
Dist. Ahmednagar - 414 302 India

Received: February 23, 2019

Accepted: April 03, 2019

**ABSTRACT:** : In the present study aerobiological investigation over ground nut (*Arachys hypogaea* L. Var. SB 11) fields was carried out during two summer seasons using continuous volumetric Tilak Air Sampler at Walunj (Ahmednagar, Maharashtra) to study qualitative and quantitative estimation of 'Other aerobiological components'. Hyphal fragments (contributed highest (39.84%) to the total airspora followed by unidentified bioparticles (18.02%), insect parts (16.49%), plant parts (15.48%) and pollen grains (10.15%) during the first summer season and hyphal fragments (33.90%), pollen grains (27.46%), plant parts (13.51%), unidentified bioparticles (13.30%) and insect parts (11.80%) during second summer season respectively. These aerobiocomponents have been recognized as aeroallergens.

**Key Words:** Aerobiocomponents, Tilak air sampler, percentage contribution, summer season, groundnut field.

### I. INTRODUCTION

Groundnut (*Arachis hypogaea* L.), commonly called peanut (Family Fabaceae) is an annual herb growing up to 30 to 50 cm. It is important oilseed crop in tropical and subtropical regions of the world. In Maharashtra, the crop is grown in kharif and summer seasons. About 75 million hector of land is under groundnut cultivation and the production is about six million tonnes. Groundnut have many uses, they can be eaten raw, roasted or with various raciones. Groundnut oil is often used in cooking. It is more healthy, contain high protein and high energy. However the crop is subjected to various fungal diseases. Aerobiology deals with the study of microorganisms which are present in the atmosphere. According to modern concept, it includes dispersion of insect population, bacteria, fungal spores, pollen grains, molds, viruses, bacteria and all forms of life, both plants and animals that are borne and transported partially or wholly by the atmosphere (Jacobs, 1951). All these component of biological origin occur in the air and constitute the 'airspora'. The studies of airborne biocomponents except fungal spores are known as 'Other biocomponents'. In many earlier aerobiological surveys the emphasis was given to the fungal spores and pollen grains due to their importance in various aspects (Mali et al., 2012; Tilak, 1984; Arsule and Pande, 2011; Aher et al., 2002; Mali and Gaikwad, 2011; Aher, 2017; Krishnamurthi and Vitthal, 1983; Thakur and Jite, 2015; Kadam et al., 2008). The 'Other aerobiocomponents' play an important role as aeroallergens similar to fungal spores and pollengrains. Therefore it is important to study the aerobiocomponents which shows allergic effects in extramural environment.

Aerobiocomponents can affect the activities of people and can cause diseases of plants, animals and even human beings also (Tilak, 1982; Ray et al., 1992; Zutkiewicz, 1997). It has been reported that airborne fungi are among the most common organism correlated with air pollution that have adverse effect on human health. It has been known beyond doubt that the airborne fungal spores play an important role in the etiology of respiratory allergic disorders (Shivpuri and Agarwal, 1969).

The present study was conducted with a view to access qualitative and quantitative dominance of 'Other aerobiocomponents' and their relation with environmental parameters.

### II. MATERIALS AND METHODS

The present aerobiological investigations were carried out over ground nut fields at Walunj, Ahmednagar, India with a view to study qualitative and quantitative assessment of airspora with the help of Tilak continuous air sampler (Tilak and Kulkarni, 1970). The sampler continuously runs with 320V current and the drum present inside the sampler completes one rotation in eight days. The sampler was operated over the groundnut fields for two consecutive summer seasons i.e. first season from 12th May 1990 to 31st August 1990 and second season from 5th My 1991 to 20th August 1991. Regular visits to the field were

## 8. Response of wheat (*Triticum aestivum*L.) to water stress in relation to the RWC, MSI and Lipid Peroxidation

EMERGING TRENDS IN BIODIVERSITY CONSERVATION (ETBC-2019)

Organized by Department of Botany, K.J. Somaiya College of Arts, Commerce and Science, Kopergaon

### Response of Wheat (*Triticum aestivum* L.) to Water Stress in Relation to the RWC, MSI and Lipid Peroxidation

S.L. Khapke

Department of Botany,  
New Arts, Commerce and Science College,  
Parner, Maharashtra, India.

**ABSTRACT:** Water stress is one the most important environmental stress, severely affects plant growth and development, limits plant production and the performance of crop plants. The present study was aimed to determine the effect of different levels of water stress conditions on RWC, MSI and Lipid Peroxidation in wheat (*Triticum aestivum* L.) at seedling and anthesis stage. Wheat cultivar (var.496) was subjected to water stress (FC) percent treatment in pot culture. The pot culture experiment was carried out in three replications by using five water stress treatments. Results revealed that the metabolites such as relative water content and membrane stability index were decreased with increasing level of drought stress treatments. The amount of lipid peroxidation enhanced gradually and significantly with increase in level of drought stress.

**Keywords:** Water stress, *Triticum aestivum*, RWC, MSI, Lipid peroxidation

#### Introduction

Wheat is the most important agricultural good in international market and also it is one of the strategic agricultural productions which have daily and universal consumption (Mollasadeghi *et al.*, 2011). Wheat is the staple food for more than 35% of world population, its anti-drought physiological study is important to maximize yield under water stress condition. In developing countries, almost 32% of wheat crop face various types of drought stress during the growth season (Morris *et al.*, 1991).

The response of plants to water stress depends on several factors such as developmental stage, severity and duration of stress. Among different environmental abiotic stresses, drought is one the most important environmental stress, severely impairs plant growth and development, limits plant production and the performance of crop plants (Shao *et al.*, 2009). Plant experiences drought stress either when the water supply to roots becomes difficult or when the transpiration rate becomes very high. Available water resources for successful crop production have been decreasing in recent years. Furthermore, scientists suggested that in many regions of world, crop losses due to increasing water shortage will further intensify its impacts (Anjum *et al.*, 2011). To avoid the stress or stress tolerance, plants can modify at morphological, metabolic and cellular levels. Sarkar *et al.* (2016) reported that decrease in RWC with increase in water stress in *Citrus reticulata*. Abdalla and El-Khoshiban (2007) reported that increase in water stress adversely affect the RWC content in selected cultivars of *Triticum aestivum*. Alteration in cell membrane stability is an important mechanism to resist drought. Soil water deficit result the decrease in cell membrane stability in different varieties of wheat (Razzaq *et al.*, 2013). Accumulation of MDA is an indication of oxidative stress in plant tissue. Increase in MDA levels under water stress condition have been recorded in different plants like, *Citrus reticulata* (Sarkar *et al.*, 2016) and wheat (Tatar and Gevrek, 2008). The plants response to water stress is a complex physiochemical process in which many biological macro-molecules and micro-molecules are involved (Ahmadizadeh, 2013). The aim of this study was to determine the physiological and biochemical response of wheat to water stress conditions.

#### Material and Methods

The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

#### Preparation of different moisture regimes (FC %)

The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method was followed with some modifications for which garden soil was used after determining its water holding capacity (Narkhede, 1989). The methodology used for analyses is briefly described below.

**Measurement of Relative Water Content (RWC)**

The relative water content was determined by using the formula given by Barrs and Weatherley (1962). RWC was determined with the formula given below,

$$RWC (\%) = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{Dry weight}} \times 100$$

**Membrane Stability Index (MSI)**

Leaf membrane stability index (MSI) was determined according to the method of Deshmukh *et al.* (1991). Leaf membrane stability index (MSI) was calculated as:  $MSI = [1 - C_1 / C_2] \times 100$

C1= Electrical Conductivity 1; C2= Electrical Conductivity 2

**Lipid Peroxidation**

The level of lipid peroxidation was measured in terms of malondialdehyde (MDA) content, a product of lipid peroxidation by following the method of Heath and Packer (1968).

**Statistical analysis**

The data obtained from RWC, MSI and lipid peroxidation parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients (Snedecor and Cochran, 1980). CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

**Results and Discussion**

**Table 1:** Effect of water stress on Relative Water Content, Membrane Stability Index and Lipid Peroxidation in leaves of wheat at seedling and anthesis stage.

Field Capacity %	Relative water Content (%)		Membrane Stability Index (%)		Lipid Peroxidation (µmole MDA g <sup>-1</sup> F.W.)	
	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage
100	85.72	82.63	48.77	78.14	2.22	3.05
80	82.57	79.44	47.59	74.23	3.13	5.09
60	70.13	67.60	32.66	68.00	3.80	5.87
40	59.19	56.27	26.89	61.34	4.47	7.10
20	54.35	51.02	18.09	52.66	5.20	8.48
SE	6.19	6.20	5.94	4.56	0.52	0.92
CD at 5%	17.21	17.24	16.51	12.61	1.44	2.55

**Relative Water Content**

Relative water content is the appropriate measure of plant water status in terms of physiological consequence of cellular water deficit. It is one of the important parameter used to evaluate the effect of various stress/treatments.

**Effect of water stress on relative water content (RWC)**

The relative water content determines the ability of plant to absorb water under moisture stress condition and used as one of the indices to determine drought effect. It is a reliable and less error prone criterion for measurement of plant water status. In present water stress treatment the relative water content was significantly decreased with increase in level of drought stress from 80, 60, 40 and 20 % field capacity. The lowest relative water content(54.35 and 51.02%) was recorded in 20 % field capacity stress treated wheat plants in comparison to control plants (85.72 and 82.63%) at seedling and anthesis stage respectively (Table 1). Similarly various researchers had confirmed that RWC was negatively affected by water stress. Taherianfaret *et al.* (2013) reported that the water stress significantly decreased RWC in soybean plant. Very

**EMERGING TRENDS IN BIODIVERSITY CONSERVATION (ETBC-2019)**

Organized by Department of Botany, K.J. Somaiya College of Arts, Commerce and Science, Kopergaon

recently, Sarkar *et al.* (2016) reported gradual and significant decrease in RWC in *Citrus* leaves under water stress condition.

**Membrane Stability Index (MSI)**

A major impact of plant environmental stress is cellular membrane modification, which results in its perturbed function or total dysfunction. The estimation of membrane dysfunction under stress by measuring cellular electrolyte leakage from affected leaf tissue into an aqueous medium is use as a measure of MSI and as a screen for stress resistance.

**Effect of water stress treatment on Membrane Stability Index (MSI)**

Stability of cell membrane under drought is an important mechanism to resist the drought. In recent investigation the lowest membrane stability index (18.09 and 52.66%) was recorded in 20 % field capacity stress treated wheat plants in comparison to control plants (48.77 and 78.14%) at seedling and anthesis stage respectively (Table 1). Like RWC, the MSI was also significantly decreased with increase in level of drought stress. Under environmental stresses plant membranes are subject to changes often associated with the increases in permeability and loss of integrity (Blokina *et al.*, 2003). Chandrasekhar *et al.* (2000) reported reduction in MSI under drought condition in hexaploid and tetraploid wheat. Similarly, Chorfi and Taibi (2011) observed reduced percentage of MSI in two different cultivars of wheat as compare to their respective controls under water stress condition.

**Lipid Peroxidation**

The degree of lipid peroxidation measured in terms of malondialdehyde (MDA) content is one of the determinants which indicate the severity of stress experienced by any plant.

**Effect of water stress treatment on lipid peroxidation**

It is indicated that the accumulation of MDA, a product of fatty acid peroxidation is a measure of oxidative stress induced membrane damage during water stress. In the present study, the obtained results clearly indicate that, the amount of lipid peroxidation increased with decreasing field capacity at seedling and anthesis stage. The amount of lipid peroxidation enhanced gradually and significantly with increase in level of drought stress from 80, 60, 40 and 20 % field capacity over control plants. The highest amount of lipid peroxidation (5.20 and 8.48  $\mu\text{mole/gm FW}$ ) in comparison to control (2.22 and 3.05  $\mu\text{mole/gm FW}$ ) was recorded at 20 % field capacity at seedling and anthesis stage respectively (Table 1). Sultan *et al.* (2012) evaluate several wheat species and reported that all species exhibited a significant rise in their MDA content after 48 hours of water stress. Chakraborty and Pradhan (2012) also observed increased values of MDA with increase in amount of water stress in different varieties of wheat.

**Conclusion**

According to results, it can be concluded that plants in drought stress time make changes in some of their physiological and biochemical features. The results from this study showed that as the metabolites such as relative water content and membrane stability index was decreased with increasing level of drought stress treatments. The amount of lipid peroxidation enhanced gradually and significantly with increase in level of drought stress.

**Acknowledgement**

The author is thankful to Ahmednagar Jilha Maratha Vidya Prasarak Samaj, Ahmednagar and also Dr. R. K. Aher, Principal, New Arts, Commerce and Science College, Parner for continuous encouragement and support.

**References**

1. Abdalla MM, El-Khoshiban NH. The influence of water stress on growth, relative water content, photosynthetic pigments, some metabolic and hormonal contents of two *Triticum aestivum* cultivars. *Jr. App. Sci. Res.* 2007; 3(12):2062-2074.
2. Ahmadizadeh M. Physiological and agro-morphological response to drought stress. *Middle-East J. Sci. Res.* 2013; 13:998-1009.
3. Anjum SA, Xie X, Wang L, Saleem MF, Man C, Lei W. Morphological, physiological and biochemical responses of plants to drought stress. *African J. Agric. Res.* 2011; 6:2026-2032.



4. Barrs HD, Weatherley PE. A re-examination of the relative turgidity technique for estimation of water deficits in leaves. *Aust. J. Biol. Sci.* 1962; 15:413-428.
5. Blokhina O, Virolainen E, Fagerstedt KV. Antioxidants, oxidative damage and oxygen deprivation stress. *Ann. Bot.* 2003; 91:179-194.
6. Chakraborty, Usha, Bhumika Pradhan. Oxidative stress in five wheat varieties (*Triticum aestivum* L.) exposed to water stress and study of their antioxidant enzyme defense system, water stress responsive metabolites and H<sub>2</sub>O<sub>2</sub> accumulation. *Braz. J. Plant Physiol.* 2012; 24(2):117-130.
7. Chandrasekar V, Sairam RK, Srivastava GC. Physiological and biochemical responses of hexaploid and tetraploid wheat to drought stress. *J. Agr. Crop. Sci.* 2000; 185:219-227.
8. Chorfi A, Taïbi K. Biochemical Screening for Osmotic Adjustment of Wheat Genotypes under Drought Stress. *Tropicultura.* 2011; 29(2):82-87.
9. Deshmukh PS, Sairam RK, Shukla DS. Measurement of ion leakage as a screening technique for drought resistance in wheat genotype. *Indian J. Plant Physiol.* 1991; 34:89-91.
10. Heath RL, Packer L. Photoperoxidation in isolated chloroplast. I. Kinetics and stoichiometry of fatty acid peroxidation. *Arch. Biochem. Biophys.* 1968; 125:189-198.
11. Mollasadeghi V, R Shahryari, AA Imani, Khayatnezhad. Factor analysis of wheat quantitative traits on yield under terminal drought. *Am. Eur. J. Agric. Environ. Sci.* 2011; 10(2):157-159.
12. Morris ML, Blaid A, Byerlee. Wheat and barley production in rain fed marginal environments of the developing world. Part I of 1990-91 CIMMYT world wheat facts and trends: wheat and barley production in rainfed marginal in environment of the developing world. CIMMYT, Mexico, D.F, 1991, 51.
13. Narkhede PL. Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolic of *rabi* sorghum and soil factors controlling conservation of moisture. *Ph. D. Thesis, M. P. K. V. Rahuri*, 1989.
14. Razaq A, Qasim Ali, Abdul Qayyum, Imran Mahmood, Muhammad Ahmad, M Rasheed. Physiological responses and drought resistance index of nine wheat (*Triticum aestivum* L.) Cultivars under different moisture conditions. *Pak. J. Bot.* 2013; 45:151-155.
15. Sarkar J, Ray A, Chakraborty B, Chakraborty U. Antioxidative changes in *Citrus reticulata* L. induced by drought stress and its effect on root colonization by arbuscular mycorrhizal fungi. *Euro. J. Bio. Res.* 2016; 6(1):1-13.
16. Shao HB, Chu LY, Jaleel CA, Manivannan P, Panneerselvam R, Shao MA. Understanding water deficit stress-induced changes in the basic metabolism of higher plants-biotechnologically and sustainably improving agriculture and the eco-environment in arid regions of the globe. *Crit. Rev. Biotechnol.* 2009; 29:131-151.
17. Snedecor CW, Cochran WG. *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press, 1980.
18. Sultan MARF, Hui L, Yang LJ, Xian ZH. Assessment of drought tolerance of some *Triticum* species through physiological indices. *Czech J. Genet. Plant Breed.* 2012; 48(4):178-184.
19. Taherianfar A, Tohidi Moghadam, HR, Zahedi H. Effect of cattle manure and mycorrhiza applications on physiological and biochemical changes in soybean (*Glycine max* (L.) Merr.) grown under water deficit stress. *Revista Científica UDO Agrícola.* 2013; 13(1):85-92.
20. Tatar O, Gevrek MN. Influence of water stress on proline accumulation, lipid peroxidation and water content of wheat. *Asian J. Plant Sci.* 2008;7:409-412.

## 9. Phytochemical Changes in Wheat (*Triticum aestivum* L.) by Arbuscular Mycorrhizal Fungi under Water Stress Conditions

[ VOLUME 6 | ISSUE 2 | APRIL- JUNE 2019]

E ISSN 2348 –1269, PRINT ISSN 2349-5138

### Phytochemical Changes in Wheat (*Triticum aestivum* L.) by Arbuscular Mycorrhizal Fungi Under Water Stress Conditions

S. L. KHAPKE

Department of Botany, New Arts, Commerce and Science College, Parner -414302 (M. S.)

Received: February 25, 2019

Accepted: March 27, 2019

**ABSTRACT:** : Considering the importance of arbuscular mycorrhizal fungi (AMF) in sustainable agriculture the present investigation was aimed to study the Phytochemical changes in wheat (*Triticum aestivum* L.) during AM fungi treatment, water stress (Field Capacity %) treatment and combination of AM fungi and water stress (FC %) at the seedling as well as anthesis stage. The pot culture experiment was carried out in three replications by using four mycorrhizal treatments along with control, five water stress treatments and combination of AM fungi and water stress treatments. The effect of these treatments on wheat was assessed for Phytochemicals like reducing sugar and phenol content at seedling as well as anthesis stage. Results revealed that the phytochemicals such as reducing sugar and phenol content was increased in all mycorrhizal soil treatment. Also, the amount of reducing sugars and phenol content increased in combine treatment of water stress and mycorrhiza in comparison to individual water stress treatments. But under water stress conditions, mycorrhizal plants accumulated more phytochemical metabolites than nonmycorrhizal plants. As a conclusion, *Triticum aestivum* in presence of mycorrhiza accumulate more metabolites to tolerate water stress by improving the osmotic adjustment.

**Key Words:** Water stress, AM fungi, *Triticum aestivum*, Phytochemical

#### INTRODUCTION

Wheat is the most important agricultural good in international market and also it is one of the strategic agricultural productions which have daily and universal consumption [1]. Wheat is the staple food for more than 35% of world population. Its grain is the main source of protein and carbohydrates. In developing countries, almost 32% of wheat crop face various types of drought stress during the growth season [2].

Among different environmental abiotic stresses, drought is one the most important environmental stress, severely impairs plant growth and development and the performance of crop plants [3]. Drought affects the quantity and quality of the grains produced [4]. Plant experiences drought stress either when the water supply to roots becomes difficult or when the transpiration rate becomes very high. Available water resources for successful crop production have been decreasing in recent years. Furthermore, scientists suggested that in many regions of world, crop losses due to increasing water shortage will further intensify its impacts [5]. Plants respond to water stress at morphological, anatomical, cellular and physiological levels with modifications that allow the plants to avoid stress and increase their tolerance.

Contributions of AM fungi to agriculture are well known. Mycorrhizas were involved in protection against drought stress through improved nutritional status and osmotic

adjustments.

In addition to the inherent response system of plants against stress, a number of soil microorganisms have been proved to be able to alleviate the stress symptoms. Mycorrhizal plants show better survival than non-mycorrhizal plants in extreme dry conditions. AM fungi are known to enhance the adoption ability of host plants under water stress conditions and help the host plants to cope up with situations of drought. Plants species inoculated with AM fungi are known to exhibit considerable physiological responses. AM fungi can influence the host plants against water stress [6]. AM fungi help the host plants to increase uptake of nutrients and tolerance to abiotic and biotic stresses [7]. Mycorrhizal plants enhance the photosynthesis and assimilation of carbohydrates more than those in non mycorrhizal plants [8]. The accumulation of metabolic substances may suggest that AM colonization could improve osmotic adjustment originating not only from proline but also from carbohydrates and proteins resulting in the enhancement of water stress tolerance. Arbuscular mycorrhizal (AM) symbiosis is the most important mutualistic association between AM from soil and plant roots [9]. Symbiotic association between AMF and plants is based on the exchange of carbohydrates and other nutrients between both the partners. Plants roots become a strong sink for sugars during mycorrhization which in turn increases the photosynthetic ability of the phototroph

[VOLUME 6 | ISSUE 2 | APRIL - JUNE 2019]

e ISSN 2348 -1269, Print ISSN 2349-5138

<http://ijrar.com/>

Cosmos Impact Factor 4.236

to compensate this usage of sugars [10]. Phenols are important components functioning as defense mechanisms against pathogen attack. Phenols occur naturally in plants and they do have antimicrobial properties which prevent fungal spore germination and toxin production [11]. The objective of this study was to evaluate the effect of arbuscular mycorrhizal fungi (AMF) on phytochemical changes in *Triticum aestivum* L. under water stress conditions.

#### MATERIAL AND METHODS

The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

#### Mycorrhizal fungus inoculum

The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil (1:1 v/v) mixture [12]. After 90 days under green house conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

#### Experimental design for AM fungi

The pot culture experiment was carried out in three replications by using four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (16.5kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi treated as control. Plants were watered as required.

#### Preparation of different moisture regimes (FC %)

The pot culture experiment was laid out in three replications and five treatments of moisture regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method was followed with some modifications for which garden soil was used after determining its water holding capacity [13].

#### Experimental design for combinational treatment of AM fungi and water stress

The above prepared FC (100% FC, 80% FC, 60% FC, 40% FC and 20% FC) set and one AM fungi treatment (75g) i.e. (control + 100% FC, 75g + 80% FC, 75g + 60% FC, 75g + 40% FC, 75g + 20% FC) were used for the combinational experiments. A uniform and healthy seeds of wheat cultivar (variety GW 496) was selected, seeds were surface sterilized with 0.1 %  $HgCl_2$ , washed thoroughly 3-4 times in sterilized distilled water and then soaked in distilled water for 12 hours. Hundred well-imbibed seeds were sown in each bucket for water stress and for combinational (AM and water stress) treatment. The said experiment was replicated three times. The methodology used for analyses is briefly described below,

#### Estimation of reducing sugars

Reducing sugars was estimated according to the method [14]. The leaves of treated and control seedlings were cut into small pieces and one g tissue was homogenized in 10 ml 80 % alcohol. This extract was condensed on hot water bath to approximately 1.0 ml and centrifuged at 5000 rpm for 15 minutes; the volume of the supernatant was adjusted to 10 ml. This extract was used for estimation of reducing sugars.

#### Estimation of total phenols

Total phenols were estimated as per the method of [15]. The leaves of treated and control seedlings were cut into small pieces and one gram tissue was homogenized in 10 ml (80 %) alcohol. The extract was condensed on hot water bath to approximately 1.0 ml; centrifuged at 5000 rpm for 15 min. Volume of the supernatant was adjusted to 10 ml with distilled water.

#### Statistical analysis

The data obtained from reducing sugar and phenol content was analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients [16]. CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

#### RESULTS AND DISCUSSION

##### REDUCING SUGARS

Sugars with reducing property (arising out of the presence of a potential aldehyde or keto groups) are called reducing sugars. Some of the reducing sugars are glucose, galactose, lactose and maltose.

Research Paper

IJRAR- International Journal of Research and Analytical Reviews | 6571

**Effect of mycorrhizal treatment on reducing sugars**

In the present study, the obtained results showed that, the amount of reducing sugars increase with increase in mycorrhizal soil treatments at both seedling and anthesis stage. Maximum increase in reducing sugar content was 7.75 and 10.18 mg/gm fresh weight in 100 gm mycorrhizal soil treatment at seedling and anthesis stage respectively (Table 1). AM fungi always serve as a

storage sink for sugars [17]. Our results are in agreement with the previous reports in which the various researchers recorded increase in reducing sugar content as an effect of mycorrhizal inoculation in *Ziziphus*[18] and tomato plants [19]

**Effect of water stress treatment on reducing sugars content**

The obtained results revealed that, the reducing sugars gradually accumulated as the level of water stress increased at seedling and anthesis stage.

**Table 1:**Effect of AM fungi on Reducing Sugars and Phenols content in leaves of wheat

AM Soil (gm)	Reducing Sugars (mg g <sup>-1</sup> F.W.)		Phenols (mg g <sup>-1</sup> F.W.)	
	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage
	Control	6.52	8.16	1.50
25	6.71	8.78	2.29	1.53
50	7.04	9.05	2.66	2.07
75	7.33	9.90	2.90	2.28
100	7.75	10.18	3.07	2.73
SE	0.22	0.37	0.28	0.26
CD at 5%	0.61	1.03	0.77	0.73

**Table 2:**Effect of Water Stress on Reducing Sugars and Phenols content in leaves of wheat

Field Capacity %	Reducing Sugars (mg g <sup>-1</sup> F.W.)		Phenols (mg g <sup>-1</sup> F.W.)	
	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage
	100	6.50	8.34	1.48
80	7.80	10.94	2.02	1.37
60	8.19	11.04	2.58	1.98
40	9.36	12.51	2.72	2.12
20	10.14	12.66	2.98	2.53
SE	0.63	0.78	0.27	0.24
CD at 5%	1.75	2.16	0.75	0.67

**Table 3:** Effect of AM fungi and Water Stress on Reducing Sugars and Phenols content in wheat

AM Soil (gm) and Field Capacity %	Reducing Sugars (mg g <sup>-1</sup> F.W.)		Phenols (mg g <sup>-1</sup> F.W.)	
	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage
	Control+100	6.50	8.28	1.45
75 +80	8.90	11.73	2.19	1.47
75+60	9.33	12.14	2.75	2.00
75+40	10.66	13.28	2.94	2.17
75+20	11.23	13.61	3.01	2.66
SE	0.82	0.95	0.29	0.25
CD at 5%	2.29	2.64	0.81	0.69

[VOLUME 6 | ISSUE 2 | APRIL - JUNE 2019]

e ISSN 2348 -1269, Print ISSN 2349-5138

<http://ijrar.com/>

Cosmos Impact Factor 4.236

The reducing sugars content was maximum i.e. 10.14 and 12.66 mg/gm fresh weight at 20 % FC water stress treatment over control (6.50 and 8.34 mg/gm fresh weight) at seedling and anthesis stage respectively (Table 2). Like proline and glycine betaine, reducing sugars also acts as compatible osmolyte during moisture stress. Our results are agreement with the previous results that increase in soluble sugar content in durum wheat plants under water stress condition [20]. Similarly, increase in reducing sugars in six different cultivars of sorghum under PEG induced water stress [21]. The authors had suggested that the involvement of accumulation of soluble sugars in osmotic adjustments under stress condition.

#### **Combine effect of AM fungi and water stress treatment on reducing sugars content**

Like individual water stress treatment, the combination treatments showed steady increase in reducing sugars content with the increase in mycorrhizal treatment along with water stress. The reducing sugars content was found maximum i.e. 11.23 and 13.61 mg/gm fresh weight over control (6.50 and 8.28 mg/gm fresh weight) at 75 gm mycorrhizal soil and 20 % FC water stress treatment at seedling and anthesis stage respectively (Table 3). Several physiological studies suggested that under stress conditions nonstructural carbohydrates (sucrose, hexoses, and sugar alcohols) accumulate in different plant species. The current hypothesis is that, sugars are either act as osmotica and/or protect specific macromolecules and contribute to the stabilization of membrane structures. Sugars may protect cells during desiccation [22]. The results of present study are in agreement with the previous results that increase in soluble and insoluble sugar concentrations in mycorrhizal wheat plants subjected to water stress [23]. Similarly, maximum accumulation of reducing sugar content in the mycorrhiza inoculated *Origanum* plants under water stress condition [24].

#### **PHENOLS**

Phenol is one of the important phytochemical which play role in plant defense mechanism during abiotic and biotic stress condition.

#### **Effect of mycorrhizal treatment on phenols content**

Plants phenolic are the most widespread classes of secondary metabolites known to be involved in the plant microbe interaction [25]. In the present investigation we observed that, the plants treated with mycorrhizal treatment showed increased phenol content than non mycorrhizal plants. The

maximum phenol (3.07 and 2.73 mg/gm fresh weight) was recorded in 100 gm mycorrhizal soil treated plants in comparison to control plants (1.50 and 1.26 mg/gm fresh weight) at seedling and anthesis stage respectively (Table 1). Such increase in phenol content due to mycorrhizal symbiosis in treated plants could be due to the reaction of wheat plants to the mycorrhizal colonization. Phenols are responsible for providing barriers to pathogen attack and helps in building mechanical strength to cell wall [26]. Similar observation recorded that increased concentration of total phenols in roots and leaves of cotton plants with higher colonization levels [27]. Similarly, increase in total phenol content in tomato plants by AM amendment in soil [19]. AM adaptation to soil significantly increased the phenol content of wheat grains [28].

#### **Effect of water stress treatment on phenols content**

In the present study, the obtained results clearly indicate that, the amount of phenols slowly increased with decrease in percent field capacity 80, 60, 40 and 20 % (or increase water stress) at seedling and anthesis stage. The highest amount of total phenols (2.98 and 2.53 mg/gm fresh weight) was recorded in 20 % field capacity wheat plants at seedling and anthesis stage respectively (Table 2). The phenolic compounds are important protective components of plants cells which synthesis is generally affected in response to different biotic and abiotic stress. The increase in polyphenol contents by drought in selected genotypes of cotton [29]. The results of present study are in agreement with the previous results that increase in phenolic content in horse gram plants under water stress condition [30]. Accumulation of phenol under stress condition indicates that the selected variety may be tolerant to water stress.

#### **Combine effect of AM fungi and water stress treatment on phenol content**

Similar to individual water stress treatment, phenol content also increased with increase in combination treatment of AM fungi and water stress. But the combine effect of AM and water stress was more effectual on phenol content than individual water stress. The highest amount of total phenol content was exhibited in 20 % field capacity with 75 gm mycorrhizal soil treated plants at both stages. At this treatment, seedling stage plant showed 3.01 mg/g fresh weight and anthesis stage showed 2.66 mg/g fresh weight phenol content (Table 3). The mycorrhizal colonization would initially be perceived by the plant as a stress or an attack at the location of

Research Paper

IJRAR- International Journal of Research and Analytical Reviews | 6591

[ VOLUME 6 | ISSUE 2 | APRIL- JUNE 2019]

E ISSN 2348 -1269, PRINT ISSN 2349-5138

colonization by endomycorrhiza[31].

**CONCLUSION**

The results from this study showed that the phytochemicals such as reducing sugars and phenols content was increased in mycorrhizal soil treatment. Compare to control, reducing sugars and phenols content was increased in the water stress treatments. Under water stress conditions, mycorrhizal plants accumulated more metabolites than nonmycorrhizal plants. As a conclusion, *Triticum aestivum* in presence of mycorrhiza accumulate more phytochemicals to tolerate water stress by improving osmotic adjustment.

**ACKNOWLEDGEMENT**

The author is thankful to Ahmednagar Jilha Maratha Vidya Prasarak Samaj, Ahmednagar and also Dr. R. K. Aher, Principal, New Arts, Commerce and Science College, Parner for continuous encouragement and support.

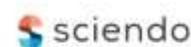
**REFERENCES**

- Mollasadeghi, V., R. Shahryari, A. A. ImaniKhayatnezhad. Factor analysis of wheat quantitative traits on yield under terminal drought. *Am. Eur. J. Agric. Environ. Sci.*, 2011;10(2): 157-159.
- Morris, M.L., Blaid, A., Byerlee. Wheat and barley production in rain fed marginal environments of the developing world. Part I of 1990-91 CIMMYT world wheat facts and trends: wheat and barley production in rainfed marginal in environment of the developing world. CIMMYT, Mexico, D.F.1991;pp 51.
- Shao, H.B., Chu, L.Y., Jaleel, C.A., Manivannan, P., Panneerselvam, R., Shao, M.A. Understanding water deficit stress-induced changes in the basic metabolism of higher plants-biotechnologically and sustainably improving agriculture and the environment in arid regions of the globe. *Crit. Rev. Biotechnol.*, 2009;29:131-151.
- Shao, H. B., Liang, Z. S., Shao, M.A. Changes of antioxidative enzymes and ABA content under soil water deficits among the tenwheat (*Triticum aestivum* L.) genotypes at maturation stage. *Colloids and surfaces B: Biointerfaces*, 2005;45:7-13.
- Anjum, S.A., Xie, X., Wang, L., Saleem, M.F., Man, C., Lei, W. Morphological, physiological and biochemical responses of plants to drought stress. *African J. Agric. Res.*, 2011; 6:2026-2032.
- Schellenbaum, L., Muller, J., Boller, T. Effects of drought on non-mycorrhizal and mycorrhizal maize: changes in the pools of non-structural carbohydrates, in the activities of invertase and trehalase, and in the pools of amino acids and imino acids. *New Phytol.*, 1998; 138:59-66.
- Ruiz-Lozano, J. M., Azcon, R., Gomez, M. Effects of arbuscular mycorrhizal *Glomus* species on drought tolerance: physiological and nutritional plant responses. *Appl. Environ. Microbiol.*, 1995;61:456-460.
- Ghorbanli, M., Ebrahimzadeh, H., Sharifi, M. Effects of NaCl and mycorrhizal fungi on antioxidative enzymes in soybean. *Biologia Plantarum*, 2004;48:575-581.
- Gadkar, V., David Schwartz, R., Kunik, T., Kapulnik, Y. Arbuscular Mycorrhizal Fungal Colonization. Factors Involved in Host Recognition, *Plant Physiol.*, 2001; 127:1493-1499.
- Wright, S. F., Upadhyaya, A. A survey of soils for aggregate stability and glomalin, a glycoprotein produced by hyphae of arbuscular mycorrhizal fungi. *Plant Soil*, 1998; 198: 97-107.
- Vidhyasekaran, P. Possible role of ortho-dihydroxy phenolics in grapevine anthracnose disease resistance. *Indian J. Exp. Biol.*, 1973;11 (5): 473-475.
- Sylvia, D. M. Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2- microbiological and Biochemical Properties*, 1994; 351-378.
- Narkhede, P. L. Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolic of rabi sorghum and soil factors controlling conservation of moisture. Ph. D. Thesis, M. P. K. V. Rahuri, 1989.
- Nelson, N.C. A photometric adaptation of the Somogyi method for determination of glucose. *J. Biol. Chem.*, 1944; 153:375-380.
- Farkas, G. L., Kiraly, Z. **Role of phenolic compounds in the physiology of plant disease and disease resistance.** *Phytopathol.*, 1962; 44:105-150.
- Snedecor, C. W., Cochran, W.G. *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press, 1980.
- Muthukumar, T., Udaiyan, K. The role of seed reserves in arbuscular mycorrhizal formation and growth of *Leucaena leucocephala* (Lam.) de Wit and *Zea mays* L. *Mycorrhiza*, 2000;9:323-330.
- Mathur, N., Vyas, A. Influence of arbuscular mycorrhizae on biomass production, nutrient uptake and physiological changes in *Ziziphus mauritiana* Lam. under water stress. *J. Arid Envir.*, 2000; 45:191-195.
- Manila, S., Nelson, R. Biochemical changes induced in tomato as a result of arbuscular mycorrhizal fungal colonization and tomato wilt pathogen infection. *Asian J. Plant Sci. Res.*, 2014;4(1):62-68.
- Kameli, A., Losel, M. Growth and sugar accumulation in durum wheat plants under water stress. *New Phytol.*, 1996;132:57-62.
- Deshmukh, R.N., Dhupal, K.N., Jadhav, S.S. Role of osmolytes and antioxidant enzymes in

- promising sorghum cultivars under PEG-6000 induced water stress. Life Sciences Symposium (LSS-2005). BARC Trombay, Mumbai,2005c; pp.13:67.
22. Black, M., H. W. Pritchard. Desiccation and Survival in Plants: Drying without Dying. CAB International, Wallingford, UK, 2002
  23. Khalafallah, A.A., Abo-Ghalia, H.H. Effect of Arbuscular Mycorrhizal Fungi on the Metabolic Products and Activity of Antioxidant System in Wheat Plants Subjected to Short-term Water Stress, Followed by Recovery at Different Growth Stages. *Jr. App. Sci., Res.*2008; 4(5):559-569.
  24. KhalilSoha El-Sayed, Abdel-Salam Ali El-Noemani. Effect of bio-fertilizers on growth, yield, water relations, photosynthetic pigments and carbohydrates contents of *Origanum vulgare* L. plants grown under water stress conditions. *Amer.-Eurasian Jr. Sustainable Agri.*,2015;9(4): 60-73.
  25. Morandi, D. Occurrence of phyto-alexins and phenolic compounds in endomycorrhizal interactions, and their potential role in biocontrol. *Plant Soil*, 1996; 185: 241-251.
  26. Conceicao, L.F., Ferreres, F., Tavares, R. M., Dios A.C. Induction of phenolic compounds in *Hypericum perforatum* L. cells by *Colletotrichum gloeosporioides* elicitation. *Phytochemistry*, 2006; 67(2):149-155.
  27. Damodaran, P.N., Udaiyan, K., Jee, H.J. Biochemical changes in cotton plants by Arbuscular Mycorrhizal colonization. *Res. Biotech.*, 2010; 1:06-14.
  28. Abd-Allah, M.M., Safwat, El-B., Bakry, A.B., Mervat, S.S. Effect of arbuscular mycorrhiza and glutamic acid on growth, yield, some chemical composition and nutritional quality of wheat plant grown in newly reclaimed sandy soil. *Res. J. Pharm., Bio. and Chem. Sci.*, 2015; 6(3):1038-1054.
  29. Parida, A., Dagaonkar, V.S., Phalak, M.S., Umalkar, G.V., Aurangabadkar, L.P. Alterations in photosynthetic pigments, protein and osmotic components in cotton genotypes subjected to short-term drought stress followed by recovery. *Plant Biotechnol.*, 2007; 1:37-48.
  30. Bhardwaj, J., Yadav, S. Comparative study on biochemical parameters and antioxidant enzymes in a drought tolerant and a sensitive variety of Horsegram (*Macrotyloma uniflorum*) under drought stress. *American J. of Plant Physiology*, 2012; 7(1):17-29.
  31. Giovannetti, M., Avio, L. Biotechnology of arbuscular mycorrhizas. *Mycorrhizas*. In: Khachatourians GG, Arora DK (ed.) *Applied Mycology and Biotechnology*, Vol. 2. Agriculture and Food Production. Elsevier, Amsterdam, 2002; pp 27.

## 10. Influence of bath temperature on microstructure and NH<sub>3</sub> sensing properties of chemically synthesized CdO thin films

*Materials Science-Poland*, 37(1), 2019, pp. 25-32  
<http://www.materialsscience.pwr.wroc.pl/>  
DOI: 10.2478/msp-2019-0002



### Influence of bath temperature on microstructure and NH<sub>3</sub> sensing properties of chemically synthesized CdO thin films

A.K. SHARMA<sup>1</sup>, S.S. POTDAR<sup>2,\*</sup>, M.A. YEWALE<sup>3</sup>, DEEPAK B. SHIRGAONKAR<sup>4</sup>, K.S. PAKHARE<sup>5</sup>,  
B.M. SARGAR<sup>6</sup>, M.V. ROKADE<sup>7</sup>, U.M. PATIL<sup>8</sup>

<sup>1</sup>School of Physics, Shri Mata Vaishnodevi University, Kakryal, Katra-182320, J&K, India

<sup>2</sup>Department of Physics, Sanjeevan Engineering and Technology Institute, Panhala-416201, MS, India

<sup>3</sup>Department of Physics, New Arts, Commerce and Science College, Parner, Ahmednagar, MS, India

<sup>4</sup>Department of Physics, Ashokrao Mane Group of Institution, Vathar, Kolhapur, MS, India

<sup>5</sup>Department of Chemistry, Anandibai Raorane Art, Commerce and Science College, Vaibhavwadi, MS-416810, India

<sup>6</sup>Material Science Research Laboratory, Department of Chemistry, Jaysingpur College, Jaysingpur, MS -416101, India

<sup>7</sup>Semiconductor Laboratory, Centre for Materials for Electronics Technology (C-MET), IDA Phase-III, Cherlapally, HCL (PO), Hyderabad-500051, India

<sup>8</sup>Centre for Interdisciplinary Research, D.Y. Patil Education Society (Deemed to be University), Kolhapur-416006, India

Cadmium oxide (CdO) thin films were synthesized using chemical bath deposition (CBD) method from aqueous cadmium nitrate solution. The bath temperatures were maintained at room temperature (25 °C) and at higher temperature (80 °C). The structural studies revealed that the films showed mixed phases of CdO and Cd(OH)<sub>2</sub> with hexagonal/monoclinic crystal structure. Annealing treatment removed the hydroxide phase and the films converted into pure CdO with cubic, face centered crystal structure. SEM micrographs of as-deposited films revealed nanowire-like morphology for room temperature deposited films while nanorod-like morphology for high temperature deposited films. However, cube-like morphology was observed after air annealing. Elemental composition was confirmed by EDAX analysis. Band gap energies of the as-deposited films varied over the range of 3 eV to 3.5 eV, whereas the annealed films showed band gap energy variation in the range of 2.2 eV to 2.4 eV. The annealed films were successfully investigated for NH<sub>3</sub> sensing at different operating temperatures and at different gas concentrations. The room temperature synthesized film showed a response of 17.3 %, whereas high temperature synthesized film showed a response of 13.5 % at 623 K upon exposure to 24 ppm of NH<sub>3</sub>.

Keywords: *CdO thin films; chemical bath deposition; X-ray diffraction; scanning electron microscopy; optical properties; EDAX; gas sensing*

#### 1. Introduction

Detection of toxic gases, pollutants, combustible and process gases is important for system and process control, safety monitoring and environmental protection. Traditional analysis methods used in gas sensing include gas chromatography, Fourier-transform, infrared spectroscopy, mass spectrometry etc. These methods are complex and also require sample preparation, so that on-line, real-time analysis is difficult. However, gas sensors based on solid state semiconductor materials offer

considerable advantages over other gas sensing methods. The great interest of industrial and scientific fields in semiconductor oxide gas sensors comes from their numerous advantages, such as small size, improved sensitivity towards low concentrations (at a level of ppm or even ppb) for a wide range of gaseous chemical compounds, possibility of on-line monitoring and low cost. Also, semiconductor sensors are easy to miniaturize, robust, reliable, and can be designed to operate over a range of conditions including high temperatures. Semiconductor sensors can be produced in arrays to allow sensing of multiple species simultaneously. Transparent semiconducting

\*E-mail: sachinpotdar20@gmail.com



oxides found different fields of applications such as flat panel displays, smart windows, light emitting diodes, electronic and photovoltaic devices [1–4]. Cadmium oxide has direct band gap of 2.2 eV to 2.5 eV [5] and indirect band gap of 1.36 eV to 1.98 eV [6–8]. It is an n type semiconductor with rock-salt crystal structure. The synthesis of nanocrystalline materials with organized morphologies is always very important. Bath temperature is one of crucial parameter in chemical bath deposition which affects the surface morphology and the microstructure of the films [9]. CdO thin films were obtained by using several techniques such as spray pyrolysis [10], DC magnetron sputtering [11], sol-gel [12], chemical vapor deposition [13] and chemical bath deposition (CBD) [14], etc. Amongst the above mentioned methods, CBD has its own advantages, such as simplicity, reproducibility, environmental friendliness, cost-effectiveness, etc. It is a low temperature method and it does not require any sophisticated instruments as well as it is well suited for producing large-area thin films. It involves deposition of semiconductor thin film on various types of substrates that are kept in aqueous solutions.

With the above considerations, we report the effect of bath temperature on the structural, morphological and optical properties of nanocrystalline CdO thin films chemically deposited from aqueous alkaline nitrate bath. As-deposited films were annealed at 450 °C for 2 h in a muffle furnace to obtain CdO films. The as-deposited and annealed films were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), UV-Vis spectrophotometry for their structural, surface morphological and optical analysis. The elemental analysis was performed by energy dispersive X-ray analysis (EDAX).

## 2. Experimental

Synthesis of CdO thin films was carried out by using CBD method which is based on stirring of alkaline bath of cadmium salt containing the substrates immersed in it. In a typical

experimental procedure, 0.1 M Cd(NO<sub>3</sub>)<sub>2</sub> was used as a source of cadmium and, aqueous ammonia solution was added under constant stirring to make it alkaline. At first, the solution became milky-turbid due to the formation of Cd(OH)<sub>2</sub> precipitate. Further addition of excess ammonia dissolved the turbidity and made the solution clear and transparent. The pH of the resultant solution was ~12. The glass microslides were cleaned with a soap solution and chromic acid and then subsequently washed with double distilled water followed by ultrasonically cleaning for 15 min. The cleaned substrates were immersed vertically in the bath at room temperature under constant stirring. Precipitation took place in the bath. During the precipitation, heterogeneous reaction occurred and the deposition of CdO on the substrate took place. The substrates were removed from the bath and washed with double distilled water, dried in air and preserved in an airtight container. The obtained films were uniform and well adherent to the substrates. Similarly, another bath was prepared by maintaining the same preparative parameters as stated above but its temperature was 80 °C. Uniform and homogeneous films were obtained. The obtained films at room temperature as well as at 80 °C were annealed in the muffle furnace at 450 °C for 2 h. The film prepared at room temperature was named as A1, while the annealed film as A2. In similar way, the film prepared at higher temperature was named as C1 and annealed film as C2. To study the structural properties of as-deposited and annealed films, X-ray diffraction patterns were recorded using X-ray diffractometer over 2θ (scanning angle range of 20° to 80° with CuKα radiation). Surface morphological studies were carried out using scanning electron microscopy. Optical absorption was measured over the wavelength range of 350 nm to 850 nm using a UV-Vis spectrophotometer. Energy dispersive X-ray analysis (EDAX) was employed for the compositional studies. The gas sensing properties of synthesized films were studied using a “static gas-sensing system”. There was electrical feed through the base plate. The heater was fixed below the base plate to heat the sample under test up to required operating temperatures. An Al-Cr thermocouple was used to sense

the operating temperature of the sensors. The output of the thermocouple was connected to digital temperature indicators. A gas inlet valve was provided at one port of the base plate. The required gas concentration inside the static system was attained by injecting a known volume of test gas using a gas-injecting syringe. For electrical measurements, silver paste contacts were made on the sample of area 1 cm × 1 cm. Initially, the I-V characteristics were studied within ±10 V and it was found that in this voltage range, the silver contacts showed ohmic behavior. The electrical resistance of the films in air  $R_a$  and in the presence of test gas  $R_g$  was measured to evaluate the gas response,  $S$ , defined as follows:

$$S (\%) = \frac{R_a - R_g}{R_a} \times 100 \quad (1)$$

### 3. Results and discussion

#### 3.1. XRD analysis

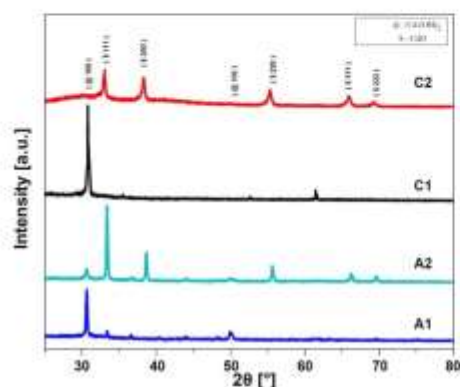
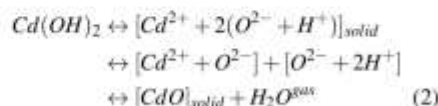


Fig. 1. X-ray diffraction patterns of films deposited at room temperature - A1 and 80 °C - C1 and annealed samples A2 and C2 corresponding to A1 and C1 thin films.

The structural changes and identification of phases of CdO thin films obtained by CBD were investigated with the help of X-ray diffraction (XRD). The diffraction angle  $2\theta$  was varied between  $20^\circ$  and  $80^\circ$  and the recorded XRD patterns for all the thin films are shown in Fig. 1. It is clear

that the as-deposited samples (A1 and C1) are oriented along (1 0 0) plane which corresponds to hexagonal CdO/Cd(OH)<sub>2</sub> structure. After annealing, Cd(OH)<sub>2</sub> films converted to pure CdO as per the following reaction [15]:



XRD patterns of annealed films show polycrystalline nature with the most prominent orientations along (1 1 1) and (2 0 0) planes. The diffraction peak at  $34^\circ$  corresponds to the (1 1 1) plane of the cubic CdO phase. The presence of diffraction peaks shows a cubic, face centered structure with polycrystalline nature. The observed  $d$  values of the film were in good agreement with those reported in the JCPD data file for CdO (JCPDS File No. 31-228, 01-1049). The crystallite size ( $D$ ) of CdO thin films prepared at different bath temperatures was calculated from X-ray diffraction studies using the following equation:

$$D = \frac{0.9\lambda}{\beta \cos \theta} \quad (3)$$

where  $\beta$  is the half width of diffraction peak measured in radian. The crystallite size calculated by using the above formula for the sample prepared at room temperature was 42 nm and for the sample prepared at higher temperature it was 69 nm. The increase in particle size at higher temperature might be due to the fact that the nuclei formed initially might be dissolved at this temperature and thus the number of the nuclei was reduced. As there was more reactant per nucleus, the particle size increased.

#### 3.2. SEM and EDAX analysis

Fig. 2 shows SEM images of as-deposited and annealed CdO thin films deposited at room temperature and at 80 °C. The SEM micrograph of as-deposited films shows nanowire- (sample A1) and nanoflake- (sample C1) like morphologies as shown in Fig. 2a, Fig. 2b, Fig. 2e, and Fig. 2f. It reveals that the as-deposited films both at room

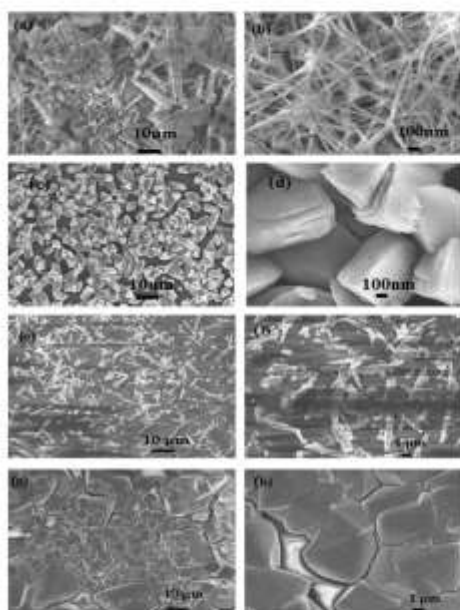


Fig. 2. SEM images of the films deposited at room temperature (a, b) and at 80 °C temperature (c, f) and their annealed (c, d and g, h) counterparts.

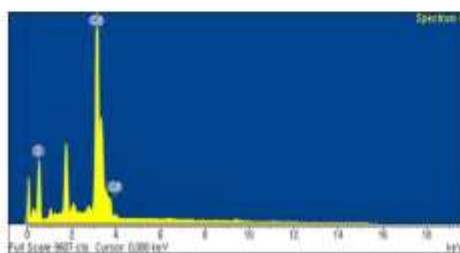


Fig. 3. Energy dispersive X-ray analysis spectrum for the CdO thin film.

temperature and 80 °C contain mixed phase of Cd(OH)<sub>2</sub> and CdO which is also shown by XRD. The annealed films show a cube-like morphology for sample A2 and sample C2 which extends on the whole surface (Fig. 2c, Fig. 2d, and Fig. 2g, Fig. 2h at various magnifications). The samples were characterized by an energy dispersive X-ray analyzer to find the elemental composition of the films. Fig. 3

Table 1. Elemental composition of the CdO thin film.

Serial no.	Element	wt. %	at. %
1	O K	45.33	85.35
2	Cd L	54.67	14.65
	Total	100	100

and Table 1 show the elemental composition of the CdO films formed by CBD method. It is clearly seen that the atomic percentages of Cd and O are 14.65 and 85.35, respectively. The results indicate the presence of high concentration of oxygen.

### 3.3. Optical studies

The plots of  $(\alpha h\nu)^2$  versus  $h\nu$  for the as-deposited and annealed films are shown in Fig. 4(a, b). The absorption spectra of as-deposited and annealed films deposited at room temperature and 80 °C were studied without taking into account the reflection and transmission losses. Annealing in the muffle furnace might cause oxidizing any hydroxide to oxide and it may explain the effect of annealing on optical absorption. It is obvious that the as-deposited films show the band gap in the range of 3 eV to 3.5 eV. Such blue shifting may be due to the presence of high bandgap hydroxide phase in both the as-deposited samples. Furthermore, from XRD patterns it is also seen that the as-deposited films (sample A1 and sample C1) consist of a mixture of different phases - cubic CdO and monoclinic/hexagonal Cd(OH)<sub>2</sub>. It may explain why both the films show blue shift of more than 1.2 eV [16]. The decrease in the band gap observed after annealing may be due to the fact that the removal of Cd(OH)<sub>2</sub> from the film took place. Band gap of 2.4 eV (sample A2) and 2.3 eV (sample C2) was evaluated. Many researchers have reported a decrease in band gap after annealing [17] for chemically deposited metal oxide thin films due to removal of hydroxide phase. These values are in good agreement with observed band gap values of CdO (2.2 eV to 2.5 eV).

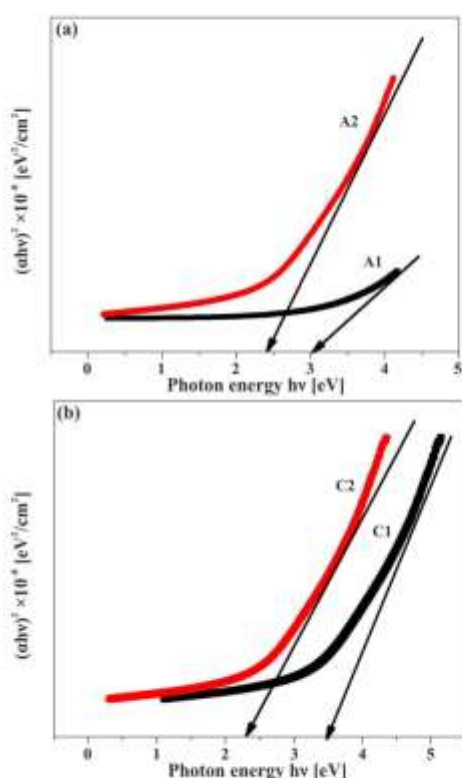


Fig. 4. The plots of  $(\alpha hv)^2$  against  $hv$  for (a) film deposited at room temperature (A1) and annealed film (A2), (b) film deposited at 80 °C (C1) and annealed film (C2).

### 3.4. Gas sensing properties

#### 3.4.1. Effect of temperature

Before exposing to  $\text{NH}_3$  gas, the CdO films were allowed to stabilize in terms of electrical resistance for half an hour and the stabilized resistance was taken as  $R_a$ . Initially, the gas response was studied as a function of operating temperature for annealed CdO film. The temperature of the sensor surface is one of the most important parameters. The temperature affects the physical properties of the semiconductor sensor material, such as charge carrier concentration, Debye length, work function, etc. The optimum operating

temperature for an effective sensor performance corresponds to that, where the material is able to catalytically reduce or oxidize the target gas, simultaneously changing the electrical properties of the sensor material. Response of sensors depends on two factors, namely, the speed of chemical reaction on the surface of the grains, and the speed of diffusion of gas molecules to that surface. These are activation processes, and the activation energy of chemical reactions is high. At low temperatures, the sensor response is restricted by the speed of chemical reactions. At higher temperature the sensor response is restricted by the speed of diffusion of gas molecules to that surface. At some intermediate temperature, speed values of the two processes become equal, and at that point the sensor response reaches its maximum [18]. According to this mechanism there is a certain temperature for every gas at which the sensor response reaches its peak value. Above this maximum temperature, the gas response decreases due to desorption of the oxygen which has been adsorbed on the surface of the sensor [19]. Another reason for the decrease in the gas response above the maximum temperature could be the increase in the carrier concentration due to intrinsic thermal excitation which decreases the Debye length [20]. This length describes the size of the space-charge region next to the surface where the free carrier concentration may be affected by the surface species. In addition, humidity also plays an important role in sensing performance. As we know, water adsorbing on the metal oxide surface does not give electrons to sensing layers. However, as explained in the literature [21, 22], it reduces the sensitivity of metal oxide sensors due to the reaction between the surface oxygen and the water molecules, which results in the decrease in baseline resistance of the gas sensor, and consequently decrease in the sensitivity [22]. Secondly, the adsorption of water molecules leads to reduced chemisorption of oxygen species on the oxide surface due to the decrease of surface area that is responsible for the sensor response. However, surface hydroxyls start to desorb at higher temperatures [23] and the hydroxyl ions can be removed by heating sensor surface at higher temperatures. Hence, recovery of

baseline resistance can be achieved. Thus, humidity effect depends on the reaction temperature of sensor becoming small at temperatures above 350 °C. In the present case we found that the sensor response reaches maximum at 623 K with negligible impact of humidity. Fig. 5(a, b) shows the influence of humidity on sensing performance and it is observed that the performance reduces from ~20 % to ~17 % due to humidity impact for sample A2. Considering the influence of humidity, the gas response of sample C2 and sample A2 (RT) was observed to be 13.5 % and 17.3 %, respectively (shown in Fig. 5b).

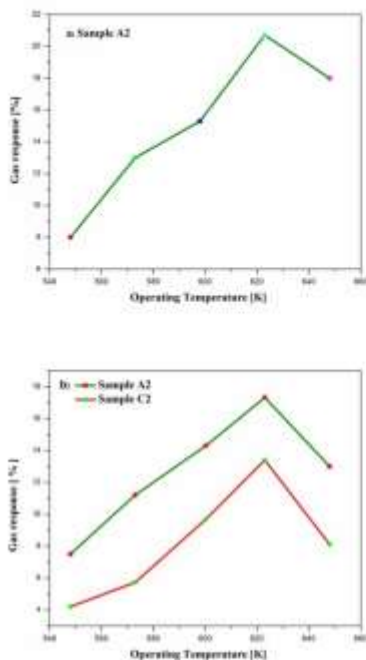


Fig. 5. Plots of gas response as a function of operating temperature for samples A2 and C2: (a) in dry air (b) at 30 % relative humidity RH.

Once the operating temperature was fixed, the sensor response was studied at different gas concentrations.

**3.4.2. Effect of NH<sub>3</sub> concentration**

Fig. 6(a, b) reveals that the response increased from 12.5 % to 19.8 % for the sample deposited at room temperature (A2), while from 7.2 % to 14.5 % for the sample deposited at 80 °C as the NH<sub>3</sub> concentration increased from 16 ppm to 28 ppm. However, at higher concentrations the increase in gas response value was steady and saturated.

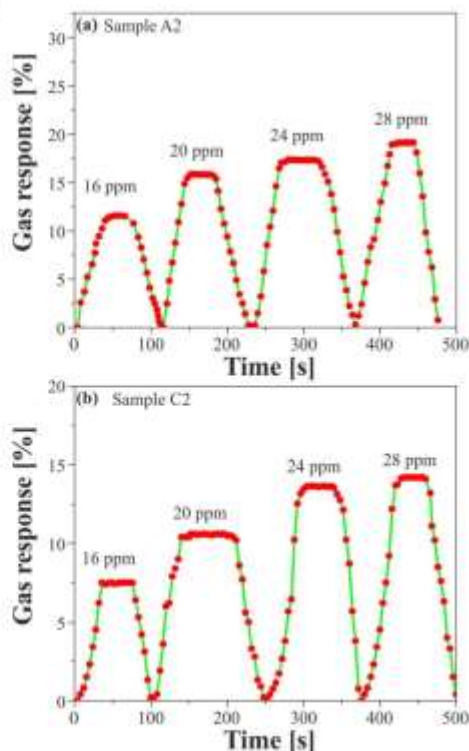


Fig. 6. Transient gas response under different gas concentrations for (a) sample A2 (b) sample C2.

The response of a sensor mostly depends on the removal of adsorbed oxygen molecules by reaction with a target gas and generation of electrons. For a small concentration of gas, acting on a fixed surface area of a sample, there is a low coverage of gas molecules on the surface and hence, minor surface reaction takes place. An increase in gas

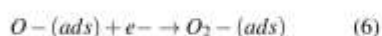
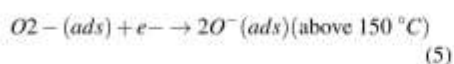
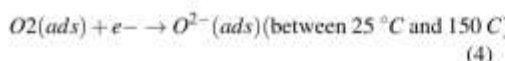
concentration increases the surface reaction due to a larger surface coverage. A further increase in surface reaction is gradual when the saturation point of the coverage of molecules is reached.

**3.4.3. Effect of bath temperature**

Fig. 7 (a, b) shows the gas response of CdO films obtained by chemical bath deposition method at different bath temperatures upon exposure to 24 ppm of NH<sub>3</sub> gas at 623 K. The figure shows that the gas response of 13.5 % was obtained for the sample deposited at 80 °C (C2) whereas the response of 17.3 % was obtained for the sample deposited at room temperature (A2). It is evident that the response largely depends upon particle size. Sample A2 with average grain size of 42 nm (as confirmed by XRD) is more sensitive than sample C2. Furthermore, A2 is composed of porous nanocubes (it is also visible in SEM), which offer more surface area for interaction with NH<sub>3</sub> molecules and enhance diffusion process.

**3.4.4. Discussion**

The mostly accepted theory for the mechanism of gas sensing of n-type semiconducting metal oxide is based on the electron transport between the sensor surface and chemisorbed species that modify the surface conductivity of the sensor [24]. When the sensor is exposed to air, the atmospheric oxygen molecules are adsorbed on the surface of the sensor, and then capture electrons from the conduction band to form the chemisorbed oxygen species (O<sup>2-</sup>, O<sup>-</sup>, O<sub>2</sub><sup>-</sup>):



Therefore, the adsorbed oxygen molecules act as acceptors and thus deplete the surface electron states and reduce the free carrier density, which subsequently results in formation of electron depletion region at the surface of the sensor. Once the

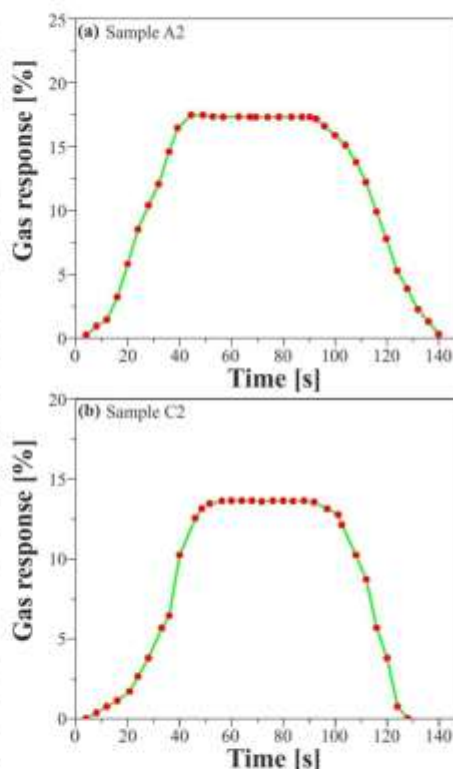
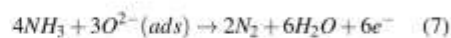


Fig. 7. Transient gas response 24 ppm of NH<sub>3</sub> at 623 K for (a) sample A2, (b) sample C2.

sensor is exposed to a target gas, the reaction between the analyte gas molecules and adsorbed oxygen species will occur. It releases electrons back to the conduction band of material. The released free electrons recombine with holes, which increases the electrical conductance of the semiconductor. These processes can be described by the following reactions:



**4. Conclusions**

The CdO thin films were deposited by using chemical method at room temperature as well as at temperature of 80 °C. As-deposited films

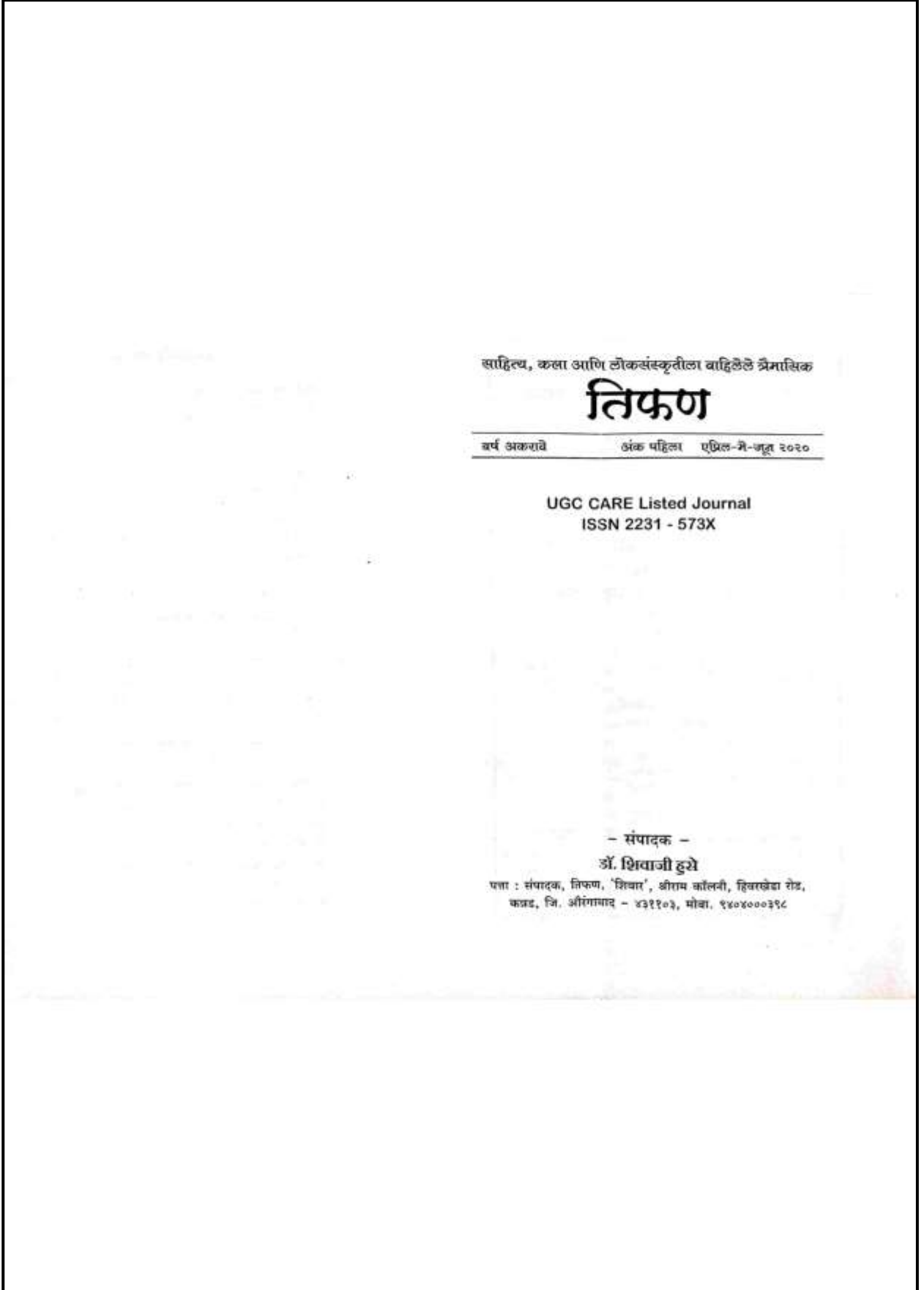
showed mixed phases of CdO and Cd(OH)<sub>2</sub> with hexagonal/monoclinic crystal structure whereas the annealed films showed face centered cubic crystal structure. SEM investigations revealed the nanowire-like morphology for the room temperature deposited film and well-developed rod-like morphology for the film deposited at elevated temperature. Annealed samples showed the cube-like morphology. Optical studies indicated that the band gap energy  $E_g$  of as-deposited films varied in the range of 3 eV to 3.5 eV. After annealing, the band gap decreased to 2.4 eV for room temperature deposited film and 2.3 eV for high temperature deposited film. EDAX analysis showed the presence of high concentration of oxygen. The sensing properties of CdO thin films prepared at different bath temperatures were studied systematically and it was found that the film deposited at room temperature showed response of 17.3 %, while the film deposited at higher temperature showed response of 13.5 % to 24 ppm of NH<sub>3</sub> at 623 K.

#### References

- [1] LEWIS B.G., PAINE D.C., *MRS Bull.*, 25 (2000), 22.
- [2] KIM H., GILMORE C.M., PIQUE A., HORWITZ J.S., MATTOUSSI H., MURATA H., KAFABI Z.H., CHRISSEY D. B., *J. Appl. Phys.*, 86 (1999), 6451.
- [3] SELVAN J.A.A., DELAHOY A.E., GUO S., LI Y.M., *Sol. Energ. Mat. Sol. C.*, 90 (2006), 3371.
- [4] ANANDAN S., *Curr. Appl. Phys.*, 8 (2008), 99.
- [5] GALICIA D.M.C., CASTANEDO-PEREZ R., JIMENEZ-SANDOVAL O., JIMENEZ-SANDOVAL S., TORRES-DELGADO G., ZUNIGA-ROMERO C.I., *Thin Solid Films*, 371 (2000), 105.
- [6] DONG W., ZHU C., *Opt. Mater.*, 22 (2003), 227.
- [7] VINODKUMAR R., LETHY K.J., ARUNKUMAR P.R., KRISHNAN R.R., PILLAI N.V., PILLAI V.P.M., PHILIP R., *Mater. Chem. Phys.*, 121 (2010), 406.
- [8] GRADO-CAFFARO M.A., GRADO-CAFFARO M., *Phys. Lett. A*, 372 (2008), 4858.
- [9] PAWAR S.M., GURAV K.V., SHIN S.W., CHOI D.S., KIM I.K., LOKHANDE C.D., RHEE J.I., KIM J.H., *J. Nanosci. Nanotechnol.*, 10 (2010), 1.
- [10] KUMARAVEL R., MENAKA S., SNEGA S.R.M., RAMAMURTHI K., JEGANATHAN K., *Mater. Chem. Phys.*, 122 (2010), 444.
- [11] SUBRAMANYAM T.K., UTHANNA S., NAIDU B.S., *Mater. Lett.*, 35 (1998), 214.
- [12] MAITY R., CHATTOPADHYAY K.K., *Sol. Energ. Mat. Sol. C.*, 90 (2006), 597.
- [13] LIU X., LI C., HAN S., HAN J., ZHOU C., *Appl. Phys. Lett.*, 82 (2003), 1950.
- [14] GUTIERREZ L.R., ROMERO J.J.C., TAPIA J.M.P., CALVA E.B., FLORES J.C.M., LOPEZ M.O., *Mater. Lett.*, 60 (2006), 3866.
- [15] BALU A.R., NAGARETHINAM V.S., SUGANYA M., ARUNKUMAR N., SELVAN G., *J. Electron. Devices*, 12 (2012), 739.
- [16] KHALLAF H., CHEN C.T., CHANG L.B., LUPAN O., DUTTA A., HEINRICH H., SHENOUDA A., CHOW L., *Appl. Surf. Sci.*, 257 (2011), 9237.
- [17] SHINDE V.R., LOKHANDE C.D., MANE R.S., HAN S.H., *Appl. Surf. Sci.*, 245 (2005), 407.
- [18] NENOV T.G., YORDANOV S.P., *Ceramic Sensors-Technology and Applications*, Technomic Publishing, USA, 1996.
- [19] WINDICHAMANN H., MARK P., *J. Electrochem. Sc.*, 4 (1979), 627.
- [20] MIZSEI J., *Sensor. Actuat. B-Chem.*, 23 (1995), 173.
- [21] QI Q., ZHANG T., ZHENG X., FAN H., LIU L., WANG R., ZENG Y., *Sensor. Actuat. B-Chem.*, 134 (2008), 36.
- [22] GONG J., CHEN Q., LIAN M., LIU N., STEVENSON R.G., ADAMIC F., *Sensor. Actuat. B-Chem.*, 114 (2006), 32.
- [23] EGASHIRA M., KAWASUMI S., KAGAWA S., SEIYAMA T., *Bull. Chem. Sc. Jpn.*, 51 (1978), 3144.
- [24] MONDAL B., BASUMATARI B., DAS J., ROYCHAUDHURY C., SAHA H., MUKHERJEE N., *Sensor. Actuat. B-Chem.*, 194 (2014), 389.

Received 2017-03-29

Accepted 2018-12-19

**11. Kashtachi Bhakari**



UGC CARE Listed Journal  
ISSN 2231 - 573X

साहित्य, कला आणि लोकसांस्कृतिका वट्टिलेले त्रैमासिक

**तिकण**

MAH MAR 34737/13 /1/2009-TC

समकालीन कथा व व्यावहारिक मराठी विशेषांक

खर्च - ११ वे, अंक पहिला  
(एप्रिल-मे-जून २०२०)

**संपादक**  
**डॉ. शिवाजी भुसे**

**अतिथी संपादक**  
**डॉ. राजेंद्र थोरात डॉ. राहुल पाटील**

डॉ. राजेंद्र थोरात	डॉ. राहुल पाटील	डॉ. मंगल इंगोले
डॉ. सुनील किने	डॉ. तांदेव पातंग	डॉ. वासुदेव जाधव
डॉ. पुन्य कागुन	डॉ. संदिपा महाजन	डॉ. वसुदेव सोनुने
डॉ. अश्विन मजें	डॉ. प्रकाश घेडी	डॉ. रमचंद्र झाडे
डॉ. संजय भातेराव		

**संपादक मंडळ**

डॉ. तांदेव पातंग  
डॉ. संदिपा महाजन  
डॉ. प्रकाश घेडी

**मुख्यभाषण समिती**  
डॉ. संजय ब्रह्मकर  
डॉ. भास्कर टोके  
डॉ. जया कादम  
डॉ. सुभाष कागुन  
डॉ. सदीप सांजोळे

मूल्य : ₹५० रुपये

या अंकातील लेखकांच्या मराठी प्रकाशक प्रवृत्ती अंतर्गतच आहे.  
या नियतकालिकाला महानगर राज्य साहित्य आणि संस्कृती विभागाने अनुदान प्राप्त झाले आहे.  
पंतु या नियतकालिकाचे प्रसिद्ध झालेले प्रत्येक अंक अंतर्गतच आहे.

पत्ता : संपादक, तिकण, शिवाजी भुसे, शिवाजी नगर, शिवाजी नगर, पंढर,  
जि. औरंगाबाद - ४३११०३, मोबा. ९८२२२२३१६

- अनुक्रमणिका -

१. मराठी कथा: संकल्पना व इतर / डॉ. जया कागुन.....	१
२. मराठी कवितेची वाटकाळ / डॉ. श्रीराम पांडव.....	१९
३. कवितेचे घटक व प्रकार / डॉ. संजय थोरे.....	३२
४. कवितेचा आकार व आंतरसुध / डॉ. राजेंद्र थोरात.....	३९
५. विचारसंग्रह व अंतर्मुख कथा 'जेव्हा मी जल घेतली होती' / डॉ. विजय कासारे.....	४४
६. शेतकऱ्यांची ज्येष्ठा घांठ्याची वास्तव कथा 'लात पिकल' / डॉ. विजय कासारे.....	५६
७. विचार आणि चिंतनाचा पाऊस : 'पाऊस आला भोका' / डॉ. कर्ण सोडवाल.....	६९
८. विद्येहास कधीच न थांबता देवाची कथा - 'उदयन' / डॉ. महादेव कांबळे.....	६७
९. प्रस्थापित ज्येष्ठतेला इतर देवाची कथा - 'उदयन' / डॉ. प्रवीण तांदे - देवगुण.....	७२
१०. आदिवासींच्या ज्येष्ठा, वेदना व संकल्पने दर्शन : 'बाबा' / डॉ. कैलास महाले.....	८३
११. गुन्हा सुटका 'बाबा' / डॉ. राजेंद्र थोरात.....	९९
१२. वैरागीत वैरागीत प्रवृत्तीचा प्रकाश टाकणारी कथा 'दण्ड दण्डाणा' / डॉ. राहुल जगदाळे.....	१००

१३. नटोसंकेपातील राग-तगाच प्रदर्शित करपाची कथा 'घण्टी' / डॉ. प्रतिभा शंकर घाग-सोनी .....	११३
१४. प्रसंगनिष्ठ किनेटातून लोकशोषण ब्रह्मपारी कथा 'शुष्कगत सवधान' / डॉ. नारायणराव पवार .....	११८
१५. शमप्रतिष्ठा व ध्येयवाद जागृताची कथा 'कष्टाची भावकी' / डॉ. शेजा संघत शेळके .....	१२८
१६. भाषिक कौशाल्ये विश्वस / डॉ. रामेंद्र रामकृष्ण सांगळे .....	१३२
१७. आफतनाशक श्रवण कौशल्य / डॉ. तुषार चोंदवडकर .....	१४०
१८. संघर्षण कौशल्याचे स्वरूप, महत्त्व व सुधारणेसंदर्भातील उदाहरण / डॉ. राजूळ असोक पाटील .....	१४४
१९. वाचन कौशल्य / डॉ. संदीप रंगराव तास्कीर .....	१५३
२०. लेखन कौशल्य डॉ. कीर्ती मिलिंद मुळीक .....	१६१
२१. ई- संवादने स्वरूप व विविध माध्यमे / डॉ. प्रकाश कातराणी रोबाळे .....	१६४
२२. सांघस लेखन / डॉ. नितीन कल्याण मोटे .....	१७५
२३. विज्ञान महाविद्यालयात पदवी शिक्षण घेणाऱ्या विद्यार्थ्यांचा वाचन अधिष्ठापना अभ्यास / डॉ. सुधास बंधू अहिरे .....	१८३

### दोन शब्द...

विद्यार्थ्यांच्या निष्ठापूर्वक शारीरिक चाचण्यांनंतर अभ्यासक्रम बदलत असताना, सावित्रीबाई फुले पुणे विद्यापीठाने भारतीय वर्षीय म्हणजे २०१९-२०२० फासून प्रथम वर्षीय अभ्यासक्रम बदलविते. त्यानुसार मराठीभाषी अभ्यासक्रम बदलता. त्यात व्यावहारिक- उपयोजित मराठीतील भाषिक कौशल्ये, कथेची तैद्धान्तिक माहिती व संभ्रमजालातील निवडक मराठी कथांचा समन्वय साधण्यात आला.

आज 'कोविड- १९' विद्याभूषुळे मानवी जगण्याचे परिप्रेक्ष्य बदलले आहे. तारिखेत गतिमान असणाऱे जग कोरोना विद्याभूषुळे स्तब्ध झाले आहे. उद्योग व्यवसायाचे गतिमान चक्र यंदळले आहे. मानवाला स्वतःला लॉकडाऊनमुळे घरातच बंदीत घ्यावे लागले आहे. घरात असताना पितृत्व, मननासाठी मोठा अन्वयी सगळ्यांनाच मिळाला. परदेशातून आणत्या देशात आलेल्या विद्याभूषुळा मोठा फटका घडवून घेऊन आले. पण त्यातल्या त्यात तो 'नाही रे' वर्गास सर्वाधिक बाधला. यंत्रणा-गिर्जांना जगण्यासाठी अतोनात हाल सहन करावे लागले, अजूनही सहनच करावे लागत आहेत. देशात दळणवळणाची सर्व साधने उपलब्ध असतानाही फरट करून पराप्रदेशात पोटा भरताना त्याचो पराप्रदेशीय यंत्रणा शोकडो किमी अंतर पायी चालता वजे लागले, हे पाहतांना संवेदनशील मन विषमण झाले.

शहर म्हणजे विकास, शहर म्हणजे गतिमान विद्य, शहर म्हणजे सुखात असे असताना 'गळ्या आपला गावच बस' असे म्हणून शहरातील लोकांचे लोडिच्या लोडि गावकडे जाऊ लागले, यातून संघर्षाची निर्माण झाला. मिळते त्या गावनाचे अखलं मूळ गाव गाळण्याची धडपड शहरा-शहरांमधून पाहण्यात मिळाली. दुधाचे डंबर, वॉन, ट्रक यातून माणसे अक्षरः लपूनलपून गावाकडे गेली. स्वतःच्यानंतर एका विद्याभूषुळे मोठ्या प्रमाणात यानची समूहाचे स्वतःलात झालेले जाण इतमर्दानिक विद्याभूषुळीत वृत्त वाहिन्यांतून पाहिले आहे. माणसाचा शैतिक विकास आणि वैज्ञानिक प्रगतीलाच कोरोना विद्याभूषुळे आव आव्हान दिले आहे. आपला देश, राज्य आराध्य क्षेत्रात लुप्तच अन्विकसित आहे, शेजा मानिसाने अधोरेखित झाले. धर्मसंश्लेषाबरोबरच अद्यकालत हॉस्पिटलम् निर्माण होण्याची आवश्यकता मानिसाने अधोरेखित झाली आहे.

लॉकडाऊनच्या कालावधीत विद्यार्थ्यांसाठी आरण एखादा विषय घेवून त्यावर अभ्यासपूर्ण लेखन करणे, या उद्देशाने आम्ही मराठी विद्याभूषुळे बऱ्ही अभ्यासक एकत्र आलो. चर्चा करताना अशा पद्धतीने ई-वेबेटे ब्रव्हिले पाहिले, बाबत एकमत झाले.

दोन शब्द... ५

## १५. श्रमप्रतिष्ठा व ध्येयवाद जागवणारी कथा 'कहाची भाकरी'

- डॉ. हरेश संपत शेळके -

भरडी विभागप्रमुख, ज्यु आर्ट्स कॉमर्स अँड सायन्स कॉलेज, पारने  
ई-मेल: hareshelke@gmail.com प्रकाशकनं: ९७६५१७६९९९

## प्रास्ताविक :

'सामकालीन भरडी कथा' सांघातील सर्व कथांमध्ये विविधता आहे. या कथा आजचे जीवनानुभव हीडवणे प्रकट करतात. या कथांमध्ये प्रज्ञा, दलित, स्त्रीवादी, आदिवासी, मुस्लिम, ग्रामीण, महानगरीय, विरोधी अशा प्रकारातील काही निवडक कथा निवडलेल्या आहेत. त्यामुळे विद्यार्थ्यांना सामकालीन भरडी कथांची ओळख होण्यास निमित्तपण महत्त्व होईल. विद्यार्थ्यांमध्ये जागृकता वाढता. विकसित होण्याच्यादृष्टीने निवड केलेल्या कथा उत्तम आहेत. सविन घाटील बोव्या 'कहाची भाकरी' या सांघातील एक महत्त्वाची आणि प्रेरणा देणारी कथा आहे.

## लेखक परिचय :

जन्म पिढीतील सरळ व महत्त्वाचे प्राणीय कथाकार असलेले सविन घाटील यांचे 'सांघाचा' आणि 'अवकाशी विडंबना' हे दोन कथासंग्रह प्रकाशित आहेत. साहित्य लेखनसाठी महाराष्ट्र साहित्य परिषद इलाहाबाद शाखेचा पुरस्कार, दलित महाराष्ट्र साहित्य संघा कोल्हापूर यांचा संकर खंडू घाटील पुरस्कार, महाराष्ट्र साहित्य परिषद शाखा मुहान्न यांचा उत्कृष्ट कथासंग्रह पुरस्कार, साहित्य साधना पुरस्कार उदगीर, अधिष्ठात्री पुरस्कार खणपूर, महाराष्ट्र शासन व समाज कल्याण विभाग कल्याणद्वारे दिल्यांग प्रेरणा आदी पुरस्कार त्यांना लाभले आहेत. सामकालीन प्राणीय प्रश्न, विदारक वास्तव व पौरविकीतून प्रभावी भाषा हे त्यांचे लेखन वैशिष्ट्य आहे. त्यांच्या कथा शेतकरी, कष्टकरी वार्गीय मुख- दुखे, व्यथा- वेदना, समाज्यात शब्दबद्ध करून त्याच्या उपाय सोप्याचा प्रयत्न करतात. तरुणांना ही कथा लोचने आकर्षक घडविण्यासाठी विकसित प्रेरणादायी ठरेल.

## कथेची पार्श्वभूमी :

सामकालीन शेत, शेतकरी, कष्टकरी, मजूर या सर्वांचा विचार केला तर आपल्याला दिवून वेले भी, शैथिल्य समस्या परंपरागत आजही यातू आहेत. म्हणजे निसर्गाच्या भरव्यावर असलेली शेत, वानरा भाव, काप झिल्ले हे निमित्त नाही तेथेही अंदाज कोणत राहणे एवढेच शेतकऱ्यांच्या हातात आहे. परसंस्था, रीका यांचे कर्न काढत राहणे, ज्याज चेत राहणे, सात बाप रीकांच्या ताब्यात असणे या सर्व काळावयात आजचा शेतकरी शेत करताना दिसतो. त्याच्या आत्मा- अपेक्षा- आकांक्षा

दिनांक ०८ १२८

या एक तर निसर्गावर अवलंबून असताना किंवा दुसऱ्या मजूरला त्याच्या मालात चांगला भाव झिल्ले आणि त्या झिल्लेला पडतून त्याने चाडिल्लेही स्वयं असतात. हे स्वाधे विश्व असते. हाच शेतकरी यार्णानुषंग शेतकरीत पिकाळा ह्याची लोकांचा शोषिता राहत आलेला आहे. 'कहाची भाकरी' कथेत विचारक या तरुण शेतकऱ्याची व्यथा अत्यंत छविदावणीताने लेखकाने रेखाटलेली आहे.

## नायक विनायककैत्री कथानक :

सामकालीन समाज जीवजल विचारक हे प्रातिनिधिक उदाहरण आहे. आज अनेक शेतकऱ्यांची हीच अवस्था आहे. त्यामुळे या कथेतून सामकालीन शेतकरी अवस्था, शेतकऱ्यांची अवस्था, शेवकती ज्या पद्धतीने विकित केले आहे त्यामध्ये लेखक यशस्वी ठरलेला आहे.

विचारक कथाचा तरुण शेतकरी, त्याचे द्राष्ट बाणेची लागवड केलेली असते. द्राष्टाचे चांगले उत्पादन होईल व पैसाही धांपत झिल्ले या आशेवर विनायकने द्राष्ट बाणेची लागवड केलेली असते. पंतु सरल टोन- हीन वार्णितमूर पडणाऱ्या शेतकरी, अवकाशी पावसाचे द्राष्ट बाणेचे प्रचंड नुकसान होत व त्याखाल असावेले कर्न मात्र एक मजूरला सादतच राहत. आज मात्र त्याच्या घाटीताने रीकांचे उत्पादन लावता. कर्न कसे वेडावणे या विचारत तो असतो. शेतकऱ्यात रीकांचे जमीनी नोटीस काढली म्हणून विनायकने शेत नुकत्याला गहाण म्हणून घाणची अर्न ठरवतं. बाता बरे ज्याज म्हणून तुलत तुलत्यान राने खावच ठरतं. त्याने रीकांचेदून स्वतःची सुटका करून घेतली. आता पुढे काय ? हा प्रश्न त्याच्यासाठी होता. कारण विचारक हा बी.बी.एम. झालेला असतो. त्यामुळे रोजगारीवर कालात जायची त्याला ताज वटते. म्हणून तो शेतकरी करायची ठरवतो. नोकरीसाठी तो घूप प्रयत्न करतो. पंतु काय मात वेत नाही. शेतकरी हातात होऊन तो घाटी चेत वेतो. या सर्व अवस्थेत त्याला व्यथन जाते. तो आकडा (जुलत) खेडू लागतो आणि हाडूडू ली या आकडाबाब्या खेळात पाचसासाडा चालत नाही. त्याला कशाचेच धन राहत नाही. तो या आकडाबाब्या खेळात अगले सर्वस्व गमावतो. एकेदिवशी कतीचे इगिने तो या आकडाबाब्या खेळात लागतो. आता आपण प्रचंड शीमेत होऊ असं त्याला वटतं. त्या राती तो स्वप्नांच्या दुनितेत शोभून जतो. सकाळी उठल्यावर तो आकडाबाब्या खेळाचा विचारत पहाण्यासाठी जातो तर सपनात हरलेला असतो. त्याचे सर्व पैसे चाका केलेले असतात. त्याला आता काही मुक्त कळते. त्याच्या घनाखालची जमीन सरकली होती. आता आपण आपल्या बायका मुलांना तोंड कर्न दाखवायचं हा प्रश्न त्याच्यामुळे चढलेला असतो. त्यामुळे या सर्व परिस्थितीत तो स्व.ता सोपण्याचा विचार करतो. पंतु एक क्षणी त्याला आपली लहाव मुले आठवतात, बायको आठवते आणि तो लहकामने फुड

श्रमप्रतिष्ठा व ध्येयवाद जागवणारी कथा कहाची भाकरी ०८ १२९

आपत्त्या घाटाच्या दिशेने चालू लागतो. सकाळी लवकर उठतो. पाळ्यावर पडलेलं खोर हुडकून काढतो. अंगोळ करताना ते पाण्याने स्वच्छ धुऊन बसवतो. आता स्वाने निवडलेला मार्ग कष्टाचा होता. काट्याकुट्यातून जायला होता पण घामचे थोती करपात होता. त्याला वाटत होते लोक शिगळीत, चार दिवस हमरीत पण इमानदाराने रावण्याच्या हास्यांना भीती कोणाची? हा विचार तो कातो.

खांद्यावर खोरं ठाकून तो नाना गंधर्वाच्या घराकडे चालू लागतो. वारण जाता त्याला कष्टाच्या भाकरीची चव चाखायची होती. त्याच्या या बदलामुळे घरातील वातावरण आनंददायी झाले होते. अशा प्रकारे शेतकऱ्याने सकारात्मक शेवट कात ही कथा शेवटच्या क्षणी एका विशिष्ट उंचीवर वेडून पोहोचवली आहे.

कथेची वैशिष्ट्ये :

१. 'कष्टाची भाकरी' ही कथा श्रमप्रतिष्ठा आणि ध्येयवाद जागवणारी व जागृती कथा आहे.
२. व्यसन, दारिद्र्य, कर्मबान्धारीपणा, दुःख, शोषण, निराशा यांचे श्रम, धाम आणि ध्येयाद्वारे मात करता येते हा संदेश ही कथा आपल्याला देते.
३. पारंपरिक असो वा आधुनिक रीती असो बदलणे अर्थकारण, अध्यामी व सुलतानी संकट, घामुळे शेतकऱ्यांची उपेक्षा संपत नाही. अशा परिस्थितीत आत्मपान जागे ठेऊन श्रम वा मूल्यवादी शीघ्र प्रवृत्तिले केव्हास जगण्याचा मार्ग सापडतो, असा संदेश ही कथा देते.
४. या घटनाप्रधान कथेचे प्रवाही कथानक, अर्थपूर्ण शेवट आणि प्राचीन बोलीमुळे कथेला उंची प्राप्त होते.
५. 'कष्टाची भाकरी' हे मूल्य अतिशय प्रत्यक्षरितेने ही कथा वाचकांसमोर उभे करते.
६. विनायकचा संघर्ष, हतबलता, निराशा आणि शेवटी विनायकाने त्याचा मिळवलेला कष्टातून विनायक ते सर्व वाचकांना प्रचंड उर्जा देणारे असे आहे.
७. जगण्याकडे सकारात्मक नृतीने कसे बघायला हवे, याचे उत्तम उदाहरण ही कथा आहे.
८. आजच्या सततच जगण्याला ही कथा सहजसणे पडलेली दिसते.
९. ही कथा आजच्या लक्ष्यांसमोर एक आदर्श उदाहरण म्हणून निश्चित संगतच येईल.
१०. बदलणे अर्थकारण आणि शेतकऱ्यांचे जगणे, त्यांच्या वाट्यात आलेले दुःख, त्या दुःखाला नाचा फोडणारी एक ज्वलंत कथा म्हणून 'कष्टाच्या भाकरी'चा उद्देश आपल्याला करावाच लागेल.

शिपन ८४ १३०

सारांश :

समकालीन शैली प्रभावातून प्रभावित असणारे प्रश्न शेतकरी, त्याच्या संदर्भात असणारे प्रश्न, शेतकरी त्याच्या जगण्याचा संघर्ष, त्याला संकटांचा करावा लागणारा सामना या सर्व गोष्टींवर मार्मिक भाष्य ही कथा करताना दिसते. विनायकचा संघर्ष या सर्व गोष्टींवर मार्मिक भाष्य करताना दिसतो. विनायकचा संघर्ष हा प्रातिनिधिक आहे. परंतु आपल्या अनतीभोवती समाजात जेव्हा आपण याद्वारे दिसतो तेव्हा विनायकसारखे संकट स्वतःवर आलेले अनेक शेतकरी आपण पाहतो. खरं तर शेतकऱ्यांच्या आशा, अपेक्षा आणि आवेगांना या सर्व विस्मयकारक आणि शैलीतून निष्कर्षार्थ जपानदरवर अवलंबून असतात. आयुष्यभर तो शेतकरी अहोरात्र कष्ट असतो. परिस्थितीशी झगडत असतो.

'कष्टाची भाकरी' फक्त एक बाजूला सुशिक्षित तरुणाचा संघर्ष, त्याची हतबलता, पराभव हे सर्व चित्रित होताना दिसते. त्यावेळी वाचक विनायकनटल संवेदनशील होत जातो परंतु तोच दुसऱ्या बाजूला त्या प्रतिकूल परिस्थितीवर केलेली मात, जगण्यासाठी निवडलेला कष्टाचा मार्ग वाचकांची उमेद वाढवणारा असतो. म्हणूनच ही कथा एक अर्थीन जीवन जगण्याची श्रेया देणारी कथा आहे.

समारोप :

'कष्टाची भाकरी' ही कथा आजच्या लक्ष्यांना मार्गदर्शन तर करतेच पण प्रतिकूल परिस्थितीशी संघर्ष करत माणूस विकेंद्रशील विचार करत गेला. परिस्थितीशी तडबडीत करत - संघर्ष करत नवे मार्ग शोधत गेला तर जगण्याचा रस्ता खोबी सापडत नाही, असे उत्तम भाष्य ही कथा करते.


संदर्भ :

१. सांडगे शिरीष, पन्ना दिलीप, सांगळे संदीप (संपा.): 'समकालीन मराठी कथा', अक्षरबंध प्रकाशन, पुणे; प्रथमावृत्ती: जून २०११
२. गणेशकर प्रभा व इतर (संपा.): 'संक्षिप्त मराठी साहित्य मय कोष' (१९२० पासून २००३ पर्यंतचा कालखंड), ग.ग.पटकर फाउंडेशन, मुंबई, दुसरे पुस्तक: सप्टेंबर २०१३
३. वरखेडे मंगला: 'सिखांचे कथालेखन: नवी टुट्टी, नवी शैली', साकेत प्रकाशन, औरंगाबाद; प्रथमावृत्ती: २००५
४. 'मराठी साहित्याचा इतिहास', खंड सातवा: भाग दुसरा, रा.ग.जाधव (पुस्तक संपा. व इतर), महाराष्ट्र साहित्य परिषद, पुणे, प्रथमावृत्ती: जानेवारी २०१०
५. 'मराठी साहित्याचा इतिहास', खंड सातवा: भाग तिसरा १९५० ते २०००, रा.ग.जाधव (मुख्य संपा. व इतर), महाराष्ट्र साहित्य परिषद, पुणे, प्रथमावृत्ती: ऑक्टोबर २०१०

८४८६

श्रमप्रतिष्ठा व ध्येयवाद जागवणारी कथा कष्टाची भाकरी ८४ १३१

## 12. Cinema and Literature: equally extraordinary works of art




IMPACT FACTOR – 5.61

# LangLit

*An International Peer-Reviewed Open Access Journal*

ISSN 2349-5189



---

## CINEMA AND LITERATURE: EQUALLY EXTRAORDINARY WORKS OF ART

**DR. BHARATE PRANJALI PANDURANG**  
New Arts, Commerce and Science  
College, Parner (9405244614)

**ABSTRACT:**

*Cinema and Literature are two different but equally extraordinary works of art. Where literature was a popular form of expression during the 18th and 19th century, cinema has taken its place by the 20th century onwards. Though cinema and literature have certain connections and differences, both have a similarity of taking its readers or audience to a different world. Literature has been a way of artistic expression for centuries now. Writers have told tales about gods and goddesses, heroes and their valiant victories, historical epics, romantic tragedies, comic incidents, legendary episodes, and much more. Cinema is by far doing the same thing for quite a few years now. One major strong point in cinema, which is absent in literature, is the advantage of visually showing the whole picture on the screen that helps the audience connect with the moment more closely. Literature takes its readers on a journey of imagination that is away from the real world while cinema shows such an imaginative world before the audience and they do not have to put much pressure on their minds to probe into their imaginations. They basically view the film through the imagination of the filmmakers. To put it, in other words, we can say that literature is an art which is developed through writing while cinema brings to life those writings to life through sound, music, visuals, and actors. Literature has all the meanings hidden in itself that are used to develop a film. Though both are somehow interdependent, both need to be studied in order to completely understand a movie based on a piece of literature. Moreover, literature has always been a great inspiration for cinema all over the world. In India, especially, epics like Mahabharata and Ramayana have been created and recreated on the silver screen several times. Novels of renowned Bengali writers, Gujarati writers, Urdu writers, and English writers are made into films every now and then. It is easily said that the first step of cinema is literature. Because once a film is in the process of making, it is the script, dialogues, and screenplay that are produced in order to develop it. The production and technical aspects are secondary in the process of filmmaking. Hence, it will not be wrong to say that literature initiated people to move on to cinema. The rest of the paper is, thus, organized as follows; section 1. Entitled Literature and cinema: on adaptation, exposes the notion of adaptation of novels. Section 2. Discusses the Influence of cinema on Literature and section 3. concludes.*

There is an extraordinary contribution of one art to the other. As history points out that it was all a world of tales and stories from where Aladdin, Ali Baba and the Forty Thieves, Hatim Tai, Cinderella, Snow White, and The Prince and the Pauper originated. And from here cinema took its inspiration and developed films based on these stories or parts of these

Special Issue

Website: [www.langlit.org](http://www.langlit.org)

203

June 2020

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyanideo Mohekar Mahavidyalaya, Kalam, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI, The Cite Factor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



An International Peer-Reviewed Open Access Journal

stories. As through the word of Malthew Arnold "Literature is the best record that is thought and known in the world", in the word of Satyajit "Literature was avenue for the expression of the creative talents."

Cinema an art of sowing life of the human being and the respective happening in life which literature glorifies. Not only the actual assurances but also reflects in an idealized form, the standards of social, thought and morality. Cinema, movies the most remarkable, illuminating fascinating discovery of science and technology, fear the credit goes to the American Scientist Thomas Edison. The tone of literature changes with the stage of society, life style and reprehensive incidents, which portrayed and given a clear view by means of perfect moulding in mode of films. Thus, critics usually compare cinematographic work to literature, assessing the degree to which a movie is faithful to a text or a novel. Many authors found a forward and backward influence. She underlines that cinema has the ability to translate deep and abstract ideas and thoughts to the screen as brilliantly as literature does. Furthermore, Brito (2006) states that "In the era of interdisciplinary, nothing is healthier than trying to see the literature's verbosity from the perspective of cinema and the movie iconicity from the perspective of literature". Film makers are inspired by novels (D. C. Griffith, Stephen Daldry) and there is no doubt that in turn, novels tend to be increasingly inspired by cinema. There is a mutual influence mainly justified by the chief factor they both have in common: narrative and story-telling.

There have been several filmmakers who have adapted novels, plays, even poetry into films like J.K. Rowling's Harry Potter Series, Jane Austen's Pride and Prejudice and Sense and Sensibility, Sarat Chandra Chatterjee's Devdas, Homer's Iliad and Odyssey (On which films like Troy and Oh Brother, Where Art Thou? are based). A Bengali filmmaker, Chidananda Dasgupta, explains about the adaptations of films from literature that certain characters and incidents from the literature may undergo changes, "but the very composition of the elements, the molecular structure if you like, would undergo a transmutation."

The purpose of the film should not be a mere copy of the literature; rather it must have its own characteristics and techniques that are motivational enough for the audience to enjoy. Though in its literary form many can say that it is in the form of a screenplay of the film but it may not be right to look at a literary piece in such a way. It has an impression of reality even in the written form and once it comes on the silver screen it enhances its qualities to a greater extent than it does in the written form.

Language is another component that differs from a book and a film. Though there may be a similarity in the use of language in both the platforms, there are certain distinct disparities between the usage of language in literature and that in cinema. The relationship between time and space is also quite different from literature to cinema. While in literature an event is described as it has happened, films show as it is happening. A film must not play the role of the literal visual representation of the book on which it is based. It must be a proper

Special Issue

204

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Bahasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IIFC, DRJI, The Cite Factor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



*An International Peer-Reviewed Open Access Journal*

production that has been transformed from the words on paper to the dialogues on the celluloid. The way both the medium expresses their meaning is where the similarity and the difference lie. Words are the only way to express but while a book has written words on it a film has audio speech which is somehow more powerful and life-like. In a film, a single scene is like a complete sentence or a series of sentences in a book. The power of audio and visual experience has a long lasting effort on the audience over the power of written words.

**Literature** is a group of works of art made up of words. Most are written, but some are passed on by word of mouth. Literature usually means works of poetry and prose that are especially well written. There are many different kinds of literature, such as poetry, plays, or novels. They can also be put into groups through their language, historical period, origin, genre, and subject. The word *literature* comes from the Latin word "learning, writing, grammar".

Most of the earliest works were epic poems. Epic poems are long stories or myths about adventures. *Ramayana* and *Mahabhart*, two Indian epics, are still read today. *Odyssey* and *Iliad* are two famous Greek poems by Homer. They were passed down through speaking and written down around the 8th century BC.

Literature can also mean imaginative or creative writing, which is looked at for its artistic value. Literature can be classified into two main groups: Prose and poetry. In the works of many famous authors - including Shakespeare and Brontë - both poetry and prose are merged together, as there is no clear divide between the two. Prose is often described as language with the primary objective of conveying a certain message to the reader using the written word. It does not conform to a set of linguistic rules - other than basic spelling and grammar - and could be called 'non-poetic' writing. Poetry, on the other hand, is seen as more of an art form. It uses the English language in an almost musical way, and involves techniques such as rhyming that would appear unnatural in most written works of prose.

There is also a difference in the structure of prose and poetry. Whereas prose is typically organized into paragraphs, poetry is written in stanzas and often takes a more linear structure than the former. Most writing you come across will be written in prose; conversations and speeches mainly take the form of prose, as do non-fiction articles, letters and most fictional books.

Despite these differences, however, there is a considerable overlap between poetry and prose which can make it difficult to define between the two. There are such things as poetic prose and prose poetry, which involve the key features of both prose and poetry in a single writing form. This blurred line of distinction between the two can be best seen in works such as *Macbeth*, where some of the writing takes a poetic form and other parts are written in continual prose. There are no real set definitions for prose and poetry, despite the attempts of many to define both terms - it is normally left up to the writer and then reader of a text to

Special Issue

205

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Bahasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, HFC, DRJI, The Cite Factor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



*An International Peer-Reviewed Open Access Journal*

determine what they think the writing classifies as - be it prose, poetry or a combination of the two.

What is Cinema? Cinema, or motion picture, is the art of moving images; a visual medium that tells stories and exposes reality. Created in the dusk of the 19th century, cinema is the world's most recent art form. It is also, by far, the world's most complex, collaborative, and costly artistic expression. At their inception, the first two versions of the film camera (the kinetograph and its European counterpart, the cinematograph) were used to record daily events such as a train arriving at a station and an elephant being electrocuted. Documentary filmmaking was then born and tremendously explored. Average men were instructed on how to use the recently-created camera and hired to undertake journeys around the globe and capture exotic images like the pyramids in Egypt and the waterfalls in Niagara.

Film Scholar's Insight: To say that the first movies were documentaries is a fallacy and a big one. The first one-feeblers were no more than a minute long, and they were called actualities. They were recordings of almost pointless daily events. Documentary filmmaking – something far more elaborate than actualities – was developed later. Documentaries are complex films with a different structure and purpose. Read more on Documentary Cinema. Perhaps the only valid argument for calling those first actualities "documentaries" is on the account of a specific style of documentary – *cinéma vérité* (French for "truthful cinema"). *Cinéma vérité* is characterized by a naturalistic approach to filming. Those first actualities were indeed naturalistic because the camera operators shot natural scenes without any intent to neither distort them nor ennoble them. Artists, however, quickly realized the camera's potential to record actions and tell scripted stories, so the camera started shooting play-like events. Narrative filmmaking was born. Scriptwriting, set design, and editing became the norm.

Entrepreneurs promptly found a way to monetize the newly-invented art. Theatres were built, and admission tickets became mandatory to enjoy that show of lights and shadows. With the high demand and increasing profits, the market became favorable for filmmakers. Soon, studios were raised. Cast and crew signed contracts. Producers became gods. And in the 1930s, the American film industry peaked, churning out dozens of movies a month.

Cinema evolved. Movies became longer. Sound was added. Hollywood was built. Color film became economical. Hitchcock lived, prospered, and died. Specials effects were created. Digital was invented. A century passed, and the motion picture industry still flourishes.

Nowadays, cinema can be defined as the art of colorful moving images enhanced by voices, sounds, and music, still telling stories, still entertaining, and most importantly, still selling popcorn.

For a long time, there has existed an interrelationship and mutual influence between literature and other forms of artistic expressions. This has resulted in painting and music

Special Issue

206

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Bahasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed; ICI, Google Scholar, Research Gate, Academia.edu, IBI, HFC, DRJI, The Cite Factor, COSMOS





IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



*An International Peer-Reviewed Open Access Journal*

based on works of fiction, drama and poetry, as well as literary works emulating pictorial styles and musical structures. The creative exchange between literature and film was initiated in the last decade of the 19th Century. Initially, film was most related to photography and painting.

Literature shares with film the ability to employ the structures and devices of narrative. Sequence of images on screen told a story and this is equivalent to the sequence of words on page. The use of language in film established firmly the connections to literature.

Films, just like in literature, present i) action ii) images iii) words replicating life. Literary works also have a stylistic and thematic basis in a realistic presentation of characters and incidents. Theatre, initially, seemed nearest to film because of the common use of actors and sets. Critics agree that films have a stronger affinity with fiction, especially with the pronounced emphasis on narrative. However, whereas the primary thrust of literature is linguistic, the thrust of film is imagistic/ visual and immediate.

Film draws from the tradition of live theatre which includes techniques of staging, lighting, movement and gestures. From the novel, film draws from structure, characterization, theme and point of view from poetry it draws from an understanding of metaphor, symbolism and other literary tropes. Film can extend into areas of the innermost privacy and consciousness just like poetry does from music film draws from rhythm, repetition and counterpoint. From painting it draws from sensitivity to shape, form, visual textures and color. Popular film developed with the emergence of the 18th Century novel. Both the 18th Century novel and film relied heavily upon realism as a technique. Early films were concerned, just like with realism in literature, daily lives of ordinary people. The subject matter and audiences was people of low social standing.

An analogy stands out for film and literature. The basic structural units of the novel were replicated in film. In the novel we have: the word, sentence, paragraph, chapter and the entire novel. In film we have the frame, shot scene and sequence. The word in literature and the image in film were similar in so far as they are visual phenomena, both perceived with the eye.

Despite different degrees of explication, both writers and filmmakers use language or languages. Some differences may exist however. For instance, whereas the film is multi-sensory communal experience emphasizing immediacy, literature is a monosensory private experience that is more conducive to reflection. A film is usually viewed in others' presence that becomes a larger part of the film's experience. Each audience member acknowledges the presence of the others. Audience response can also affect perception of a film. A novel is typically a private experience in which the relationship between the author and the reader is relatively direct and immediate. Others' responses do not impinge on the novel, thus making it conducive to reflection as the reader can pause and mull over or re-read.

Special Issue

207

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Bahasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, HFC, DRJI, The Cit Factor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189



*An International Peer-Reviewed Open Access Journal*

The above notwithstanding, the film and the novel are alike insofar as their order is typically linear. Movement is generally sequential and the events and scenes are ordered in direct relation to each other. Whether the order is ABC or CBA, the progression is usually sequential, straightforward and predictable.

By and large, therefore, film is considered as a branch of literature. Filmmakers are indebted to literature in a wide variety of ways. Since literature is a narrative art intent upon creating images and sounds in the reader's mind, then film is obviously literary- an extension of the older narrative arts. Indeed, the most distinctive quality of good writing is visual: to convey images by means of words, to make the mind see, to project onto that inner screen of the brain a moving picture of objects and events to convey a balance and reconciliation of a more than usual state of emotion with more than usual order. Film is therefore visual literacy (as opposed to verbal literacy), a new medium which is an extension and enlargement of the idea of literacy itself. In contemporary scholarship, everything written, for example, film scripts, are a part of the study of literature, thus film is a branch of literature.

Literature and Film, examines adaptations of textual narratives into film. In order to provide some thematic focus for our study, we will explore in particular representations of violence in the 20th century (colonialism, war, and genocide). We will consider both different contexts (African imperialism, Nazi Germany, and Rwanda), as well as differing degrees of adaptation --from those films that constitute more or less faithful renditions of the texts, to those that merely share a common subject matter. In addition, as an introduction to the sophisticated analysis of the medium, we shall begin the semester with one of the great films of all time in terms of cinematography, Orson Welles's 1941 Citizen Kane.

Special note: we will view the first two films Citizen Kane and The Reader in class; you will be responsible for getting access to and viewing Apocalypse Now and Hotel Rwanda on your own. Plan accordingly. One copy of each film is available at Polk Library circulation desk.

Define key terms related to literary techniques, movements, and/or historical periods as relevant to the specific focus of the course. Understand texts as carefully constructed artifacts whose final shape reflects a series of choices consciously made to produce meaning. Analyze texts for their formal characteristics, their subject matter, their emergence out of specific historical contexts, and the connections amongst these elements. Compose an effective, mechanically sound critical argument that defines a thesis and supports that thesis with evidence. Retrieve, evaluate, and summarize scholarly sources within the field and/or purview of literary studies. Recognize the place of literary study as an indispensable component of a Liberal Education that uniquely cultivates critical thinking, communication skills, and creative capacities. Understand the ways in which reading literature helps us develop empathy, develops our social imaginations, and expands the boundaries (geographical, chronological, and ontological) of our world.

Special Issue

208

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, HFC, DRJI, The Cite Factor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal***Research & Writing:**

Because our focus is not the passive consumption of literature and film but an active, critical response to them, we will engage in research and writing as they relate to our subject matter. You will be required to conduct academic research, based on the skills introduced in WBIS or its equivalent (a prerequisite to this course). As such, familiarity with basic university-level research and documentation methods is required, and students will be expected to manifest competency in the skills needed to produce university-level written analyses on topics in the Humanities.

As should be evident from the above description, English 231 is a film analysis, not a film appreciation, course. We are not viewing the films for the purposes of rating them or, perhaps, even enjoying them (for the novels). Serious study of serious works of literature and film is not about entertainment and, done properly, requires knowledge, training, time, and effort. There is certainly nothing wrong with using one's leisure time to read or watch for entertainment or diversion, but one does not need a university course for that.

It should go without saying, but I'll say it anyway--you are choosing to take a 3-credit course in 18 days. Earning those credits in less than three weeks also poses challenges that you must be willing to accept as part of the format. It is my responsibility--to the university, to my department, to my profession--to ensure that you do, in fact, earn those credits with work that is equivalent to what students do in the 14-week semester. If that weren't the case, courses like this could not be offered for full credit--it's in students' best interests that those standards are upheld, so that these courses can continue to be offered in this way.

**REFERENCES:**

1. Assistant Professor of English, Jazan University, Jazan, Saudi Arabia
2. STAM, Robert. Reflexivity, in *Film and Literature: From Don Quixote to Jean-Luc Godard*. UMI Press, 1985.
1. Subsequently published by Columbia University Press in 1992.
2. Quoted in Linda Catarina Gualda: "Literature and Cinema: link and confrontation". *MATRIZES*, São Paulo, v. 3, n.2, pp 201-220, jan./jun.2010
3. Sergei Eisenstein: "Film Form", ed. and trans. Jan Leyda (Harcourt, Brace: New York, 1949), 196
5. Joseph Conrad preface to «The Nigger of the Narcissus». 1897.
6. Belen Vidal Villalur: "Textures of the Image: Rewriting the American Novel in the Contemporary Film". *Universitat de València*, 28 nov. 2011 - 146 pag
7. Robert Stam, and Alessandra Raengo, eds. *Literature and Film: A Guide to the Theory and Practice of Film Adaptation* Oxford:Blackwell, 2005.

Special Issue

209

June 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohakar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, HFC, DRJI, The Cite Factor, COSMOS



IMPACT FACTOR – 5.61

**LangLit**

ISSN 2349-5189

*An International Peer-Reviewed Open Access Journal*

8. Brian McFarlane "Novel to film: an introduction to the theory of adaptation". Clarendon Press, 1996, Oxford
9. Brian McFarlane "Novel to film: an introduction to the theory of adaptation". Clarendon Press, 1996, Oxford
10. 10 Spiegel; "Fiction and the camera eye, Visual Consciousness in Film and the Modern Novel", University Press of Virginia;

Special Issue

210

June 2020


Website: [www.langlit.org](http://www.langlit.org)

Contact No. : +919890290602

Two Day Multidisciplinary International Webinar On "Role Of Language In Human Development: A Holistic Approach" Organized by Department of English, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad & S.M. Dnyandeo Mohekar Mahavidyalaya, Kalamb, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IFC, DRJI, The Cite Factor, COSMOS

## 13. The Element of Indianness and Role of Women in Indian Society




IMPACT FACTOR – 5.61

# LangLit

*An International Peer-Reviewed Open Access Journal*

ISSN 2095-0105



---

7.

## THE ELEMENT OF INDIAN-NESS AND ROLE OF WOMEN IN INDIAN SOCIETY IN THE HUNGRY TIDE

**DR. VISHAL GULABRAO SALVE**  
M.A., B.Ed., M.Phil., Ph.D.  
New Arts commerce and Science College,  
Parner, Ahmednagar

**SACHIN SHANKAR GADEKAR**  
M.A., M.Phil., Ph.D. (Appear)  
Research Student,  
I.A.S.E Pune

**ABSTRACT:**

*This paper has been divided into three parts. The first part highlights some aspects of Indian-ness and Role of Women in Indian Society. It highlights the manifestation, investigation and analytical illustration of the notion of Indian-ness with reference to selected novel of Amitav Ghosh. After a short introduction, it analyses the novel The Hungry Tide as a very good example of study material for analysis of Indian-ness and Role of Women in Indian Society. It deals extensively with the analysis of the salient features of the Indian-ness and Role of Women in Indian Society in Amitav Ghosh's novel The Hungry Tide. The chapter tries to focus on different characters in this novel, their ways of behaviour manifesting the notion of the Indian ethos, and the associations among the characters which are intricate. In conclusion, this paper validates the element of Indian-ness and Role of Women in Indian Society in the selected novel.*

**Key words:** Indian-ness, Role of Women in Indian Society, Social milieu, Indian-Ethos

**Preliminaries:**  
'Only a great, rare, deep genius can catch what surrounds us daily, what always accompanies us, what is ordinary- while mediocrity grabs with both hands all that is out of rule, what happens only seldom and catches the eye by its ugliness and disharmony.' - Nikolai Gogol

Things that surround us involving daily tasks and ordinary experiences are the hallmark of Amitav Ghosh's writing. The beauty of literary creations can be explored to the deepest possible levels only if we take into consideration the local ethos depicted in the works. The study of Indian English writing has always thrown different challenges for the readers and the researchers. The post-colonial references, the so-called deep rooted Indian cultural contexts influence the writing as well as the study of it. The focus has been on the Indian-ness and its impact on interpretations and re-interpretations. Indian-ness is also a major characteristic of local intensity. The contextual aspects and socio-cultural imprints have added a value to Indian-ness making it a unique flavor all together.

In Indian society, men have always lived their life for the defense of women in the society so; it has never been a female-dominated culture. It can be noticed that, the women in this

---

Special Issue

Website: [www.langlit.org](http://www.langlit.org)

37

January, 2020

Contact No. : +919890290602

National Conference on "New Horizons for Women's Studies in Twenty First Century" at  
Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IJPC, DRJI, The CiteFactor, GOSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2048-3103



An International Peer-Reviewed Open Access Journal

novel are frequently referred to as the objects of physical pleasure by the men surrounding them, they achieve the state of headship and are seen operational for the well-being of society.

If we try to understand the word *Ethos* we need to trace back to the Greek tradition of evolution of words. Basically *Ethos* is a Greek word which bears the meaning as an individual character and community culture. Webster Dictionary outlines it as the characteristic spirit of culture, era or community. Ethos is an element of the psychology of the society and it is associated with the behavior which is investigated as usual, impulsive and unintentional. In addition, it is something which if absorbed at the place of work would lead to the stress less behaviour and enhanced productivity. The notion of Ethos is studied hereafter in relation to India and Indian context which bears the name as Indian-ness.

India, a land of saints, a land of warriors and patriots, and a land of heritage has a rich culture and tradition. It is really a fascinating act to comprehend India in true sense as it contains varied cultures, traditions, customs, principles, languages, civilizations, religions, races and so on. India is truly labeled as a country with 'unity in diversity'. Jawaharlal Nehru (1948), in his *The Discovery of India* has tried to realize India and an essence of Indian-ness. He says that, "Sometimes as I reached a gathering, a great roar of welcome would greet me: 'Bharat Mata Ki Jay'- 'Victory to Mother India.' I would ask them unexpectedly what they meant by that cry, who was this Bharat Mata, Mother India, whose victory they wanted? My question would amuse them and surprise them, and then, not knowing exactly what to answer, they would look at each other and at me." (p. 60).

#### The Hungry Tide:

*The Hungry Tide*, published in 2005, by Amitav Ghosh is one of his popular novels. The novel is set in the repercussion of the destruction caused by Tsunami in the Indian Ocean in 2004 which confounded the whole region.

Language and communication are the prominent themes in this novel which are frequently referred. The very notion of Indian-ness is presented through the reference of these themes. In this novel, there are varied ways in which inevitable significance of language is presented through instances of human conversation. Piya is not conversant in Bangla language which delineates her distinction among the local people of the Sundarbans. She is of Indian origin and her physical outlook is common like Indians. However, her communication with the family members of Kanai presents her American influence.

#### The Analysis of the Element of Indian-ness and Role of Women in Indian Society in The Hungry Tide:

Piya draws a wave with her art of free hand. "Hello." Nilima answered with a smile and few words in Bengali. Nilima's use of Bengali words while talking to Piya displays her sense of Indian-ness. However, she receives a regretful response from Piya. "I am sorry," she said, shaking her head, "I'm afraid I don't understand."

Special Issue

38

January, 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +919890290602

National Conference on "New Horizons for Women's Studies in Twenty First Century" at

Abasahab Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academic.edu, IBI, IJPC, DRJI, The G3toFactor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2455-3102



An International Peer-Reviewed Open Access Journal

“Of course,” said Nilima. “I’m the one who should apologize. I always forget. It’s your appearance that gets me mixed up — I keep having to remind myself not to speak to you in Bangla.” (THT: 249)

In this way, Nilima’s talk of apology exhibits Indian-ness which expresses her sense of regret.

Piya is of Indian origin still, her way of talking displays her American persona. This feature is quite noticed by Kanai in his first meeting with Piya. Her father spoke only English to her, in order to assure that she would adapt to their new country. (THT: 207)

Piya, in her research activity, comes across the local person named Fokir and both don’t know each other’s language. They find difficulty while conversing with each other. However, both take help of gestures and striking compassion towards each other to transmit messages. Both remain with each other for a considerable time doing works of their own. They do not use language but comprehend each other’s needs and do accordingly. This notion of perfect understanding is a part of Indian-ness.

“It was surprising enough that their jobs had not proved to be utterly incompatible. . . . But that it had proved possible for two such different people to pursue their own ends simultaneously — people who could not exchange a word and had no idea of what was going on in one another’s heads — was far more than surprising; it seemed almost miraculous. Nor was she the only one to remark on this: once, when her glance happened accidentally to cross Fokir’s, she saw something in his expression that told her that he too was amazed by this seamless intertwining of their pleasures and their purposes.” (THT: 141)

This sort of comprehension of one another beyond the barriers of language is a component of Indian-ness. *The Hungry Tide* explores the background which turns out to be more appealing when Piya presents the association among her parents.

“They spoke Bengali to each other,” said Piya with a laugh. “But that was when they were speaking, of course. When they weren’t, I was their sole means of communication. And I always made them translate their messages into English — or else I wouldn’t carry them.” (THT: 250)

The author of this novel puts forward the reality that Piya’s parents are incapable or reluctant to converse and comprehend each other though they speak same language. In this way, it becomes quite clear that language doesn’t stand as the barrier in communication but the affection and intention of people remains the significant factor in the association of people.

#### Intricate Role of Women in Social Milieu

In *The Hungry Tide*, there is a reference to intricate role of women which they have to perform in social milieus which exhibits the notion of Indian-ness. The novel depicts the women whose lives are quite complex. There are some scenes in which men are seen as sexually harassing women accompanying them. Piya meets accident on her hired boat and

Special Issue

39

January, 2020

Website: [www.langlit.org](http://www.langlit.org)

Contact No.: +919890290602

National Conference on “New Horizons for Women’s Studies in Twenty-First Century” at

Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academic.edu, IEL, IJFC, DRJI, The CiteFactor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2048-7100



*An International Peer-Reviewed Open Access Journal*

gets the same experience from her official security guards which travel along with her on the same boat.

“She could scarcely believe she had succeeded in ridding herself of them. She had expected more scenes and more yelling, fresh demands for money. On cue, as if to show her that she had not gotten off lightly, the guard held up her Walkman — he had managed to extricate it from her belongings before handing them over. Then, to celebrate his theft, he began to make lurid gestures, pumping his pelvis and milking his finger with his fist.” (THT: 58)

Ghosh describes this kind of sexual obsession with the robbery of Piya's belongings as part of low section of human life compelling to transform simple person into a thug. He even points out that, such habits are not only restricted to the lower classes of the society but are the possessions of higher classes too. Kanai, who meets Piya during his journey in the train, is a qualified and high-class person. He too has some of these obsessions. On his meeting with Piya we can come across his incredible opinions about women.

“Kanai liked to think that he had the true connoisseur's ability to both praise and appraise women, and he was intrigued by the way she held herself, by the unaccustomed delineation of her stance.” (THT: 05)

This sort of behaviour is a part of negative side of Indian-men where woman is treated brutally as compared to man.

Here, Amitav Ghosh has used the phrase “praise and appraise”. He indicates Kanai's investigation of women as the possessions of somebody. He reflects traditional Indian patriarchal mind set which tend to dominate women in any possible way, Kanai feels interested in Piya which is the outcome of the destructive conclusion of his latest affair with a woman.

“Two weeks earlier she had stormed out of his house and forbidden him ever to call her again. He hadn't taken this seriously until he tried to call her cell phone, only to find that she had given it to her driver. This had come as a considerable blow to his pride, and in the aftermath he had tried to plunge himself into a short affair of the kind that might serve to suture the wound suffered by his vanity: that is to say, he had sought, without success, a liaison where it would fall to him to decide both the beginning and the end. In coming to Lusibari, he had resigned himself to the idea of briefly interrupting this quest — but if life had taught him any lesson, it was that opportunities often arose unexpectedly. Piya appeared to be a case in point. It was not often such a perfectly crafted situation presented itself: with his departure foreordained in nine days, his escape was assured. If Piya decided to avail herself of his invitation, then there was no reason not to savor whatever pleasures might be on offer.” (THT: 14)

Special Issue

40

January, 2020

Website: [www.langlit.org](http://www.langlit.org)


Contact No. : +919890290602

National Conference on “New Horizons for Women's Studies in Twenty First Century” at

Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IFL, DFC, DRIL, The CitFactor, COSMOS






IMPACT FACTOR - 5.61

# LangLit

*An International Peer Reviewed Open Access Journal*

ISSN 249870100



---

Kanai seems to be reluctant while paying attention to Piya's genuine emotions as he is entrapped in an affair sternly to please his self-esteem. At the beginning he imagines Piya in the context of sexual association but their relation grows in a different angle turning to be meaningful for their survival.

It can be noticed that, the women in this novel are frequently referred as the objects of physical pleasure by the men surrounding them, they achieve the state of headship and are seen operational for the wellbeing of society. Author has portrayed the character of Kanai's aunt whose name is Mashima whom he illustrates in bright words.

"If you go to the hospital and ask for "Mashima," said Kanai, "everyone will know who you mean. My aunt founded it, you see, and she heads the organization that runs it, the Badabon Trust. She's a real personage on the island — everyone calls her Mashima, even though her real name is Nilima Bose." (THT: 12)

This kind of appreciation for the well deeds of others is an ingredient of Indian-ness where person keep respect for each other.

The very word 'Mashima' means 'aunt' in Bangla language which highlights the entire domestic responsibilities that she performs in favor of her society. This sense of responsibility is a part of Indian-ness. Moyna, the wife of Fokir plays almost a task like that of Nilima Bose. She is seen striving to shore up herself and her family. Kanai explores this feature of Moyna in his talk with Piya.

"Just think of the life she's led," said Kanai. "She's struggled to educate herself against heavy odds. Now she's well on her way to becoming a nurse. She knows what she wants — for herself and her family — and nothing is going to keep her from pursuing it. She's ambitious, she's tough, and she's going to go a long way." (THT: 163)

The character of Moyna is a representative of Indian-ness where it is taught that a person should understand his responsibilities and work restlessly for the well-being of his family. In this way, *The Hungry Tide* reflects intricate lives of women with the indication to Indian-ness. At one sides the women have to face the patriarchal burdens and at the other side, they achieve respect for their significant contribution in their families and society.

**Religion as a Significant Notion:**  
The ingredient of Indian-ness is religion which is a significant notion in Indian context. This novel is noteworthy for its religious contexts. Mangrove forests remain at the center of belief for the people in the Sundarbans who feel a presence of God in these forests. Bon Bibi is the goddess of the forests which remains a divine figure for the people of Sundarbans. They have kept their faith on this goddess in the quest of their survival from threats which encircle their lives. Piya comes across this goddess when Fokir shows her place which is exists in shrine surroundings veiled deep in trees in the forests.

---

Special Issue


41

January, 2020

Website: [www.langlit.org](http://www.langlit.org) Contact No. : +919890290602

National Conference on "New Horizons for Women's Studies in Twenty-First Century" at  
Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IFI, IJOL, DBJI, The CiteFactor, OASIS




IMPACT FACTOR - 5.61

# LangLit

*An International Peer-Reviewed Open Access Journal*

ISSN 2349-7302



---

"On approaching closer she saw it was not a shrine at all but a leaf-thatched altar or shrine: it reminded her distantly of her mother's puja table, except that the images inside didn't represent any of the Hindu gods she was familiar with. There was a large-eyed female figure in a sari and beside it a slightly smaller figure of a man. Crouching between them was a tiger, recognizable because of its painted stripes." (THT: 127)

The presence of a tiger is an inevitable part in the lives of people of the Sundarbans. Their lives are entrapped with the frequent attacks of tigers which is a common happening in their area. This animal can meet during the time of night without any indication and the civilians of the place are so threatened due that they seemed to have banned uttering the word 'tiger'. In this sense the tiger has got an identity of a ghost or any supernatural entity.

The natural surroundings of the forests of Sundarbans are matchless and the manner of adoration of the goddess is too distinct. Piya keenly observed the way in which Fokir executes his religious rituals.

"First they fetched some leaves and flowers and placed them in front of the images. Then, standing before the shrine, Fokir began to recite some kind of chant, with his head bowed and his hands joined in an attitude of prayer. After she had listened for a few minutes, Piya recognized a refrain that was repeated again and again — it contained a word that sounded like "Allah." She had not thought to speculate about Fokir's religion, but it occurred to her now that he might be Muslim. But no sooner had she thought this than it struck her that a Muslim was hardly likely to pray to an image like this one. What Fokir was performing looked very much like her mother's Hindu pujas — and yet the words seemed to suggest otherwise." (THT: 127)

The religious rituals performed in front of Bon Bibi are a fine mixture of Hindu and Muslim conviction transforming it into a distinct homely religion. This sort of ritual is a part of Indian-ness which exhibits the matchless beauty of natural scenes of the islands formed by discrete surroundings. It is even noticing that residents who are the inhabitants of the Sundarbans would look at the backwoods in their region as a sole and celestial occurrence which can be differently viewed by the outside people. Kanai too seems to be incomprehensive while looking at the mysteries of the forests of Sundarbans. In this way, there is a fine mixture of varied religious components in this novel which show the residents of the islands, their distinct faith and population tide by the way of religion reflecting Indian-ness.

**The social divergences among the varied social classes in Indian society:**  
One more part reflecting Indian-ness in this novel is the social divergences among the varied social classes in Indian society. There is an occurrence of uneasy relations among the lower class people and upper class people. Piya experiences this while getting consent for her research activity from local officials.

"As it turned out, her experience was not quite as grim as she had anticipated. It did indeed take a full hour of waiting before she could even make her way

---

Special Issue


42

January, 2020

Website: [www.langlit.org](http://www.langlit.org) Contact No.: +919890290602

National Conference on "New Horizons for Women's Studies in Twenty First Century" at  
Abusahib Garware College, Pune, Maharashtra, In India

Indexed: ICL, Google Scholar, Research Gate, Academia.edu, ISI, IJPC, ORJI, The CiteFactor, COEMOS




IMPACT FACTOR – 5.61

# LangLit

*An International Peer-Reviewed Open Access Journal*

ISSN 2454-7102



---

past the first doorkeeper, but once she was inside her progress was unexpectedly swift. Thanks to her uncle's influence, she was led almost immediately into the presence of a harried but obliging senior ranger." (THT: 27)

Piya deploys her own influence of relations to move the things required for her research and in this way shows how the things are performed in Indian context. Such relations are not all the time invincible but they play a constructive role while managing the things. In the due course of time Piya finds her official escort flippant and domineering and locates herself in an utter difficulty.

"Would these men have adopted the same attitude if she had been, say, a white European, or Japanese? She doubted it. Nor for that matter would they have dared to behave similarly with her Kolkata cousins, who wielded the insignia of their upper middle class upbringing like laser-guided weaponry. They would have known how to deploy those armaments against men like these and they would have called it "putting them in their place." (THT: 31)

This extract shows how Piya experiences harshness from her guards as she has not exercised her influence that her upper-class cousins might have exercised.

This provokes the major topic of racial discrimination which is too an ingredient of Indian-ness. Being of Indian origin, Piya's supremacy is vanished in the opinions of her official associates. In their residence in the Sunderbans, both Kanai and Piya come across the people belonging to the lower strata of society and who are economically weak. In the due course of time when Fokir and Piya become well acquainted with each other, Kanai's wife Moyna is suspicious of Piya's objectives.

"She wants to know why a highly educated scientist like you needs the help of her husband — someone who doesn't even know how to read and write." (THT: 176).

This sort of suspicion is a component of Indian-ness. At the same time, it is noticeable that Kanai displays his politeness and his approach towards Fokir gets exhibited through his words.

"So tell me, then, Fokir, do you ever feel like visiting a city?" It was only after he had spoken that he realized he had inadvertently addressed Fokir as *tui*, as though he were indeed a child. But Fokir seemed not to notice." (THT: 263)

In the above extract, Kanai has deployed informal way of utterance where he unintentionally expresses demeaning and indifferent approach while talking to Fokir. Kanai regards himself as superior to others and remains entrapped with the thoughts of his own wealth and academic credentials. This sort of treatment to others forms the part of Indian-ness. Ghosh has finely delineated the intricacies in the relation of Fokir and Kanai as well as Piya and

---

Special Issue

43

January, 2020

Website: [www.langlit.org](http://www.langlit.org) Contact No. : +919890290602

National Conference on "New Horizons for Women's Studies in Twenty-First Century" at  
 Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academic.edu, IBIDS, JIFC, DRJI, The CiteFactor, COSMOS



IMPACT FACTOR – 5.61

LangLit

Latur (MS) India



*An International Peer-Reviewed Open Access Journal*

Fokir too. He brings forward the uneasiness in these associations due to divergences in class and societies which are still prominent in India.

The character of Fokir remains the inevitable constituent of Indian-ness due to his exhibition of Indian way of life, his purely Indian manners and his behaviour with others including Kanai and Piya. We come across the character of Fokir as the guide of Piya for her research in the mangrove forests which is her prime objective. In the due procession of the plot of this story he compels other characters to associate with innate and divine worlds in which they are surviving. In his early meeting with Piya, Fokir tells Piya that Bon Bibi is the Goddess of the forest which he considers as the protecting power from threats. Fokir loves singing and Piya could understand the meaning of his songs in the due course of time when she becomes familiar with his language.

“Kanai turned away from her to say a few words to Fokir, and suddenly, to Piya’s surprise, Fokir began to sing, or rather to chant, in a quick rhythm. “What’s he saying?” Piya said to Kanai. “Can you translate?” “I’m sorry, Piya,” Kanai said. “But this is beyond my power. He’s chanting a part of the Bon Bibi legend and the meter is too complicated. I can’t do it.”(THT: 255)

In this way, Fokir’s songs and religious commitments gives indication of the temperament of other characters and their spiritual lives on the islands. Fokir is fond of narrating the tales of Bon Bibi and thus, establishes himself as a link to the mythological ancient times of Indian context.

Kanai remains puzzled due to Fokir’s incomprehensive character and feels astonished while he sings songs. Eventually, they come together in the forests where Kanai experiences his senselessness while looking at Fokir’s intuitive appreciation of the region. This sort of non-understanding of others is a part of Indian-ness. In addition, Fokir comes across the foot prints of an animal and marks them as that of a tiger’s footprints. However, Kanai shows his disbelief towards Fokir’s declaration. At this point, reaction of Fokir marks the distinctiveness of both the characters.

#### Conclusion:

The notion of Indian-ness highlights the values and practices that the culture in India dedicates to the service of human beings. These values and practices are based on varied traditions of India and have been influenced by distinct threads of Indian philosophy which has achieved a distinct place in the world.

The term ‘Indian-ness and Role of Women in Indian Society’ is widely associated with the Indian way of life and it gets manifested in the code of conduct of people who belong to India. It has got illustrated through the merits and flaws of people who display their courage, strength and timidity at the same time.

*The Hungry Tide* reflects intricate lives of women with the indication to Indian ethos. At one side, the women have to face the patriarchal burdens and on the other side, they achieve respect for their significant contribution in their families and society.

Special Issue  
Website: [www.langlit.org](http://www.langlit.org)

44

January, 2020

Contact No. : +919890290602

National Conference on ‘New Horizons for Women’s Studies in Twenty First Century’ at

Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IJFC, ORJI, The CiteFactor, COSMOS



IMPACT FACTOR – 5.61

LangLit

ISSN 2090-7103



An International Peer-Reviewed Open Access Journal

Thus, it can be said that, the notion of Indian-ness and Role of Women in Indian Society is well explored in *The Hungry Tide* by Amitav Ghosh which depicts the values practiced in India and the code of conducts of people who live in India and abroad. It even manifests the adjustments of foreigners with Indian soil learning the features of Indian-ness.

## REFERENCES

## Primary Sources

1. Ghosh, Amitav. *The Hungry Tide*. New Delhi: Ravi Dayal Pub, 2004. Print.

## Secondary Sources

2. Choudhury, B. *Amitav Ghosh: Critical Essays*. New Delhi: PHI Learning Pvt. Ltd. 2009.
3. Cristal, D. *MLA Handbook for Writers of Research Papers*. 7<sup>th</sup> ed. New Delhi: East-West Press Edition, 2009. Print.
4. Das, Saswat. *Home and Homelessness in The Hungry Tide: A Discourse Unmade*. *Indian Literature* 235 (2006):179-185.
5. Leena, N. *The Fictional Works of Amitav Ghosh: An Intensive Study of the Confluence of History and Human Insights*. Ph.D. Diss. Puducherry: Pondicherry University. 2007. PDF File.
6. Mahanta, Banibrata. *Foregrounding the Local: Nature, Language, and Human Enterprise in Amitav Ghosh's The Hungry Tide*. *Indian Journal of English Studies* XLIV (2007): 97-105. Print.
7. McCutcheon, David. *Indian Writing in English*. Calcutta: Writers Workshop, 1969. Print.
8. Mishra, Binod, et al. *Indian Writing in English*. New Delhi: Atlantic, 2006. Print.
9. Mohan, Ramesh, (ed.) *Indian Writing in English*. Bombay: Orient Longman, 1978. Print.
10. Nehru, Jawaharlal. *The Discovery of India*. New Delhi: Jawaharlal Nehru Memorial Fund & Oxford University Press, 1948. Print.
11. Spratt, P. *Hindu Culture and Personality*. Bombay: Manaktalas, 1966. Print.
12. Tiwari, Subha. *Amitav Ghosh: A Critical Study*. New Delhi: Atlantic, 2003. Print.

Special Issue

45

January, 2020

Website: [www.langlit.org](http://www.langlit.org)

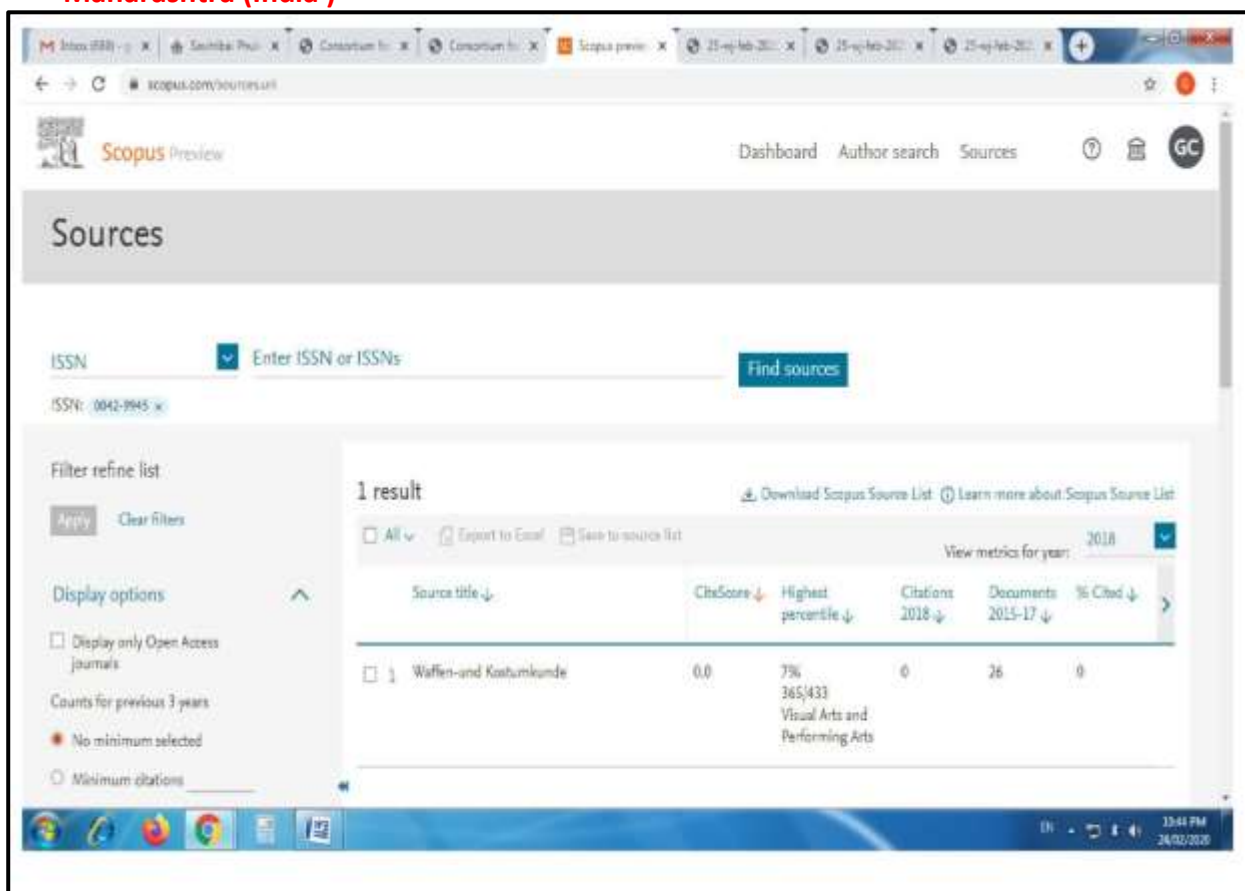
Contact No. : +919890290602

National Conference on "New Horizons for Women's Studies in Twenty First Century" at

Abasaheb Garware College, Pune, Maharashtra, India

Indexed: ICI, Google Scholar, Research Gate, Academia.edu, IBI, IJFC, ORJI, The CiteFactor, COSMOS

**14. Analysis of Sustainable Agricultural Development in Ahmednagar District of Maharashtra (India)**



**Analysis of Sustainable Agricultural Development in Ahmednagar District of  
Maharashtra (India)**

**Dr. Ganesh K. Chavhan<sup>1</sup>, Dr. Santosh R. Pagare<sup>2</sup>,**

**Dr. Raghunath E. Najan<sup>3</sup>, Dr. Bhaguji G. Rashinkar .**

1. Assistant Professor, K. J. Somaiya College of Arts, Commerce & Science, Kopergaon, Dist.- Ahmednagar, (E-mail ID- [gc.geography@gmail.com](mailto:gc.geography@gmail.com), 9766768082)
2. Associate Professor, K. J. Somaiya College of Arts, Commerce & Science, Kopergaon, Dist.- Ahmednagar, (E-mail ID- [srpagare@gmail.com](mailto:srpagare@gmail.com), 9822191868)
3. Assistant Professor, New Arts Commerce & Science College, Parner, Dist.- Ahmednagar, (E-mail ID- [mr.najan@gmail.com](mailto:mr.najan@gmail.com), 7588602654)
4. Assistant Professor, Late Abasaheb Kakade College of Arts, Bodhegaon Dist.- Ahmednagar, (E-mail ID- [bgrashinnkar@gmail.com](mailto:bgrashinnkar@gmail.com), 9373173701)

**Abstract:**

The green revolution is succeeded only where the irrigation facilities are available. Every possible effort takes by government through five year plans but small farmers could not get the benefit of green revolution. Due to this create large gap between small and big farmers even though increase the gap between irrigated and reinfed area. This situation creates the regional imbalance. To overcome this problem systematic planning in agriculture is more essential. The improvement in agricultural development is generally the result of a more efficient use of the factors of productions. The regional differences in agricultural productivity are the result, partly of the natural advantages of abiotic environment (soil and climate) and partly of farming efficiency as controlled by cultural ecology.

Agriculture is the leading occupation and the main stay of the people living in the Ahmednagar district which is one of developing district of Maharashtra. The present research is a study of measurement of agricultural productivity and its spatial and temporal changes in the Ahmednagar district of Maharashtra state.

*Keywords: Productivity, Sustainable Development, Green Revolution, Abiotic Environment, Measurement of Productivity.*

**Introduction:**

The concept of agricultural development is defined by several scholars and economist. In general, agricultural productivity means output per unit of input or per unit of area respectively. The improvement in agricultural productivity is generally the result of a more efficient use of the factors of productions, viz. environment, arable land, labour, capital and like.

The choice of an area and topic under investigation has been influenced by many considerations. Firstly, study region is located in rain shadow zone of western ghat has remarkably scanty rainfall, it affects on agricultural land use as well as productivity. Secondly, area selected for the study is agriculturally imbalanced region. The valleys of various tributaries of Godavari and Bhima rivers agriculturally advanced and other parts are agriculturally backward.

#### Study Area:

The present study from Ahmednagar district of Maharashtra has been selected as a study area. It extends between  $18^{\circ} 20'$  to  $19^{\circ} 59'$  north latitudes and  $73^{\circ} 40'$  to  $75^{\circ} 43'$  east longitudes. It situated partly in the upper Godavari basin and partly in the Bhima basin. The district is very compact in shape, north- south length of 210 km. and east-west breadth of 200 km.



**Location map of study area**

The study region is divided into three physical divisions, namely, Sahyadri hill ranges i.e. Kalsubai, Adula, Baleshwar and Harishchandragad, plateau and plains. The average annual rainfall in the district is 578.8 mm. (22.79 inch). The mean daily maximum temperature is  $39^{\circ}$  centigrade and mean daily minimum temperature is  $11.7^{\circ}$  centigrade. The district appears four types of soil, namely, deep black, medium black, coarse shallow and red soil. In study region 70.28 percent area under cultivation, out of this 29.42 percent is



irrigated. Cropping pattern of district is different in irrigated and rain fed area. The rivers and its left and right canals is the source of irrigation as well as Well irrigation is commonly used. Sugarcane is the predominant crop in the rivers basin and canal command area. In *kharif* season bajra, maize, pulses, cotton, oilseeds i.e. groundnut and soyabean, etc. are grown and wheat, jowar, maize, gram, onion, sunflower are grown in *rabi* season.

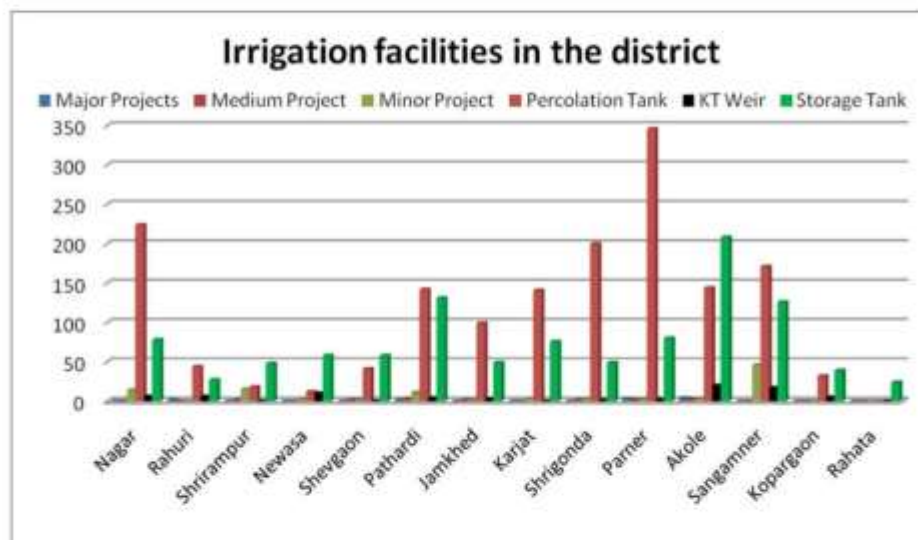
**Objectives:**

- To study the spatio-temporal changes in the agricultural productivity in Ahmednagar district.
- To assess the spatial and temporal patterns of agricultural irrigation development in the district.
- To study of the agricultural population density and High variety of Yield in the study area.

**Database & Methodology:**

In the first phase of the research primary and secondary data was collected. The collected data has been analyzed by applying different statistical methods and is presented through tables and figures. The spatial and temporal aspects of general and agricultural land use have studied in depth. To delineation of crop regions Doi's crop combination technique was applied.

**Irrigation System in the District:**



Graph no. 1 Graphical presentation of available irrigation facilities in the district.

In district for the purpose of irrigation and drinking water many major, medium and minor projects is constructed. Wilson dam near Bhandardara in Akole tehsil was constructed on river Pravara. This dam impounded about 11 thousand million cubic feet of water behind the dam. The storage feeds two canals, the pravara right and left bank, taking off from a pick-up weir 90 km. downstream of the dam at village Ozar. These canals irrigates an area about 32000 hectares mainly in the tehsils of Sangamner, Rahuri, Rahata, Shrirampur and Newasa.

Table no. 1 Irrigated Area in Ahmednagar District

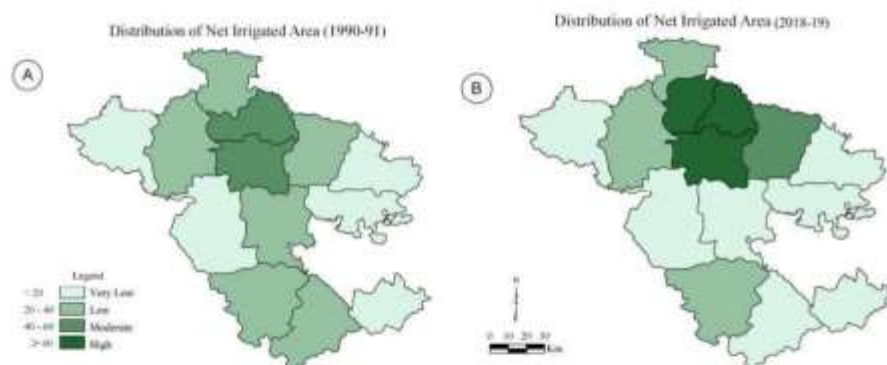
Tehsils	% share of surface irrigation		Volume of Change	% share of underground irrigation		Volume of Change
	1990-91	2018-19		1990-91	2018-19	
Nagar	1.44	2.98	1.54	-1.54	97.02	-1.54
Rahuri	43.85	48.52	4.67	-4.67	51.48	-4.67
Shrirampur	25.33	60.14	34.81	-34.81	39.86	-34.81
Newasa	60.02	35.85	-24.17	24.17	64.15	24.17
Shevgaon	0.77	3.72	2.95	-2.95	96.28	-2.95
Pathardi	3.50	1.00	-2.5	2.5	99	2.5
Jamkhed	1.86	14.66	12.8	-12.8	85.34	-12.8
Karjat	39.13	24.98	-14.15	14.15	75.02	14.15
Shrigonda	35.75	54.88	19.13	-19.13	45.12	-19.13
Parner	28.03	29.11	1.08	-1.08	70.89	-1.08
Akole	28.51	46.33	17.82	-17.82	53.67	-17.82
Sangamner	16.81	8.50	-8.31	8.31	91.5	8.31
Kopargaon	35.09	44.44	9.35	-9.35	55.56	-9.35
Rahata	--	21.78	--	--	78.18	--
<b>Total</b>	<b>29.53</b>	<b>31.41</b>	<b>1.88</b>	<b>-1.88</b>	<b>68.59</b>	<b>-1.88</b>

Source: Calculated by Authors

During the year 1990-91 surface irrigation accounted 70.47 percent of the total irrigated area in district. Spatial distribution pattern reveals the maximum share recorded in those tehsils where surface irrigation share is lowest. During the year 2018-19 share of underground irrigation is recorded 68.59 percent. It share has decline by 1.88 percent during the period of investigation. In study region ground water sources become dry in summer season it adverse effects on agriculture. This calls for rational use of available water through proper water management techniques.

Spatial distribution of net irrigated area for the year 2018-19 has show in fig. B. During this year net irrigated area was 29.42 percent and varies from 10.86 to 95.82 percent. Very low net irrigated area recorded in seven tehsils namely, Nagar, Jamkhed, Karjat,

Shevgaon, Patherdi, Parner, Akole while low net irrigated area registered in southern tehsil Shrigonda and northern tehsils namely, Sangamner and Kopergaon. Tehsil Newasa registered moderate category whereas highest net irrigated area found in northern part of study area consisting tehsils of Rahata, Rahuri and Shirampur. An analysis shows a marked increase net irrigated area by 5.05 percent during two decade. Except thails of Nagar, Shevgaon, Karjat and Shrigonda rest of the tehsils



Map1 A&B: shows the Distribution of Net Irrigated Area during 1990-91 and 2018-19.

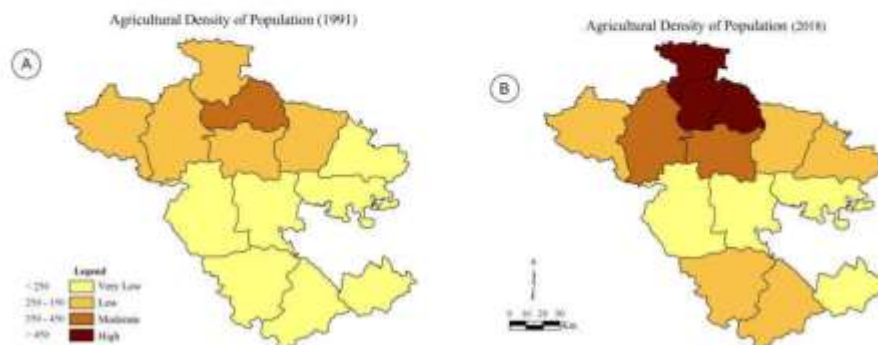
#### Agricultural Density of Population

Agricultural density means the ratio between agricultural population and agricultural land i.e. net sown area. The crude and physiological density fails to show the actual pressure of population on agricultural land. To overcome this problem agricultural density is work out of district for the year 1991 and 2018. It shows the concrete picture of population pressure on agricultural land. Table shows the tehsil wise agricultural density, it was 242 and 303 persons during the year 991 and 2018 respectively.

Agricultural density of population was work out and divided into four categories i.e. very low, low, moderate and high. According to census 1991, very low density was found in Nagar, Shevgaon, Patherdi, Jamkhed, Karjat, Shrigonda and Parner tehsils while low (250 to 350 persons) density marked in Rahuri, Newasa, Akole, Sangamner and Kopergaon tehsils. Tehsil Shirampur recorded moderate category whereas high category was not found in any tehsil.

Fig B reveals agricultural density of population for the year 2018. Very low category was found in low irrigated area comprised tehsils of Nagar, Patherdi, Jamkhed and Parner while low category was marked in Newasa, Shevgaon, Karjat, Shrigonda and Akole. Rahuri and Sangamner tehsils registered moderate category while high category was found in

northern parts of district comprised Shirirampur, Kopergaon and Rahata tehsils. During the period of two decade agricultural density of population has increased in all tehsils of district.



Map 2 A & B shows Agricultural Density of Population

**High Yielding Varieties (HYV) of Seeds**

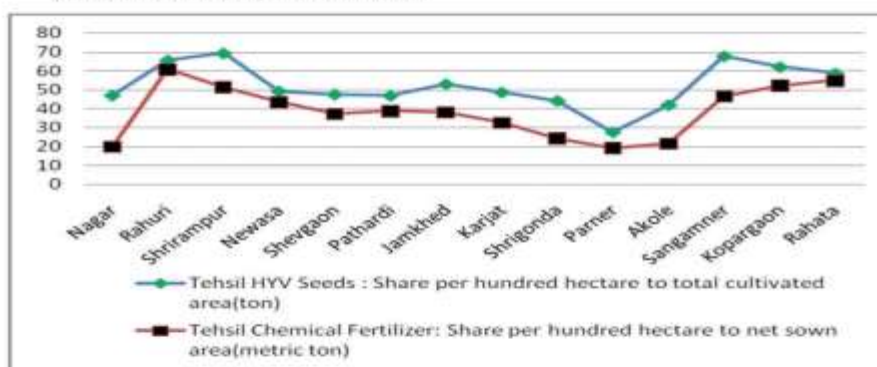
The HYV seeds have played vital role in augmenting agricultural production. These seeds not only help in increasing agricultural production by 10 to 20 percent but introducing new characteristic in the biological structure of the plant like, quick maturing, higher yield and resistant to insects, diseases and drought. In India the success of green revaluation is partly associated with the use of HYV seeds. The adoption of HYV of seed does not require any special skill and farmers of various socio-economic and cultural backgrounds can adopt the new seeds easily. The success of green revolution in the study region is also closely related to the use of HYV of seeds particularly of wheat, bajra, jowar, sugarcane, oilseeds, cotton, pulses, vegetable and other crops. The Government of India proclaimed the new policy on seed development in October, 1988. The thrust of this policy is to protect for the Indian farmer high quality seed available anywhere in the country with a view to maximize the crop yields, boost agricultural productivity and farm income. In study region tehsil Panchyat Sammittee and private distributors distribute the HYV seeds. Panchyat Sammittee of each tehsil is supervising the distribution system of HYV seeds.

Table of Share of HYV Seeds and Chemical Fertilizer (2018)

Tehsil	HYV seeds	Chemical fertilizer
	Share per hundred hectare to total cultivated area(ton)	Share per hundred hectare to net sown area(metric ton)
Nagar	47.00	19.80
Rahuri	65.62	60.89
Shrirampur	69.31	51.37
Newasa	49.20	43.49
Shevgaon	47.50	37.30
Pathardi	46.88	38.84

Jamkhed	52.97	38.04
Karjat	48.63	32.60
Shrigonda	44.16	24.22
Parner	27.53	19.14
Akole	41.89	21.50
Sangamner	67.77	46.55
Kopergaon	62.11	52.22
Rahata	58.65	54.78

Source: Revenue Dept. of each tahasil



The use of HYV seeds data for the year 1990-91 was not available so researcher interpreted only data of the year 2018-19. During this year 27212 and 58552 thousand ton HYV seeds use in *kharif* and *rabi* season respectively (excluding sugarcane and fodder). Change the attitude of farmers, intensive minor irrigation schemes and use of chemical fertilizers has supported the increased use of HYV seeds in district. Use of HYV seeds per hundred hectare of total cropped area was work out (excluding area under sugarcane and fodder crop) and divided into four categories i.e. very low, low, moderate and high having the range below-40, 40-50, 50-60 and above 60 respectively. Table 3.8 and fig. 3.17 revealed very low category was marked in Parner tehsil while Akole, Shevgaon, Newasa, Patherdi, Nagar, Shrigonda and Karjat tehsils noticed low category. Moderate category was registered in Jamkhed and Kopergaon tehsils while high category was found in northern high irrigated parts of district comprised tehsils of Kopergaon, Sangamner, Rahuri and Shrirampur. The northern high irrigated tehsils have used high amount of HYV seeds per hundred hectares to total cropped area compared to south and south-western part of the district. It means that the use of HYV seeds is largely depends on availability of irrigation.

**Conclusion:**

Agricultural development of any region is governed by various non-physical determinants viz. irrigation, farm implements (traditional and modern), demographic factors,

livestock, high yielding variety of seeds, use of chemical fertilizer, market facilities, agricultural credit and government policy. In study area for the purpose of irrigation many major, medium and minor projects are constructed viz. Bhandardara, Baragaon Nandur, Devthana, Mandohal, and Pargaon Ghatsheel. Canals, rivers, wells and tube wells are the major sources of irrigation in district. During the period of two decade net irrigated area increased by 5.05 percent of net sown area. During the period of investigation traditional farm implements such as wooden plough, cart and oil engines density rapidly declined while modern farm implements such as iron plough, tractors, electric pumps density increased in district.

In Ahmednagar district livestock plays a prominent role agricultural development. Goat and sheep combine occupied first rank while cattle occupy second rank out of total livestock population in district. During the period of investigation cattle and other livestock share was declined by 6.44 and 6.4 percent respectively while buffaloes and goat and sheep share was increase by 4.63 and 8.2 percent respectively.

According to census 1991, 81.18 percent (2839454) population was receding in rural area while in 2011, 79.90 percent receding in rural area. The literacy rate of district was 61.03 percent and male literacy is more than female. Population density of district has 198 and 267 persons per square kilometer during 1991 and 2018 respectively. During the period of two decade density such as crude, physiological and agricultural increased in district. The use of high yielding variety of seeds and consumption of chemical fertilizers was higher in north parts of district compare to southern parts. During 2018-19 in *kharif* season 27212 thousand ton and in *rabi* season 58552 thousand ton HYV seeds used in the district. The total fertilizer consumption was 424662 metric ton in 2018-19. During the period of investigation major, sub and weekly market centers increased by 1, 5 and 40 respectively.

#### References:

1. Adnaik, N. (2012): "Changes in General Land Use Pattern in The Drought Prone Region of Maharashtra", A Research Volume on Population and Resources, Edited by Raymane, A. S. Vol: 2, pp: 267-275.
2. Barlowe, R. (1963), "Land Resources Economics", Prentice-Hall, Englewood Cliffs, p. 1.
3. Bhatia, S.S. (1967): "A New Approach to Measurement Agricultural Efficiency in Uttar Pradesh", Economic Geography, Vol: 43, No: 3, pp: 224-260.

4. Bhattacharya, R. (1994): "Changing Land Use and Cropping Pattern in Bihar", *New Dimensions in Agricultural Geography*, Vol: 4, Concept Publication, New Delhi, pp: 283-312.
5. Coppeock, J. T. (1968): "The Geography of Agriculture", *Journal of Agricultural Economics*, Vol: 19, pp: 153-175.
6. Date, V. S. and Pawar, N. S. (1988): "Agricultural productivity: A Micro Level Study of Two villages in Pune District, Maharashtra. *Transactions Institute of Indian Geographers*, Vol: 10, No: 1, Jan. 1988. pp: 1-7.
7. Hussain, M. (1996): "Systematic Agricultural Geography", Rawat Publication, Jaipur, p: 122.
8. India, (2012): "India Annual Report-2012", Publication Division, Ministry of information and broadcasting, Govt. of India, p.110.
9. India, (2012): "India Annual Report-2012", Publication Division, Ministry of Information and Broadcasting, Govt. of India, p.71.
10. India, (2012): "India Annual Report-2012", Publication Division, Ministry of Information and Broadcasting, Govt. of India, p.366.
11. Jena, D. (2012): "Agricultural Productivity in Kalahandi District of Orissa Over the Decades: A Temporal Assessment", *International Journal of Management, IT and Engineering*, Vol: 2, No: 4, April 2012, pp: 230-239.
12. Kendall, M.G. (1939): "The Geographical Distribution of Crop Productivity in England", *Journal of the Royal Statistical Sociesty*, Vol: 102, No: 2, pp: 21-48
13. Kumbhare, A. R. (1978): "Agricultural Land Use in Upper Godavari Basin", Unpublished Ph. D. Thesis, Submitted to University of Poona, Pune.

**15. Agriculture Productivity****Agriculture Productivity**

Prof. Dr. Deepak Pandharinath Sontakke

**Introduction:**

Agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. While individual products are usually measured by weight, their varying densities make measuring overall agricultural output difficult. Therefore, output is usually measured as the market value of final output, which excludes intermediate products such as corn feed used in the meat industry. This output value may be compared to many different types of inputs such as labour and land (crop yield). These are called partial measures of productivity. Agricultural productivity may also be measured by what is termed total factor productivity (TFP). This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs. This measure of agricultural productivity was established to remedy the shortcomings of the partial measures of productivity; notably that it is often hard to identify the factors cause them to change. Changes in TFP are usually attributed to technological improvements.

**Research Methodology:**

Secondary data is used in the present research work which is collected from different secondary sources. Eg. Magazines, Books, Reports and Websites etc.

**Objective:**

Objectives of present research work is to find out the reasons of low productivity of agriculture sector and to recommend remedies for increasing agricultural productivity.

**Agriculture productivity = Total agriculture crop production/Total land area (hectares)**

Moreover, the average yield per hectare in respect of rice and wheat which were 7.1 quintals and 6.6 quintals respectively in 1949-50 gradually increased to 10.8 quintals and 9.1 quintals in 1964-65 showing an annual growth rate of 2.1 per cent and 1.3 per cent in respect of rice and wheat respectively. Again during the post-green revolution period (1965-2009), the average yield per hectare in respect of rice and wheat has again increased to 21.86 quintals and 28.91 quintals respectively showing a considerable annual growth rate of 3.4 per cent in respect of wheat and 2.3 per cent in respect of rice. But the annual growth rate of coarse cereals increased by only 1.3 per cent and that of pulses of only 0.5 per cent during the period 1967-2009. Moreover, the annual growth rate of yield per hectare of all crops went up to 2.49 per cent during the period 1980-81 to 1993-94 as compared to that of 1.28 per cent during 1967-68 to 1980-81. Moreover, potato has recorded a considerable increase in annual growth rate from 1.6 per cent during 1950-65 to 3.0 per cent during 1967-2009. Again, taking all crops together, the annual average growth rate of all crops rose from 1.3 per cent during 1950-1965 to 1.9 per cent during 1967-2009. Thus the above data reveal that the green revolution and the application of new bio-chemical technology have become very much effective only in case of wheat and potato but proved ineffective in case of other crops.

**Reasons for Low Productivity:****Heavy Burden of the Population**

In India, the burden of the population is too much on the agricultural land; due to which the agricultural activity cannot be properly controlled. In India about 70% people are dependent on agriculture. The increasing burden of the population on agricultural land, is one of the main reasons for low productivity.

(108)



### **Illiteracy, Superstition and Malnutrition**

The agricultural productivity depends much on efficiency, skill and sincerity of human resources. In India, unfortunately, the human resources are suffering from various deficiencies, the Indian farmer is illiterate and superstitious, their health is also frail. In the environment of superstition and conservatism the backwardness and low productivity of agriculture is natural.

### **Defective Social Organisation of Farmers**

The Indian Social organisation of the farmers has been defective. The casts system and joint family system have not provided that encouragement and power by which they can increase their productivity. Due to cast-ism, proper cooperation of all in the agricultural activity is not possible. The family tensions and differences have very much responsible for minimizing the productivity of the farmer.

### **Suggestions:**

Following are the some suggestions for improvement of agriculture productivities

#### **Transport Facilities:**

To facilitate the farmers to produce new farm inputs and enable them to sell their product in markets, villages should be linked with mandies. It would help to raise their income which in turn stimulates the farmer's interest to adopt better farm technology with sufficient income.

#### **Better Irrigation Facilities:**

Indian agriculture is mainly dependent on monsoon. So permanent means of irrigation should be developed. There should be large number of tube wells and canals for irrigation.

#### **Green Manure:**

Production of chemical fertilizers should be increased and it should be made available to farmers at sub-sidised rates. Farmers should be educated for firing green manure. Oil cakes may be used as fertilizers.

#### **Credit Facilities:**

Farmers should be advanced loans at reasonable rates of interest. Regional Rural Banks should be opened. Commercial banks should be directed to provide loans to small farmers on easy terms. Local moneylenders should be scrutinized to stop their malpractices.

#### **Agricultural Marketing:**

Agricultural marketing should be improved so that the farmer gets proper price for their produce warehousing facilities should be improved. Means of Transport should be strengthened. Regulated markets and Co-operative marketing societies should be established.

### **Reference:**

#### **A. Books:**

- 1) Agriculture Economy of India: Current Status and Issues- Malvika Singh
- 2) Agriculture Productivity in India- Bhau D. S.
- 3) Department of Agricultural and Cooperation.
- 4) [www.rbi.com](http://www.rbi.com)
- 5) [www.wikipedia.com](http://www.wikipedia.com)

**Prof. Dr. Deepak Pandharinath Sontakke**

Head department of Economics, New Arts Commerce & Science College, Parner Dist, Ahmednagar

**Prof. Dr. Deepak Pandharinath Sontakke**

Head department of Economics, New Arts Commerce & Science College, Parner Dist, Ahmednagar

**16. Impact of Govt. policies on State Transport Service in Maharashtra***Studies in Indian Place Names*

ISSN: 2394-3114

(UGC Care Journal)

Vol-40-NO.11-February-2020

**Impact of Government Policies on State Transport Services in Maharashtra****Prof. Dr. Shirish Nana Gawali**

Research Guide, C.D. Jain College of Commerce, Shrirampur, Dist.- Ahmednagar (M.S.)

**Mr. Yuvaraj Manohar Waghare**

Research Students, N.A.C. &amp; S. College, Parner Tal- Parner, Dist.- Ahmednagar (M.S.)

• **Abstract:** If you think about the transport in India, the most used route is the road transport. Because 70% of the people in the country are still living in the village and they use the road most for their transportation. On the other side, if road transport is said, then the society thinks about the type of traffic you can afford and afford. That is why all the people in the community are using public transport. The public transport that the first priority is for transport, the same is true for their expectations. That means public transport is more convenient and comfortable, but people use it more. On the other hand, the more public transport they use, the more they benefit. Bombay State Transport, which existed before independence, Maharashtra State Road Transport Corporation (MSRTC) was created in Maharashtra state after the formation of this linguistic provinces. Since the establishment of MSRTC, the services provided to the passengers so far are really good. As per changing times, changes are being made according to need. However, if the public transport service is more capable, then the development of that state is much better. Therefore the functionality of M.S.R.T.C. should be more efficient and robust.

The main objective of this research study is impact of Government policies on state transport services in Maharashtra. It has to say that many people of life are dependent on government buses. That is why state transport is said to be the life line of Maharashtra. Maharashtra State Road Transport Corporation (MSRTC) working on the basis of 'No Profit, No Loss', but in other side state transport incurring heavy losses from many years. State public transport, which was incurring losses of Rs.1122.98 lakhs in 2005-06, was successful in reducing up to Rs. 386.11 in 2009-10, but from the period 2002-2007, MSRTC lost Rs. 13331.26 crore. In the last 5 years, cumulative net loss is Rs. 2712 crores. It is estimated that MSRTC may lose a loss of Rs 490 crores in 2017-18. So inadequate Government policies is one of the reason for the losses of ST, and what needs to be improved in it is studied through this research study.

• **Introduction:** Before using the various means of transport, humans used their own steps. After many years of journey, man created tools for the journey of travel by using animals such as camels, horses and bulls. Then in the year 3500 when the human being invented the wheels, the real sense of movement got encouraged. In the 17th century and in the 18th century, transport instruments like bikes, motorbikes, trucks, cars, trains, aircraft, trams, were discovered and modern vehicles were used for transport.

On 1st of June 1948, the first bus was run on the road of Maharashtra from Ahmednagar to Shivaji Nagar (Pune). The bus has a capacity of 30 and its rent was Rs. two and a half rent. It is started by Bombay State Road Transport Corporation included Gujarat, Maharashtra and Bombay. After Independence, two different states as well as state transports were created such as Maharashtra and Gujarat and the Bombay was included in Maharashtra. Today the scope of M.S.R.T.C. is very wide in Maharashtra. The Maharashtra State Road Transport Corporation (M.S.R.T.C.) is today the biggest state transport undertaking in India. With a fleet strength of 9,370 buses, it owns 12.32% of the total nationalized fleet in the country. MSRTC also happens to be the first Road Transport Corporation in the country. Maharashtra State Road Transport, Mumbai Central Office, 31 divisional Offices, 3 Central Workshops, 250 Agra, 3 Training Centers, 9 Tier Reconstruction Centers, 568 Bus Stations, 3639 Traveling Shelters and 16000 Buses and 104000 With the help of staff, everybody provides uninterrupted service to 70 lakh passengers every day. Maharashtra State Road Transport Corporation is working to provide travel services in all parts of the rural, urban, hilly and tribal areas of Maharashtra for the purpose of 'Village Road there'.

- **Objectives of Study:**

- 1) To find out impact of Government policies in M.S.R.T.C. revenue
- 2) To give recommendation on Government policies.

- **Statement of Hypothesis:**

M.S.R.T.C. suffering from losses because of mismanagement and uncertainty in Government policies.

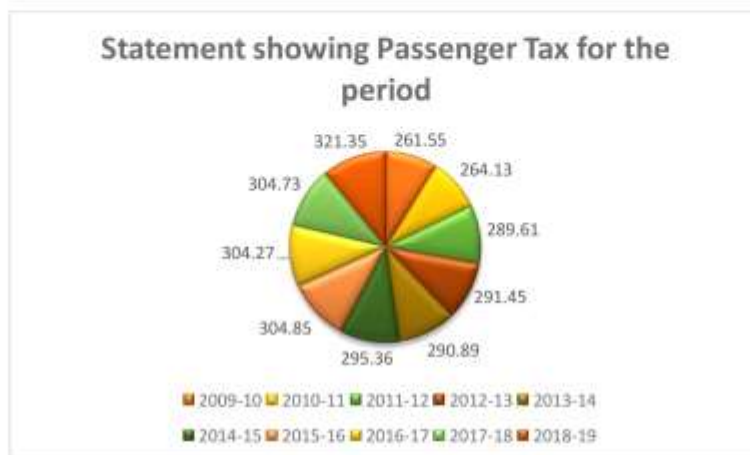
- **Research Methodology:** Primary data has been collected through Field visit, Personal Interview, Observation and the Secondary data is collected specially from annual administrative reports of MSRTC and various websites including the official website of MSRTC, Research publication, Newspapers, Articles, official documents, periodicals, Government records, etc.

- **Sample Size:** Since the research study is related to the Ahmednagar district. In Ahmednagar district, there are 11 depots, 26 bus stations in the city with divisional office, so the sampling method has been use. Divisional officer, Ahmednagar and 05 depots from south and north zone are taken as a sample for research.

- **Data Analysis:**

**Table No. 1.Statement showing Passenger Tax Expensesfor the period From 2009-2010 to 2018-19**

Year	Passenger Tax (Rs. in Lakhs)	Variation (%)
2009-10	261.55	-
2010-11	264.13	0.99%
2011-12	289.61	9.65%
2012-13	291.45	0.64%
2013-14	290.89	-0.19%
2014-15	295.36	1.54%
2015-16	304.85	3.21%
2016-17	304.27	-0.19%
2017-18	304.73	0.15%
2018-19	321.35	5.45%
Average	292.82	

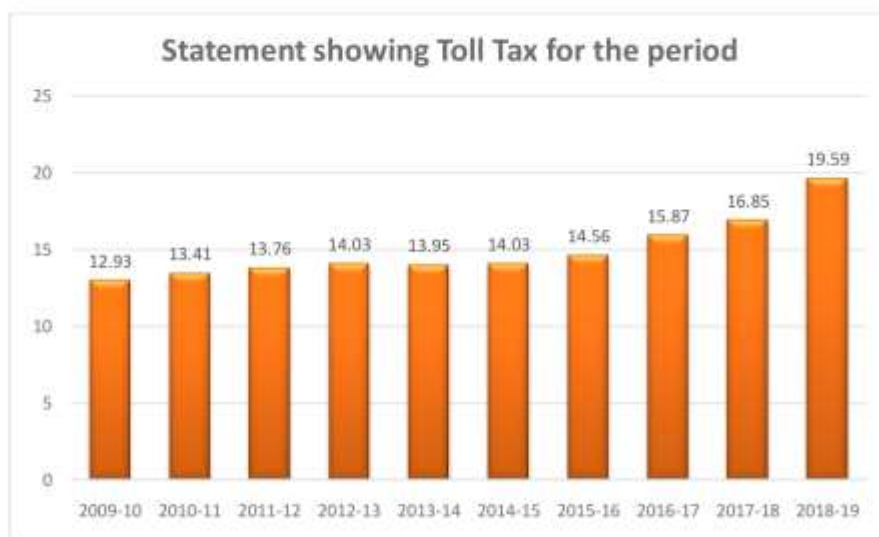


**Chart No. 1.**

**Interpretation:** Passenger tax is one of the most important expenses affecting in the total variable cost of MSRTC. In the F.Y. 2009-10 MSRTC, Ahmednagar Division paid Rs. 261.55 Lakhs as passenger tax to the State Government. Every year it is increasing except F.Y. 2013-14 and 2016-17. In these two year variation came only 0.19%.

**Table No. 2 Statement showing Toll Tax for the period From 2009-2010 to 2018-19**

Year	Toll Tax (Rs. in Lakhs)	Variation (%)
2009-10	12.93	-
2010-11	13.41	3.71%
2011-12	13.76	2.61%
2012-13	14.03	1.96%
2013-14	13.95	-0.57%
2014-15	14.03	0.57%
2015-16	14.56	3.78%
2016-17	15.87	9.00%
2017-18	16.85	6.18%
2018-19	19.59	16.26%
Average	14.90	



**Chart No. 2**

**Interpretation:** From F.Y.1991 under the scheme of privatization the Government of Maharashtra has introduced to construct the roads, from private contractors, and these contractors then imposed the toll tax on the road users. So from 1998-99, MSRTC has also to pay the toll tax.

As per the above table it is clearly shown that, there is consistency growth in the toll tax expenses except in the F.Y. 2013-14. In this year toll tax expenses was decreased by 0.57%. From F.Y. 2014-15, expenses was increased and in last year it is the

*Studies in Indian Place Names*

ISSN: 2394-3114

(UGC Care Journal)

Vol-40-NO.11-February-2020

highest amount of expenses spend by MSRTC, that is Rs. 19.59 Lakhs. In last 10 years MSRTC is paid Rs.14.90 lakhs averagely on the expense consider as toll tax.

**Table No.3 Statement showing High Speed Diesel for the period From 2009-2010 to 2018-19**

Year	H.S.D. Oil (Rs. in Lakhs)	Variation (%)
2009-10	621.53	-
2010-11	658.49	5.95%
2011-12	689.43	4.70%
2012-13	695.38	0.86%
2013-14	742.10	6.72%
2014-15	721.83	-2.73%
2015-16	755.45	4.66%
2016-17	926.55	22.65%
2017-18	945.07	2.00%
2018-19	996.42	5.43%
Average	775.225	



Chart No. 3

**Interpretation:** The above table showing various kinds of concessions and other facilities giving by M.S.R.T.C. under the guidelines provided by State Government. The concession rate has been started at least 50% and if we observe carefully 100% concession given in most of the facilities.

• **Findings:**

- 1) The MSRTC has not issued policy guidelines to the all department due to uncertainty in Government policies and the officers can not prepare annual budget.
- 2) Apart from the basic need to make maximum use of resources in terms of vehicles, MSRTC is also concerned with, to minimize the operating cost. The study revealed that in the MSRTC about 33.96% of the total costs are incurred on HSD/L, 34.94% on Time Scale Staff and 13.38 % on taxes (Passenger and Toll Tax etc.)
- 3) The MSRTC has expressed anxiety over the critical financial position of the corporation, but to overcome this financial crisis as well as for development of passenger transport services,
- 4) It is revealed from the study that the MSRTC is suffering from losses because of the uneconomical routes.
- 5) It is observed from the above study that the corporation (MSRTC) is suffering losses due to heavy maintenance expenses. The maintenance expenses is the major cause of loss to the MSRTC.

• **Testing of Hypothesis:** MSRTC is suffering losses because of mismanagement and uncertainty in Government policy.

Table No.1, 2 and Chart No. 1, 2 indicates passenger taxes and toll tax respectively. In the last 10 years, Ahmednagar division has spent 13% of the total

expenditure on paying tax. That is why MSRTC catches its huge impact. The government will be able to forgive the toll tax by changing its policies in relation to tax, and the corporation will be sure that the passenger tax is required to be at concessional rate. Apart from the concession made by the government for commuters, the losses are being made to the corporation. The amount of concession given is also essential for classifying the corporation on time.

The Table No3 and Chart No. 3 shows the cost of HSD oil. In the last 10 years, an average of Rs. 775.23 lakhs has been spent on Ahmednagar division every year. There is no doubt that it is very difficult to cut diesel costs, but MSRTC is the government-generated transport service for the services of passengers. Therefore, it is imperative for the state government to supply diesel to the corporation at discounted rates.

From the above information, it seems that, there is definitely a major impact on government's goal policy on MSRTC.

**Hence, Hypotheses is proved.**

• **Recommendations:**

- 1) The Maharashtra Government should leave its narrow attitude regarding tax issue on the profits of the corporation, stop raising passenger taxes and should direct the corporation fix up suitable return on investment in advance in their corporate planning process.
- 2) To improve the effectiveness of their corporate plans the corporation should think of associating their divisional managers and depot managers in their planning exercise.
- 3) The budgets should be prepared based on the long range plans and suitable corporate policy guidelines should be issued by the State Government to the M.S.R.T.C. department before the budgeting process starts every year.
- 4) It is necessary for the corporation, not only to design and implement preventive maintenance schedules, but also to regularly review them to check up their effectiveness in reducing tax policies.
- 5) Concessions in passengers fare schemes should be adopted and wide publicity to these schemes should be given through newspapers and T.V. To meet the expectations of passengers all over the Maharashtra State.

• **References:**

- Government of India, Census Report 2011-12
- Annual Administration Report of MSRTC from 2010-11 to 2017-18
- Report of 20 Point Parameters of MSRTC, Ahmednagar Division, 2009-10 to 2018-19
- Government of India, Economic Survey, 2015-16, 2017-18
- <http://msrtc.gov.in/history.html>. (official website)
- [economictimes.indiatimes.com/articleshow/Jan 06, 2009](http://economictimes.indiatimes.com/articleshow/Jan 06, 2009)
- [www.business-standard.com/article/September 22, 2015](http://www.business-standard.com/article/September 22, 2015)



**17. Recent Trends in E-Commerce***Journal of Information and Computational Science*

ISSN: 1548-7741

**Recent Trends in E-Commerce****Prof.GalboteTusharAmbadas** Contact No.7276752221

New Arts, Commerce and Science College, Parner.

Mail:galbotetushar92@gmail.com

**Abstract**

The recent phase is internet and E-commerce of our life, after adopting the policy of 1991. Before 1991 rarely peoples are concern with this, like high class and standard living peoples. Now it is very popular today with all kinds of people from wealthy to needy, from entrepreneur to employees, from world class people to students. E-commerce has changing the way of business and changing the way traditional commerce also. It's also consists prior to the distribution, buying, selling, marketing, advertising and servicing of products or services with the help of internet, Wi-Fi, and related computers networks. Commonly known as e-commerce consist of buying and selling of products or services over electronic system. Supply internet marketing, online transactions processing, electronic data interchange (EDI), Inventory management system and automated data collection system.

**2. Introduction:** Electronic commerce, commonly known as (electronic marketing) e-commerce or e-Commerce, consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks. The amount of trade conducted electronically has grown extraordinarily with widespread Internet usage. E-Commerce is not about the technology itself, it is about doing business using the technology. It is an electronic business application and involves electronic fund transfer, supply chain management, online transaction processing, e-marketing, corporate purchasing, value chain integrations etc. E-commerce creates new opportunities for profitable activities online. The e-commerce is one of the huge things that have taken the business by a storm. It is creating an entire new economy, which has a huge potential and is fundamentally changing way businesses are done. Here we try to analyse the recent trends in e-commerce.

**3. Objectives:**

To highlight the recent trends of E-Commerce in India.

**4. Research Methodology:** Present paper is based on Secondary data has been used for the purpose of this study. Secondary data is collected with the help of Websites, Journals and newspapers.

Volume 10 Issue 2 - 2020

250

www.joics.org

**5. RECENT TRENDS IN E-COMMERCE:**

**5.1. Increased Security for E-Commerce Development:** All the added benefits of online shopping for customers will do little until and unless the details of customers are safe and they feel secure while making various purchases online. Online details and credentials are becoming valuable to customers and for that ecommerce security is very important. Moreover, hackers these days are paying more money in order to exploit social accounts, gain information, and steal credit card information. As the ecommerce websites popularity is increasing it is important forecommerce players and vendors to authenticate details of its users with one extra password. Or just enable two-factor authentication.

**5.2. 'Mobile Friendly' Website and App's:** Now a day's large number of shoppers use smart phones, tablets and other mobile devices are the main tools for accessing Internet or browsing E-commerce company website for their convince. In the recent few years we can see that majority of E-commerce sites will go 'mobile-friendly' or 'responsive design' which helps to user in handling easily and smartly.

**5.3. A Huge international market:** While many merchants may be worried only about reaching buyers in their own backyards, consider the inevitable growth of the international ecommerce market. Shoppers have no problem going beyond borders -- buying from U.S. vendors, for example -- as long as those vendors' sites and storefrontscan translate their copy, allow multiple types of payment and utilize shipping solutions that aren't outrageously priced.

**5.4. The power of personalization:** Marketing personalization is a two-way street. Merchants have the ability to gather more data on their customers and prospects than ever before. Meanwhile, personalization has become an expectation of the modern consumer. Personalized shopping experiences based on demographics, previous buying behavior and browsing history are also just the start. Personalization is easy when you have access to the right data. Figuring it out all on your own takes time. That's where a platform like Evergage becomes essential to ecommerce success. It's a real-time personalization platform that combines behavioral analytics with your customer data and advanced machine learning. This allows you to interact with each person who visits your store so you can deliver a truly personalized and individualized experience. You'll automatically deliver personalized content and product recommendations and can use split-testing to optimize your conversion rates. You'll be able to reduce shopping-cart abandonment and improve customer loyalty.

**5.5. Quick Service:** E-commerce trends drive to constinously improve the customer experience. Now E-commerce companies are trying to reduce the processing time of search, selection order, customer service and delivery of products and service. E-commerce companies focus on improving the overall customer experience and reducing friction

wherever possible, to drive and support sales. Delivery services are also improving, and customers can easily track their product at any point of delivery, which tends to know position of delivery.

**5.6. Improved Security against Malpractices:** Retailers lose billions of dollars annually due to fraud, signaling the need for merchants to protect themselves and their customers alike. With security already on the minds of consumers at large, expect a heavier emphasis on security from specialized services and storefront platforms. While there are already ways for merchants to prevent fraud, expect security to become a bigger priority in the coming years.

**5.7. Invention of New Technology, and Device:** New technologies like Facial Recognition, Virtual Fitting Rooms, etc play most important role in current E-commerce system.

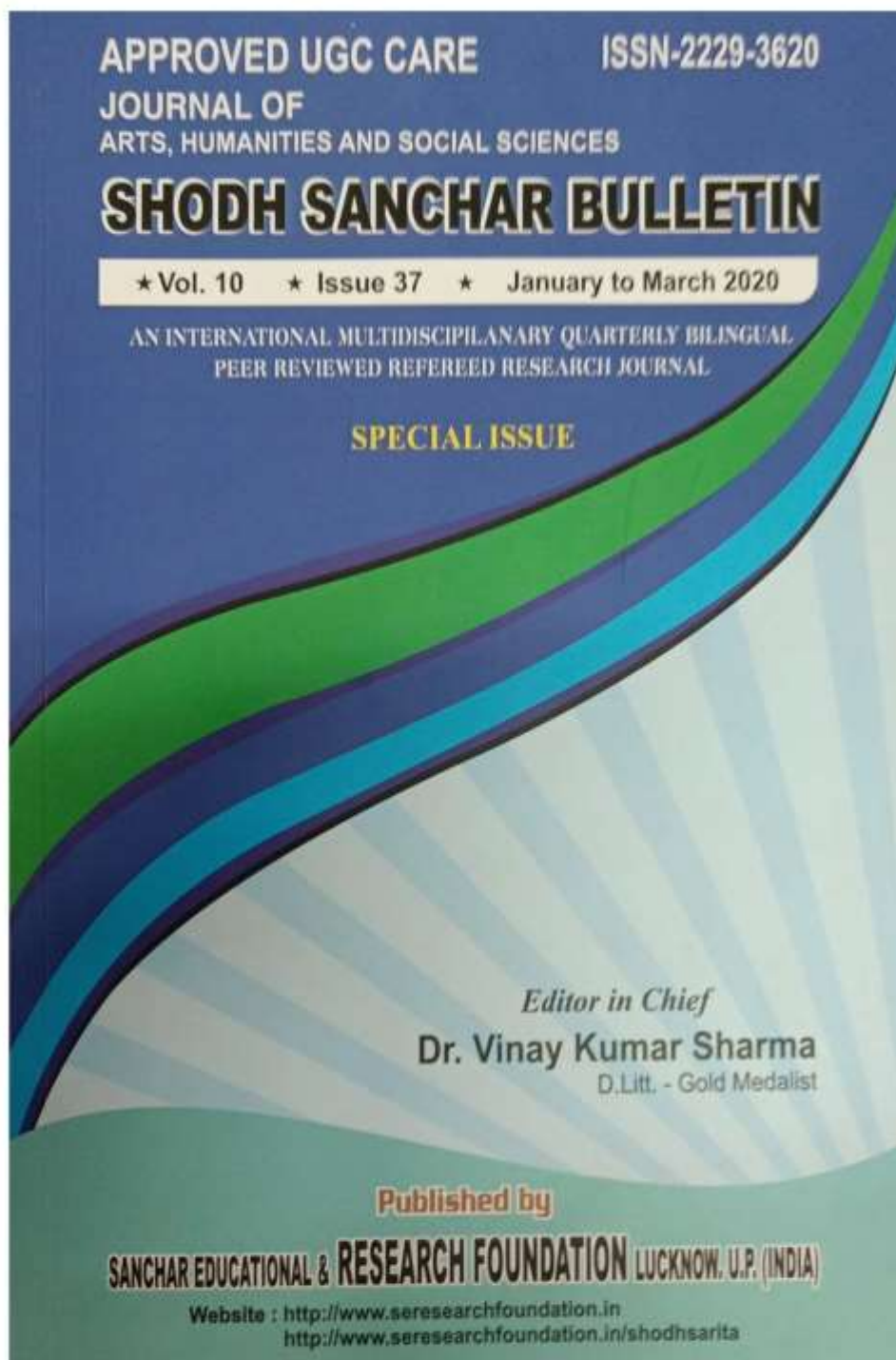
### Conclusion

History and life style of human beings are subject to modify depending upon the scientific development. These developments mastered all sectors in commerce, transportation, educations, management, communications etc and every part of the human being. The world around has significantly changed- mobile phones, social networking, blogs, style of shopping, and also style of business. E-commerce is changing the shape and the concepts of business. New technologies that could significantly bring paradigm shift in the e-commerce. In the recent years innovative technologies emerge the E-commerce market is gradually changing and getting more and more attractive for consumers by offering them new advantages and unmatched conveniences.

### References

- (1) Kalakota, Ravi and Whinston, Andrew B. —*Electronic Commerce – A Manager's Guide*, Pearson Education, Inc.
- (2) Suh, B and Han L., 2003, *The Impact of Customer Trust and Perception of Security Control on the Acceptance of Electronic Commerce*, *International Journal of Electronic Commerce*, Vol 7, No. 3, pp. 135-161
- (3) Seybold, Pat (2001). *Customers.com*. Crown Business Books
- (4) Chaudhury, Abijit; Jean-Pierre Kuilboer (2002). *e-Business and e-Commerce Infrastructure* McGraw-Hill. ISBN 0-07-247875-6.
- (5) Frieden, Jonathan D.; Roche, Sean Patrick (2006-12-19) "E-Commerce: Legal Issues of the Online Retailer in Virginia" (PDF). *Richmond Journal of Law and Technology*.
- (6) *International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 06 | Sep-2015*
- (7) "Increased protection against fraud" retrieved from <https://www.pixelcrayons.com/blog/ecommerce/e-commerce-development-trends-2018/>

## 18. The role of IT in research



<b>Contents</b>		
• The Role of Information Technology in Research	Bhauasheb B. Shelke	1
• Innovative Technologies and Services in Academic Libraries	D. G. Shewale	5
• Information Technology Impact on Library Professionals in Current Era	Dr. G.N Panchal	9
	Dr. Sambhaji G Patil	
• Ethics in Library and Information Science Profession	Dr. Pawar Gunpat Ramrimg	12
• Role of Librarians in the Internet Age	Prof. K. D. Guldagad	16
• Professional Ethics in Librarianship : an Indian Perspective	Prof. Karlas Gorakh Umbare	21
• A Study of Faculty Research Productivity in ASC College across Academic Discipline	Manisha K. Gaikwad	29
• Research Productivity of College Librarian affiliated to Savitribai Phule Pune University	Manisha N. Jadhav	35
	Anil N. Chikate	
• A Webometrics Study of Websites of Universities : A comparative Study of websites of universities from Maharashtra and Gujarat	Dr. Nilesh H. Hande	42
• Impact of Social Media on Tribal Students: A Study	Dr. P.B. Ghante	55
	Dr. A. N. Chikate	
• Impact of Information Technology on College Libraries Sub Theme : Modern Information Technology	Prof. Mohan Mahadik	60
• Tracing the Trending Online Journals among Library Professionals : An Exploration	Dr. R. M. Marwade	62
• Digital Library : An Overview	Prof. Rajendra Suryabhan Lawande	70
• Best Practices in Librarianship – Services to the Readers : Compilation of Who's who	Mokashi Ramchandra Manohar	73
• Evolving Library as a Learning Resource Centre : Challenges and New Horizons	Rishi S. Gajbhiye	77
• Trends in LIS Research	Rupali V. Oak	81
• Institutional Repository : Presentation Tools and Software	Sapnarani S. Ramteke	81
• Information Literacy for Librarian in Higher Education	Nilesh Balaso Saste	9
• Research ethics in LIS and changed the role of Librarian to information Scientist / Information gatekeeper.	Dr. Savita Sadashivrao Awchar	9
	Dr. Asmita Shrinivas Dhumal	
• Ethis In Library and Information Science	Surekha Sunil Harpude	11
• Role of Academic Libraries in Research Support Services : An overview	V. A. Naikwadi	1
	P. V. Naikwadi	
• Calibre e-Book management for Libraries with special reference to S.P.Jain College Library, Pabal : An overview	Yogesh B. Daphal	
• Preparing for the Usability test with screen capture Technology	Mate Yogesh	

ISSN - 2229-3620 APPROVED UGC CARE		SHODH SANCHAR BULLETIN Vol. 10, Issue 37 January - March 2020 Page Nos. 1-4
AN INTERNATIONAL BILINGUAL PEER REVIEWED REFEREED RESEARCH JOURNAL		

## The Role of Information Technology in Research

□ Bhausaheb B. Shelke\*

### ABSTRACT

Information and Communication Technologies (ICT) have become commonplace entities in all aspects of life. Across the past twenty years the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavor titling business and governance. Problem solving is an age old activity. The development of electronic devices, specially the computers, has given added impetus to this activity Computer is certainly one of the most versatile and ingenious developments of the modern technological age. Today people use computers in almost every walk of life. To the researcher, the use of computer to analyses complex data has made complicated research designs practical. Electronic computers have by now become an indispensable part of research students in the physical and behavioral sciences as well as in the humanities in this age of computer technology, must be exposed to the methods and use of computers. A basic understanding of the manner in which a computer and ICT work helps a person to appreciate the utility of this powerful tool. Keeping all this in view, the present paper introduces the basics of ICT and computers, especially it. Answers questions like: What is an ICT computer? How does it function? How does one communicate with it? How does it help in analyzing data? How does it help in Research?

**Keywords :** ICT; Research Role; Software; Data.

#### Introduction :

Information Technology covers a broad spectrum of hardware and software solutions that enable organizations to gather, organize, and analyze data that helps them achieve their goals. Information technology can be used for information processing communication and problem solving tasks. Information Technology covers almost every aspect of our daily lives from business to leisure and even society. Today PCs, Cell phones, email and internet have all not become an integral part of our very culture but also play an essential role in our day to day activities.

#### Objective :

The objective of this present study is to study the importance role of information technology in research.

#### Research Methodology :

The information, which is used in this study, is

collected from different secondary sources. It is completely depend on the secondary data.

#### Data Analysis :

##### Information Technology

The information technology (IT) refers to creation, gathering processing, storage and delivery of information.

Following device and systems are considered information technologies.

1. The postal system – IT exchanges information.
2. A filing cabinet – IT stores information.
3. A library – It stores information
4. A mathematical algorithm – It process information

Information Technology refers to both the hardware and software that are used to store retrieve and manipulate information.

\*Librarian - New Arts, Commerce and Science College, Parner, Dist. Ahmednagar.

**Information system**

Information system is a combination of people hardware software procedure network and data resources. The components of Information system are as -

1. **People** – It is one the important component of an information system. People are the end users who use computers to make themselves more productive.
2. **Procedure** – The rules or guidelines for people to follow when using software, hardware & data procedures. These procedures are typically documented in manuals written by computer specialist.
3. **Software** – A programme consists of step by step instruction that tell the computer how to do its works. The purpose of software it is to convert data into information.
4. **Hardware** – The equipment that processes that data to create information is called as hardware. It includes the keyboard, mouse, monitor, system, unit and other device Hardware is controlled by software.
5. **Data** – The raw, unprocessed facts, including text. Number, image and sound are called data processed data yields information.
6. **Connecting** – The additional part to the information system, called connectivity, allows computers to connect and to share information.

These connections, including internet connection, can be by telephone lines, by cables or through the air connectivity allows users to greatly expand the capability and usefulness of theirs information system.

**Data and software**

Data are any facts, number or text that can be processed by a computer. Today organization are accumulating vast and growing amount of data in different formats and different database. This includes operational or transaction data such as, population, area under various geographical aspect, sales, lost, inventory payroll and accounting.

Data is raw material for data processing data related to fact, event and transactions. Information is data that has been processed in such a way as to be meaningful

to the person who receives it. It is anything that is communicated. E.g. Researchers who conduct market research survey might ask member of the public to complete questionnaires about a product or a service. These completed questionnaires, are processed and analyzed.

**Software**

Computer software is a collection of computer programme & related data that instruct of computer what to do and how to do it. Applications of information technology in various sector/ Research

1. I.T. in Business Research
2. I.T. in industry Research
3. Product design Research
4. Product manufacturing Research
5. I.T. at home and play Research
6. I.T. in education and training Research
7. I.T. in science and engineering Research

**The role of computer in research**

Applications	inSome of the various uses
1. Education	(i) Provide a large data bank information; (ii) Aid to time-tabling; (iii) Carry out lengthy or complex calculations; (iv) Assist teaching and learn processes; (v) Provide students' profiles; (vi) Assist in career guidance
2. Commerce	(i) Assist the production of material (known as v processing) such as rep letters, circulars etc. (ii) Handle payroll of person office accounts, Invoice records, keeping, s analysis, Stock control financial forecasting.
3. Banks and Financial	(i) Cheque handling; institutio (ii) Updating of accounts; (iii) Printing of customer statements; (iv) Interest calculations.

- |                        |  |   |
|------------------------|--|---|
| 4. Management          | <ul style="list-style-type: none"> <li>(i) Planning of new enterprises;</li> <li>(ii) Finding the best solution from several options;</li> <li>(iii) Helpful in inventory management, sales forecasting and production planning;</li> <li>(iv) Useful in scheduling of projects.</li> </ul>  | <ul style="list-style-type: none"> <li>(iii) Selection of appropriate statistical measures/ techniques;</li> <li>(iv) Selection of appropriate software package;</li> <li>(v) Execution of the computer program.</li> </ul>   |
| 5. Industry            | <ul style="list-style-type: none"> <li>(i) In process control;</li> <li>(ii) In production control;</li> <li>(iii) Used for load control by electricity authorities;</li> <li>(iv) Computer aided designs to develop new products.</li> </ul>  | <p>In spite of all this sophistication we should not forget that basically computers are machines that only compute, they do not think. The human brain remains supreme and will continue to be so for all times. As such, researchers should be fully aware about the following limitations of computer-based analysis:</p> <ol style="list-style-type: none"> <li>1. Computerized analysis requires setting up of an elaborate system of monitoring, collection and feeding of data. All these require time, effort and money. Hence, computer based analysis may not prove economical in case of small projects.</li> <li>2. Various items of detail, which are not being specifically fed to computer, may get lost sight of.</li> <li>3. The computer does not think; it can only execute the instructions of a thinking person. If poor data or faulty programs are introduced into the computer, the data analysis would not be worthwhile. The expression "garbage in, garbage out" describes this limitation very well.</li> </ol> |
| 5. Communications      | <ul style="list-style-type: none"> <li>(i) Helpful in electronic mail; and Transportation</li> <li>(ii) Useful in aviation: Training of pilots, seat reservations, provide information to pilots about weather conditions;</li> <li>(iii) Facilitate routine jobs such as crew schedules, time - tables, maintenance schedules, safety systems, etc.;</li> <li>(iv) Helpful to railways, shipping companies;</li> <li>(v) Used in traffic control and also in space flight.</li> </ul> |   |
| 7. Scientific Research | <ul style="list-style-type: none"> <li>(i) Model processing;</li> <li>(ii) Performing computations;</li> <li>(iii) Research and data analysis.</li> </ul>  |   |
| 8. The homes           | <ul style="list-style-type: none"> <li>(i) Used for playing games such as chess, draughts, etc.;</li> <li>(ii) Can be used as an educational aid;</li> <li>(iii) Home management is facilitated.</li> </ul>  |   |

Researchers interested in developing skills in computer data analysis, while consulting the computer centers and reading the relevant literature must be aware of the following steps :

- (i) Data organization and coding;
- (ii) Storing the data in the computer;

**Conclusion :**

The adoption and use of ICTs in Research have positive impact. ICT can affect the delivery of education and enable wider access to the research and teaching learning process. The wider an availability of best practice and best research material, which can be shared be ICT. ICT can faster better technique literature review Researcher for researchers.

Performing calculations almost at the speed of light, the computer and ICT has become one of the most useful research tools in modern times. Computers and ICT are ideally suited for data analysis concerning large research projects.

Researchers are essentially concerned with huge storage of data, their faster retrieval when required and processing of data with the aid of various techniques. In all these operations, computers and ICT are of great help. Their use, apart expediting the research work, has reduced human drudgery and added to the quality of research activity.



**References:**

1. Kothar, C. R., Research Methodology Methods and Techniques. ISBN (13): 978-81-224-2488-1, New Age International (P) Limited, Publisher, S4835 24, Ansari Road, Daryaganj, New Delhi 110002.
2. Dhekane, Shahaji H., Information Technology, MSBS and HSE Pune 411004.
3. Jain, Gopal Lal, Research Methodology ISBN 81-7594-127-8 Published by Mangal Deep Publication, Jaipur.
4. Noor Syed - UI Amin Department Education University of Kashmir, An Effective use of ICTs Education and Learning by on world knowledge, Research and Experience.
5. Berelson, Bernard, Content Analysis: Communication Research, New York: Free Press 1952.
6. Best, John W., and Kahn, James V., "Research Education," 5<sup>th</sup> Ed., New Delhi: Prentice-Hall India Pvt. Ltd., 1986.



## 19. Preparation & Performance of CuS thin films in Non-Aqueous Medium as Supercapacitor Electrode Materials.

Published by :  
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)  
ISSN: 2278-0181  
Vol. 9 Issue 02, February-2020

# Preparation and Performance of CuS thin films in Non-Aqueous Medium as Supercapacitor Electrode Materials

S. L. Kadam<sup>1</sup>, R. A. Kadam<sup>2</sup>, M. A. Yewale<sup>1,\*</sup>

<sup>1</sup>Post Graduation Department of Physics and Research Centre, New Arts, Commerce and Science College, Parner - 414302.

<sup>2</sup>Department Applied Science, Shri Chhatrapati Shivaji Maharaj College of Engineering Nepti Ahmednagar- 414005

**Abstract** - In this study, cauliflower microstructure of CuS thin films were prepared by using electrodeposition method for the assembly of supercapacitor application. X-ray diffraction analysis shows their polycrystalline nature and SEM images confirmed their cauliflower microstructure. The investigation of structural, elemental and compositional properties of the CuS thin films were confirmed that the thin films were used as electrode material for supercapacitor applications. As predictable, the synthesized CuS thin films were useful in different supercapacitor application. The CuS thin films shows specific capacitance (SC) of value 102 F g<sup>-1</sup> at a scan rate of 10 mV s<sup>-1</sup> in a 1 M NaOH electrolyte.

**Keywords:** Electrodeposition method, nanostructure, supercapacitor, capacitance, contact angle, Electrochemical study.

### 1. INTRODUCTION

Supercapacitor or electrochemical capacitors are energy storage and passive gadget, which display fast charging rates. The main characteristics of the supercapacitor are maximum power capability, quick charge propagation, charging and discharging response, life cycle, maintenance cost, durability [1]. As compared to the conventional capacitor the supercapacitor have high energy density, due to which equipment's have high energy storage capacity and fast charging. Because of these characteristics scientists working in the field of energy storage in supercapacitor have focused on the synthesis of new materials that can be useful to enhance the efficiency of the device. Metal chalcogenide shows crystalline structure and exhibits interest in electronic, optical, electrical and mechanical properties due to these structure. In the previous few decades, diverse materials like carbon nanotubes (CNTs) [2], graphene oxide (GO) [3], metal oxides [4], polymers [5] etc. were tried for supercapacitor application. Also, composites of RGO/MnO<sub>2</sub> [6], NiO/CNTs [7], polyaniline/CNTs [8] etc. were ready for more enhancement in the electrochemical supercapacitor performance. The metal sulfides like CoS<sub>2</sub> [9], NiS [10], MnS [11], CuS [12], MoS<sub>2</sub>[13] etc. have expected attention for their exhaustive usage in supercapacitor. Currently copper sulfide (CuS) has been studied for numerous applications like quantum dot solar cell (QDSC) [14], sensors [15], as an electrode for Li-ion battery [16], supercapacitor electrode [17] etc. Copper sulfide have advantages over graphene oxide and metal oxide is their higher conductivity [18] Furthermore, copper based materials shows numerous valence states and ionic chemistry, which marks them a capable candidate for electrochemical applications. CuS is an

associate with chalcogenide material family having different structural properties of attention for the application in supercapacitor [19-20]. Till now, studies on chemical synthesis and supercapacitive properties of CuS film have been infrequent. Present work reports easy-going chemical synthesis of binder free CuS films and its electrochemical supercapacitive performance tested in 1M NaOH electrolyte.

### II. EXPERIMENTAL DETAILS

#### A-Materials:

Copper nitrate Cu(NO<sub>3</sub>)<sub>2</sub>, sulfur powder(S), sodium nitrate(NaNO<sub>3</sub>), dimethyl sulfoxide (CH<sub>3</sub>)<sub>2</sub>SO.

#### B- Preparation of CuS thin films:

CuS thin films were prepared by using simple three electrode electrodeposition method. For the synthesis of CuS thin film 0.1 M Copper nitrate Cu(NO<sub>3</sub>)<sub>2</sub> were dissolve in dimethyl sulfoxide (CH<sub>3</sub>)<sub>2</sub>SO and 0.1 M of sodium nitrate (NaNO<sub>3</sub>) and 0.1 M sulfur powder were dissolve in dimethyl sulfoxide (CH<sub>3</sub>)<sub>2</sub>SO. The depositions were performed using above solution and films were deposited for 20 min., the deposition potential was kept 0.9V. Similar process was carried for deposition of CuS thin film for different molar concentration of sulfur. Prepared film were used for further characterization.

### III. RESULTS AND DISCUSSION

#### A- X-ray diffraction (XRD) study:

Fig.1 shows the XRD graph of products synthesized by electrochemical method at different molar concentration of sulfur. When the concentration of sulfur changes from 0.1 M molar to the 0.03 M diffraction peaks of 48.6° variations were observed. The intensity of the peak corresponding to these angle peaks decreases with increase in molar concentration of sulfur. The XRD patterns of the synthesized CuS thin films deposited for diverse molar concentrations from bath (a, b, c) with deposition time of 20 min are shown in Fig. 1. Numerous concentrations show the development of polycrystalline CuS structure and they are indexed with JCPDS Card Nos.01-074-1234. To conclude the phases of current cauliflower structure, XRD were used. The XRD of the peaks observed for CuS and the orientation of the plane along (100), (104), (105), (106), (110), (204) and (214) direction. All of the samples display an analogous XRD pattern, which indicates development of the films in a specific way. Diffraction peaks of other phases or impurities were not observed, further it was observed that the precursors have been totally converted into CuS nanostructures. All the

Published by :  
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)  
ISSN: 2278-0181  
Vol. 9 Issue 02, February-2020

d values are in much agreement with the theoretical value. From Fig. 1 it is observed that with increasing in molar conc. the peak intensity goes on decreasing shows reduced crystallinity. The crystallite size were calculated by using Scherrer's formula. The crystal size decreases with the increase in molar concentration of sulfur in the film composition. Greater the concentrations of sulfur lesser are the crystal size. The crystallite size of the film were changes with change molar concentration of sulfur shown in table 1

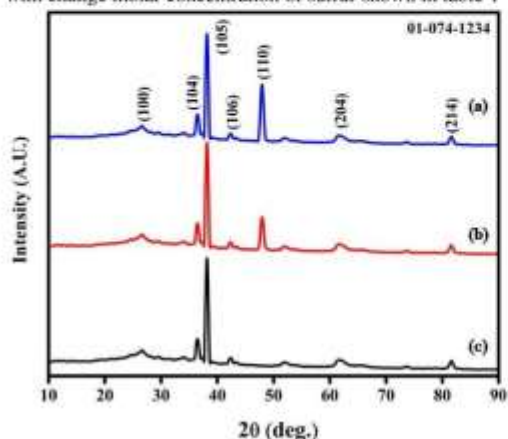


Fig. 5 XRD graph of CuS thin films for different concentration of Sulfur.

TABLE 1- Variation crystallite size with change in sulfur concentration.

Sr. No.	Deposition time (min)	Molar concentration of Copper	Molar concentration of Sulfur	Molar ratio of Cu/S Molar	Crystal size (nm)
1.	20	0.1	0.1	1:1	19
2.	20	0.1	0.2	1:2	15
3.	20	0.1	0.3	1:3	09

**B- SEM and EDAX analysis**

The surface morphology and structure of CuS samples synthesized by electrochemical method is as shown Fig. 2. The as-grown CuS samples showed small cauliflower-like morphology. SEM micrographs exposes that the flowers are cluster of numerous small granules. The full array of one small cauliflower structure is observed in this micrograph. These micrograph shows that the sample is uniformly covering the substrate and is composed of dense array of small granules like nanostructures with 0.9 micrometer in diameter. The average diameter of the cauliflower is about 0.70 micrometer. Fig. 3 shows the EDS micro images of the CuS thin films deposited at 0.3 M concentration of sulfur. The samples exposed the presence of Cu and S confirming the formation of the CuS thin films. The atomic percentage of Cu is 51.9% and sulfur is 48.1 %.

**C- Wettability study**

Fig. 4 shows the wettability of CuS thin film. The wettability study explains the interaction between electrolyte and surface of the thin film. When contact angle of the film were small, the more interaction of the electron with electrode and electrolyte. For small contact angle there is the

probability of transfer of electron from electrolyte to electrode which enhance the charge transfer mechanism. The wettability of CuS thin films show the contact angle of the water with CuS thin film is 97°. Small contact angle may more useful to study of supercapacitive behavior.

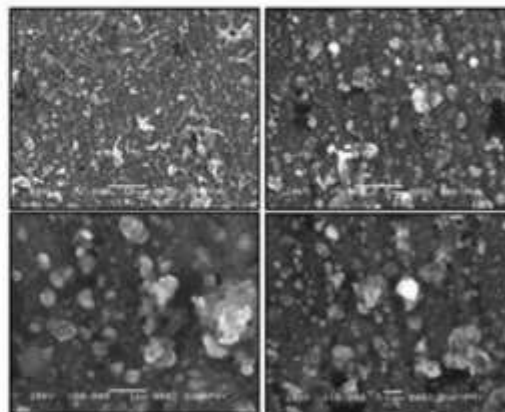


Fig. 2 SEM micrograph of CuS thin films for 0.3 M concentration of Sulfur.

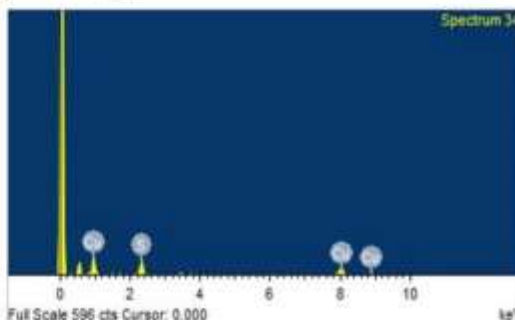


Fig. 3 EDS spectra of CuS thin films for 0.3 M concentration of Sulfur.

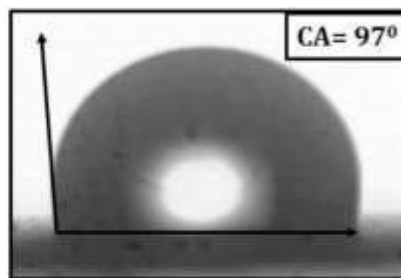


Fig. 4 Contact Angle of CuS thin films.

**D- Electrochemical supercapacitive properties**

Afterwards the structural, surface morphological and compositional study of the CuS films were confirmed, CV measurements were carried out to more examine the electrochemical supercapacitive properties. CV graph of the

Published by :  
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)  
ISSN: 2278-0181  
Vol. 9 Issue 02, February-2020

as synthesized CuS electrodes were noted at varying scan rates of 10-50  $\text{mV s}^{-1}$  within a potential of -1.5 to 1.0 V in a 1 M NaOH electrolyte. CV graph of the as synthesized CuS electrodes is as shown in Fig. 5. The specific capacitances of the electrode were calculated from equation 1. The specific capacitance of the electrode is  $102 \text{ F g}^{-1}$ .

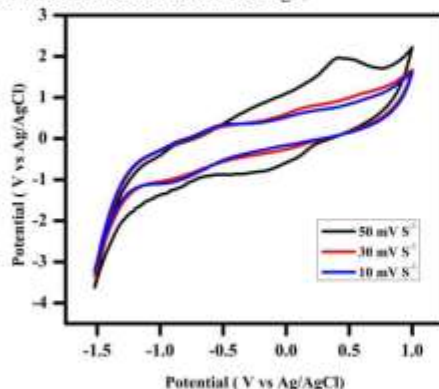


Fig. 5 Cyclic Voltammetry of CuS thin films in 1 M NaOH electrolyte

#### IV. CONCLUSIONS

In conclusion, advanced CuS thin films were successfully produced by the Electrodeposition method at different molar concentration of sulfur. The electrochemical results exposed that the CuS thin films display good capacitive performance. The surface topography and crystal structure exploration established the development of a cubic polycrystalline nature and the development of different small cauliflower nanostructures on conducting stainless steel substrate of the CuS thin films. The maximum specific capacitance value  $102 \text{ F g}^{-1}$  were noted at scan rates of  $10 \text{ mVs}^{-1}$  in 1 M NaOH electrolyte.

#### REFERENCE

- [16] H. Liu, L. Sun, Y. Zhao, T. Tan, Y. Zhang, *Applied Surface Science*, 466 (2019) 309-319.
- [17] T. Marimuthu, N. Anandhan, R. Pameerselvam, K.P. Ganesan, A. Amali Roselin, *Nano-Structures & Nano-Objects*, 17 (2019) 138-147.
- [18] K. Krishnamoorthy, G.K. Veerasubramani, P. Pazhamalai, S.J. Kim, *Electrochim Acta* 190 (2016) 305-312.
- [19] K. V. G. Raghavendra Chandu V.V. M. Gopi, R. Vinodh. L. K. Durgaa, H. J. Kim, *Journal of Energy Storage*, 27( 2020), 101148.
- [20] M.A.Yewale A.K.Sharma D.B.Kamble C.A.Pawar S.S.Potdar S.C.Karle. *Journal of Alloys and Compounds*, 754 (2018) 56-63.
- [1] S.K.Shinde, S.M.Mohite, A.A.Kadam, H.M.Yadav, G.S.Ghodake, K.Y.Rajpure D.S.Lee, D. Y.Kim, *Journal of Electroanalytical Chemistry*, 850 2019, 113433.
- [2] S.K. Ujjain, P. Ahuja, R. Bhatia, P. Attri, *Mater Res Bull* 83 (2016) 167-171.
- [3] Q. Yang, S.K. Pang, K.C. Yung, *J Power Sources* 311(2016) 144-152.
- [4] L. Liu, Y. Luo, W. Tan, Y. Zhang, Fan Liu, G. Qiu, *J Colloid Interface Sci* 482 (2016) 183-192.
- [5] Y. Zhao, C.A. Wang, *Mater Des* 97 (2016) 512-518
- [6] P.Y. Chan, Rusi, S.R. Majid, *Solid State Ionics* 262 (2014) 226-229.
- [7] G.S. Gund, D.P. Dahal, S.S. Shinde, C.D. Lokhande, *ACS Appl Mater Interfaces*, 6 (2014) 3176-3188.
- [8] X. Wu, Q. Wang, W. Zhang, Y. Wang, W. Chen, *Electrochim Acta* 211 (2016) 1066-1075.
- [9] R.B. Pujari, A.C. Lokhande, J.H. Kim, C.D. Lokhande, *RSC Adv*, 6 (2016) 40593-40601.
- [10] L. Yu, B. Yang, Q. Liu, J. Liu, X. Wang, D. Song, J. Wang, X. Jing, *J Electroanal Chem* 739 (2015) 156-163.
- [11] R.B. Pujari, A.C. Lokhande, A.A. Yadav, J.H. Kim, C.D. Lokhande, *Mater Des* 108 (2016) 510-517.
- [12] K.J. Huang, J.Z. Zhang, K. Xing, *Electrochim Acta* 149 (2014) 28-33.
- [13] M. Wang, H. Fei, P. Zhang, L. Yin, *Electrochim Acta* 209 (2016) 389-398.
- [14] S. S. Kalanur, S. Y. Chae, O. S. Joo, *Electrochim Acta* 103 (2013) 91-95.
- [15] F. A. Sabah, N. M. Ahmed, Z. Hassan, H. S. Rasheed, *Sensors and Actuators A: Physical*, 249 (2016) 68-76.

IJERTV9IS020341

www.ijert.org

614

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

## 20. Impact of aluminum oxide nanoparticles, silver nanoparticles and their Nano composites on *Vigna radiata* Seedling Growth

Research Journal of Chemistry and Environment

Vol. 24 (3) March (2020)

Res. J. Chem. Environ.

### Impact of aluminum oxide nanoparticles, silver nanoparticles and their nanocomposites on *Vigna radiata* Seedling Growth

Dhawale V.P.<sup>1\*</sup>, Mohite K.C.<sup>2</sup> and Kulkarni S.D.<sup>3</sup>

1. Department of Physics, New Arts Commerce and Science College, Parner, Ahmednagar- 414302, INDIA

2. Department of Physics, C.T. Bora College, Shirur, Pune- 412 210, INDIA

3. Department of Environmental Science, New Arts Commerce and Science College, Ahmednagar- 414 001, INDIA

\*vijaya.dhawale2009@gmail.com

#### Abstract

Wide use of nanoparticles (NPs) leading to their possible escape into environment and their interaction with living organisms demands immediate attention. We evaluated impact of nanomaterials (aluminum oxide nanoparticles ( $Al_2O_3$  NPs), silver nanoparticles (AgNPs), nanocomposites of  $Al_2O_3$  NPs and AgNPs,  $Al_2O_3$ -1wt%Ag,  $Al_2O_3$ -10wt%Ag) in different concentrations on early growth of *Vigna radiata*. Three concentrations of nanoparticles viz. 50, 100, 150 mg/L were taken for the analysis. Seed germination percent was not affected in all the concentrations of nanomaterials.

A significant positive influence on root length, wet and dry biomass, seedling vigor index was observed for all seeds with respect to those of unexposed control germination. In most nanomaterial concentrations, 100 mg/L showed positive response on dry weight biomass. Inhibition on shoot length varied greatly among nanomaterials and the plant. These results are significant in terms of use and disposal of nanoparticles.

**Keywords:** Phytotoxicity, seed germination, aluminum oxide nanoparticles, silver nanoparticles, *Vigna radiata* L., nanocomposite.

#### Introduction

Nanomaterials are defined as particles with size less than 100 nm in at least one dimension<sup>1</sup> and are gaining vast interests in recent decades. Because of their large surface area to volume ratio, small size and high reactivity, nanoparticles find applications in various industrial sectors and in our daily lives.<sup>2</sup> Silver nanoparticles (AgNPs) are the most commercialized nanomaterials widely used in antimicrobial and personal care products, building materials, water filtration, medical instruments and in many other industrial and biomedical applications.<sup>3</sup> The employment of NPs in agriculture envisages that these particles will impart some beneficial effects to the crops. It has been found that the NPs could improve both plant germination and growth rate of seeds.<sup>4</sup>

However, the impact of NPs on different plant species can vary greatly and there are conflicting reports of both positive

and negative types. Among positive effects, the addition of nano-  $TiO_2$  at 2.5 - 40 g/Kg of soil promoted the growth of spinach likely by protecting the chloroplasts from aging during long term illumination.<sup>5</sup> Nano-ZnO particles have significant inhibition on seed germination of cucumber as well as shoot and root growth of wheat, green gram and cucumber.<sup>6</sup> In contrast, it has been reported that silver nanoparticles, in general, had no effect on germination rate.<sup>7</sup> Nanoparticles have different levels of toxicities which may be size and shape dependent and have the ability to penetrate the cell walls.<sup>8,9</sup>

However, NPs causes both positive and negative effects on higher plants as seed germination, root elongation, cell division, growth and metabolic processes<sup>10,11</sup> NPs can lead to a wide variety of toxicological effects on human,<sup>12</sup> environment,<sup>13</sup> bacteria<sup>14</sup> and aquatic organisms.<sup>15</sup> These studies are important in understanding the nature of interactions between NPs and plants in order to encompass the impact of nanotechnology in agriculture particularly its toxicity concerns, genetic engineering and plant disease control.

Aluminum oxide nanoparticles are used in high performance ceramics,<sup>16</sup> rocket propellants and explosives,<sup>17</sup> catalysts,<sup>18</sup> coatings,<sup>19</sup> sunscreens<sup>20</sup> etc. Apart from their use as fillers and packing material,<sup>21</sup> they find special applications in wastewater treatment.<sup>22</sup>  $Al_2O_3$  NPs also serve as a solid phase extraction material for absorption, adsorption and preconcentration of heavy metal ions and other pollutants.<sup>23-25</sup> Reports of silver NP released from fabrics during washing and the leaching of NPs from paints add to the apprehensions of NPs getting leaked into the environment.<sup>13,26,27</sup> The extensive use of NPs raises a concern of their escape into the environment. Hence, it is essential to understand the effects that NPs can have on living organism. Only few reported studies on vascular plants showed that AgNPs have detrimental effects on plant growth.<sup>28</sup> Overall, the current phytotoxicity profile of nanomaterials is very preliminary and empirical.

In view of the available literature, the present investigation was designed to investigate the effects of  $Al_2O_3$  NPs, AgNPs and various nanomaterials in different concentrations on the seedling growth of *Vigna radiata* (L.) Wilczek (mung). The legumes are well known for their excellent source of high-quality protein and their role in improving the soil fertility. Present study will provide us germination percentage,

germination rate, root elongation in addition to the shoot height and biomass. This approach helps to enhance our understanding of the phytotoxicity effects posed from different nanomaterials on the most important economic plant *V. radiata*.

### Material and Methods

**Nanoparticles:** Aluminum oxide<sup>29</sup> and silver nanoparticles<sup>30</sup> and their nanocomposites<sup>31</sup> were prepared by sol-gel method.

**Preparation of nanoparticles suspension:** Nanoparticles stock suspensions (1000 ml/L) were prepared by pre-weighed Al<sub>2</sub>O<sub>3</sub> NPs, AgNPs and their nanocomposites in deionized water (DI-water) and dispersed by ultrasonic vibration (100 W, 40 kHz) for 30 min. For further stabilization of nanoparticle suspension, 10% (v/v) polyethylene glycol (PEG-400), a dispersant was added.<sup>32</sup> The suspensions were sonicated again for at least 1 min before use.

**Seed germination and exposure:** Seeds of mung bean (*Vigna radiata* L.) were purchased from the local market. The seeds were stored in dark under room temperature. All the seeds were checked for their viability by suspending them in deionised water. The seeds which settle to the bottom were selected for further study.

Seeds were immersed in 10% sodium hypochlorite solution for 10 minutes to ensure surface sterility.<sup>33</sup> After rinsing three times with DI-water, seeds were soaked in deionised water (control) and different nanomaterial suspension solution (Al<sub>2</sub>O<sub>3</sub> NPs, AgNPs and their nanocomposites (Al<sub>2</sub>O<sub>3</sub>:AgNP; 1:1, Al<sub>2</sub>O<sub>3</sub>:AgNP; 2:1, Al<sub>2</sub>O<sub>3</sub>:AgNP; 1:2) and Al<sub>2</sub>O<sub>3</sub>-1wt%Ag, Al<sub>2</sub>O<sub>3</sub>-10wt%Ag). To investigate the promotory and inhibitory effects of nanomaterials on mung bean, three concentrations (50, 100, 150 mg/L) of each NPs and NCs were prepared. Seeds were soaked in each suspensions (50, 100, 150 mg/L) for 2 hours. One piece of a moisture germination paper was put into each 100 mm x 15 mm Petri dish.

In each Petri dish, 5 ml of test medium of nanoparticle and nanocomposites (50, 100 and 150 mg/L) were added. Seeds were then transferred onto the moisture germination paper with 10 seeds per dish and 1 cm of larger distance between each seed.<sup>34</sup> Petri dishes were covered and sealed with tape and allowed to germinate at 25±1°C in the incubator. Seeds were checked daily for moisture content.

Germination percentage was calculated when no further germination took place for 5 days. For the germination rate and root and shoot growth investigation, seeds were allowed to germinate for 10 days. Seed germination and percent (FGP) of each treatment was calculated. Seedling root length and shoot length was measured. A seed was considered to have germinated when radical emerged from the seed coat according to the following equation:<sup>35,36</sup>

$$FGP = \frac{\text{No. of germinated seeds after 4 days}}{\text{dxTotal number of germinated seeds}} \times 100$$

**Germination Index (GI):** Germination index was calculated according to the following equation:<sup>37</sup>

$$GI = \frac{\text{Germination percentage of each treatment}}{\text{Germination percentage in the control}} \times 100$$

**Seedling Vigor Index (SVI):** It was calculated according to the following formula:<sup>38</sup>

$$SVI = \frac{\text{Average shoot length}}{\text{Average root length}} \times \text{Germination percentage}$$

**Root and shoot length (cm):** After germination, the length of roots and shoots for all treatments and related controls (untreated) were measured.

### Results and Discussion

**Microscopic characterization:** The transmission electron microscopy (TEM) image and selected area electron diffraction (SAED) pattern of Al<sub>2</sub>O<sub>3</sub> NPs and AgNPs are shown in figures 1(A, B) and figure 2(A, B). The TEM micrographs indicated that the Al<sub>2</sub>O<sub>3</sub> NPs shows slight agglomeration with spherical morphology and their average particle size were found to be 77.7 nm.

Analysis of AgNPs particles in TEM micrograph shows monodispersed and spherical shape having average particle size 17.3 nm (Figure 2 A, B). The SAED pattern of Al<sub>2</sub>O<sub>3</sub> NPs and AgNPs shows that the rings are composed of dots suggesting the crystalline nature of these particles (Figure 1C and Figure 2C). Energy dispersive X-ray spectrum (EDAX) showed peaks of Al and O confirms Al<sub>2</sub>O<sub>3</sub> NPs composed of Al and O (Figure 1D). Figure 2D shows AgNPs composed of element Ag.

**Effect of nanoparticle suspension on seed germination:** Seed germination and seedling growth are being widely used to test phytotoxicity of chemical species such as nonmaterial which may be released into the environment. This is because seed germination, root and shoot elongation measurements are quite rapid for use on acute phytotoxicity tests with several advantages: sensitivity, simplicity, low cost of suitability for reactive chemicals and contaminated soil samples.<sup>39</sup> The effect of Al<sub>2</sub>O<sub>3</sub> NPs, AgNPs, different concentrations of Al<sub>2</sub>O<sub>3</sub> NPs and AgNPs and their nanocomposite (50, 100 and 150 mg/L) on germination in *Vigna radiata* was examined. At the concentrations which we used the nanomaterials were observed to have no effect on seed germination.

Indeed, in the presence of increasing nanomaterials concentrations, the seed germination percentage was almost constant and was found to be 100% and differences between the germination percent of the controls and respective treatments were in no case statistically significant (fig. 3). These results are similar to earlier reports for different plant

species wherein no negative effect of Al<sub>2</sub>O<sub>3</sub>NPs was observed.<sup>40,41</sup> AgNPs have significant positive effects of on seed germination in *Trigonella foenum-graecum*

(Fenugreek).<sup>42</sup> In wheat, inhibiting response was recorded at 5000 mgL<sup>-1</sup> after exposure of young seedlings to nanoparticles.<sup>34</sup>

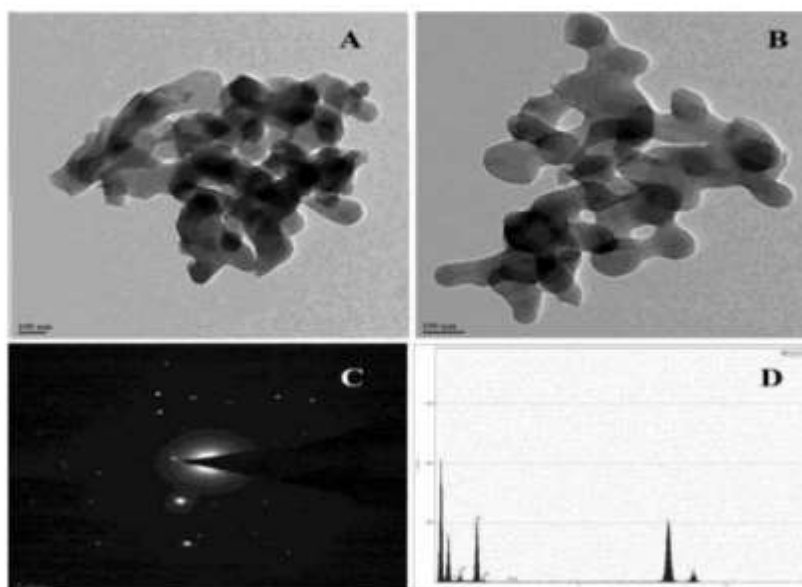


Figure 1: (A, B) Transmission electron micrographs (TEM), (C) selected area electron diffraction pattern and (D) EDAX of Al<sub>2</sub>O<sub>3</sub> nanoparticles.

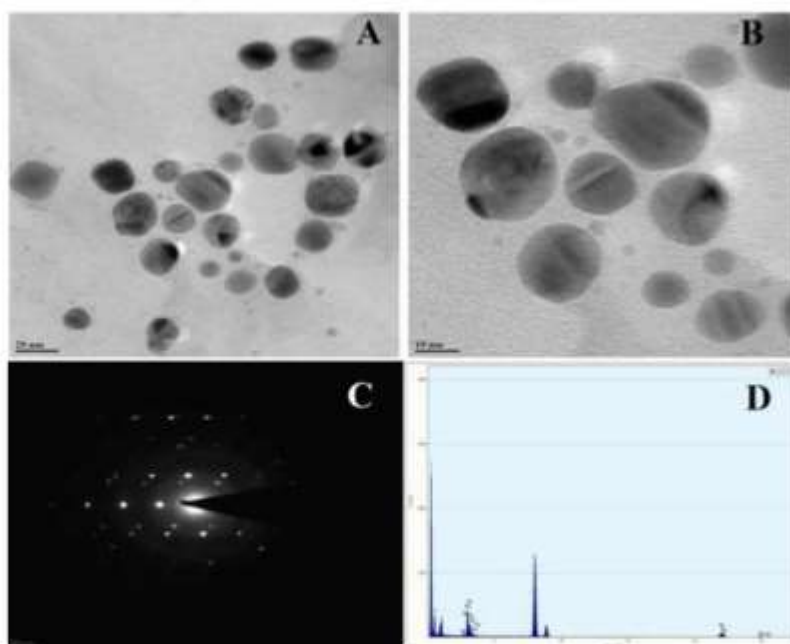


Figure 2: (A, B) Transmission electron micrographs (TEM), (C) selected area electron diffraction pattern and (D) EDAX of Ag nanoparticles.

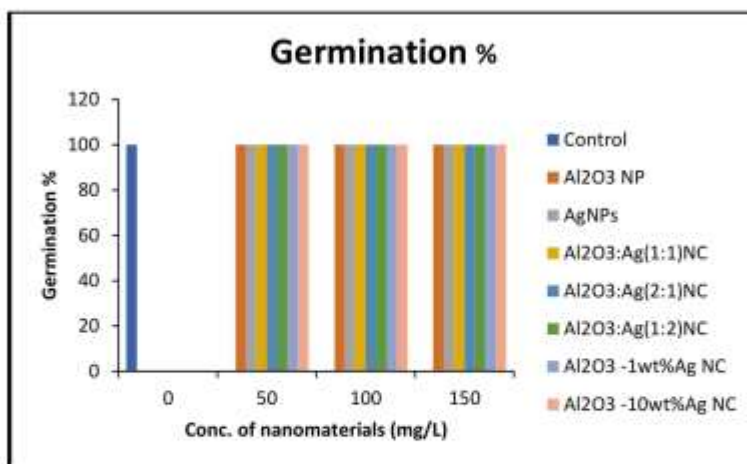


Figure 3: % Germination of Vigna radiata

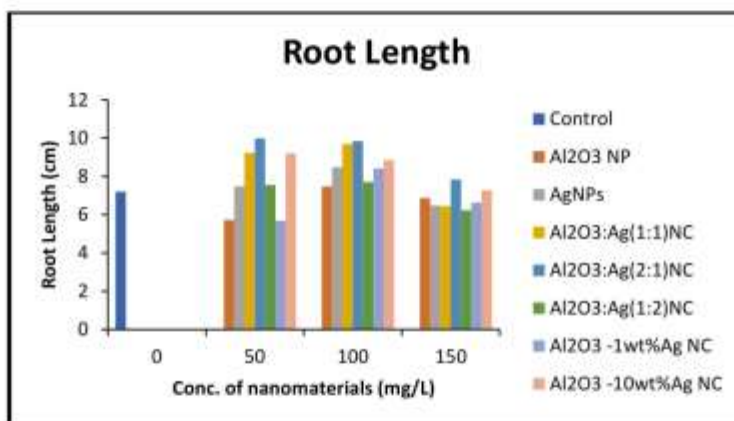


Figure 4: Effect of different concentrations of nanomaterials on Root length

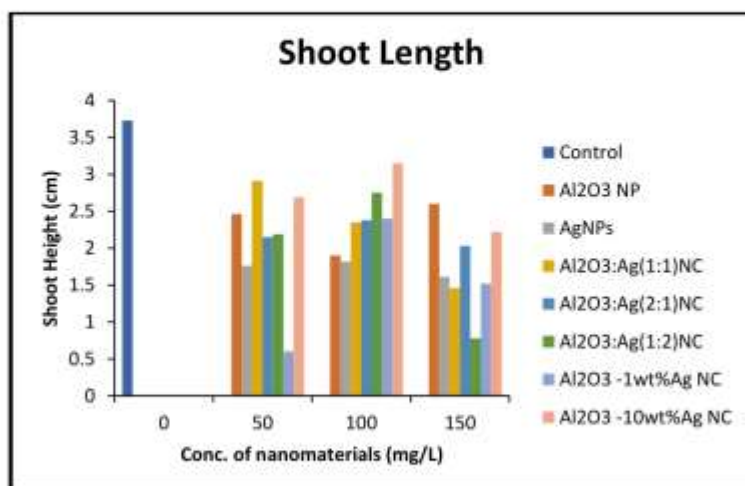


Figure 5: Effect of different concentrations of nanomaterials on Shoot Length



A significant influence on root elongation was observed in most of the nanomaterial concentrations as compared to the control during the present study. In general it was observed that, root length is maximum for all nanomaterials of concentration 100 mg/L as compared to 50 and 150 mg/L nanomaterial concentration. Highest root length 9.9 cm was noted at 50 mg/L (in 2:1 ratio of  $Al_2O_3$  NPs:AgNPs nanocomposite) followed by 9.84 cm at 100 mg/L (in 2:1 ratio of  $Al_2O_3$  NPs: AgNPs nanocomposite), 9.69 cm at 50 mg/L (in 1:1 ratio of  $Al_2O_3$  NPs and AgNPs nanocomposite), 9.2 cm at 50 mg/L nanocomposite (in ratio of  $Al_2O_3$ -10wt%Ag), 8.85 cm at 100 mg/L nanocomposite (in ratio of  $Al_2O_3$ -10wt%Ag).

However, minimum root length 5.73 cm was noted in 50 mg/L concentration of  $Al_2O_3$  NPs as compared to the control (fig. 4). Recent report showed promotor effects of  $Al_2O_3$  NPs on root growth of *A. thaliana*.<sup>43</sup> However, negative effects were reported in several plants on exposure to NPs at very high concentration ranging from 1000 to 10,000 mgL<sup>-1</sup>. In case of *Zea mays* (corn), *Cucumis sativus*, *Glycine max*,

*Brassica oleracea* and *Daucus carota*, a marked decline in root growth was reported at 2000 mg/L.<sup>44</sup> Aluminium is well known for its toxicity to plants wherein roots are the most easily effected part.<sup>45</sup> Especially, Al is toxic to plants in acidic soil due to dissolution of Al ions from the naturally occurring harmless aluminium oxides and aluminosilicates.<sup>44,46</sup>

Al ions cause inhibition of growth in root by blocking the cell division thus resulting in stunted and brittle roots.<sup>46</sup> Al ion-induced injury to the roots results in poor uptake of ions and water, further affecting the overall growth of plants.<sup>44,46</sup> Various other factors like cell wall disjunction, loss of plasma membrane integrity, alteration of cytoskeleton structure and imbalance in Ca homeostasis have also been considered responsible for Al toxicity.<sup>44</sup> Phytotoxicity of nanoparticles indicate that the elemental composition as well as the seed coat type may play a significant role in developmental phytotoxicity.<sup>47</sup> Seed coat plays a very important role in protecting embryo from harmful external factors as seed coat can have selective permeability.

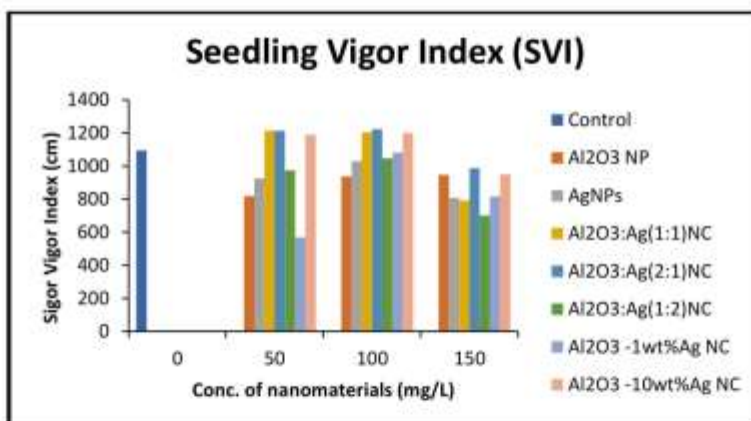


Figure 6: Seedling Vigor Index (SVI) of *Vigna radiata* after exposure to different concentrations of nanomaterials

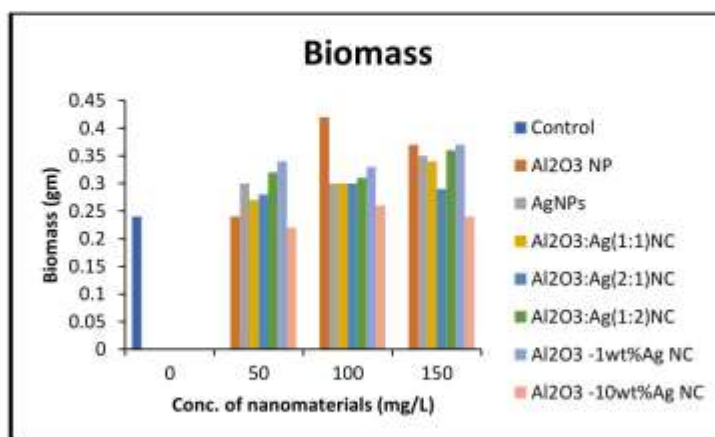


Figure 7: Effect of different concentrations of nanomaterials on biomass

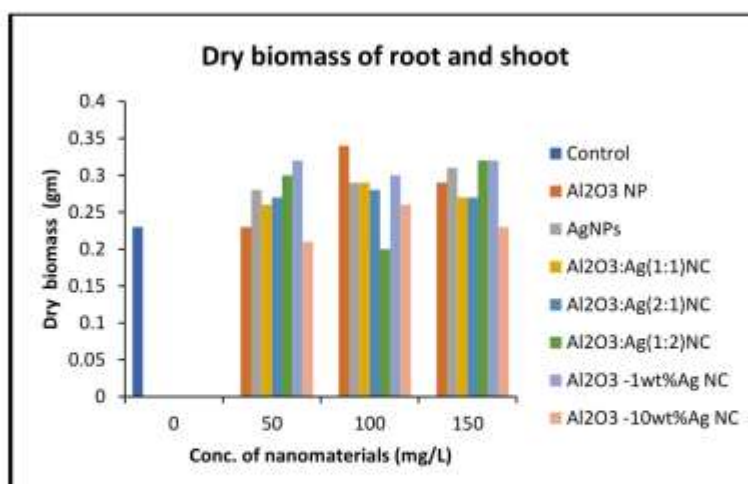


Figure 8: Effect of different concentrations of nanomaterials on dry biomass

The shoot length did not increase greatly with the nanomaterial treatment. Significant reduction in shoot length was observed as compared to control, the results are graphically illustrated in fig. 5. The undesirable effect of nanomaterials on shoot length might be due to its toxic effect. Toxic symptoms seem to appear more in the roots rather than shoots.<sup>48</sup>

Seedling vigor is the ability of a seed to emerge rapidly from soil or water, mainly with reference to seed germination rate and early seedling growth.<sup>49</sup> Seeds with high vigor is important for crop production because it can not only significantly enhance seedling establishment but also improve the capability to compete against weeds at seedling stage. A significant difference of various nanoparticle concentrations was observed on seedling vigor index. Highest seedling vigor index was produced from Al<sub>2</sub>O<sub>3</sub> NPs:AgNPs (2:1) treatment in 100 mg/L concentration which was 1222 followed by 1214 from Al<sub>2</sub>O<sub>3</sub> NPs:AgNPs (2:1) treatment in 50 mg/L concentration and 1200 in Al<sub>2</sub>O<sub>3</sub>-10%wtAg in the 100 mg/L. However, significant negative seed vigor index (701) was recorded in Al<sub>2</sub>O<sub>3</sub> NPs:AgNPs (150 mg/L) concentration (fig. 6). Nanoparticles does not affect shoot length which may be a consequence of confronting roots with excess of NPs and low transportability of this material to the shoot.<sup>50</sup>

Significant increase in wet biomass 0.42 gm, 0.37 gm, 0.37 gm, 0.36 gm and 0.35 gm was produced in Al<sub>2</sub>O<sub>3</sub> NPs (100 mg/L), Al<sub>2</sub>O<sub>3</sub> (150 mg/L), Al<sub>2</sub>O<sub>3</sub>-1wt%Ag (150 mg/L), Al<sub>2</sub>O<sub>3</sub> NPs: AgNPs; 1:1 ratio (150 mg/L) and AgNPs (150 mg/L) respectively. However, lowest biomass 0.22 gm was noted only in Al<sub>2</sub>O<sub>3</sub>-10wt%Ag than that of the control. The test plant exhibited increase in biomass but at variable rate. No significant reduction in wet biomass was reported except in the Al<sub>2</sub>O<sub>3</sub>-10wt%Ag (50 mg/L) nanocomposite concentration. Significant positive influence on dry wet

biomass was observed 0.34 gm in Al<sub>2</sub>O<sub>3</sub> NPs (100 mg/L) followed by 0.32 gm in Al<sub>2</sub>O<sub>3</sub> NPs:AgNPs (in 1:2 ratio; 50 mg/L), Al<sub>2</sub>O<sub>3</sub>-1wt%Ag (50 mg/L and 150 mg/L).

Remarkable decrease in dry wet biomass 0.21 gm was noted only in Al<sub>2</sub>O<sub>3</sub>-10wt%Ag (50 mg/L) (fig. 7 and fig. 8). Significant changes on dry weight of *Lemma minor* L at different AgNP concentrations are due to different NPs size.<sup>51</sup> Similar result was also observed when 100 mg/L nanomaterial concentration showed more adverse effect on dry weight of test plant than 50 mg/L and 150 mg/L nanomaterial concentration.

It is seen that, all nanoparticles (A-G) having concentrations ranging from 50 mg/L to 150 mg/L were not toxic to germination percentage as well as to biomass, root length and shoot height by comparing with the controls respectively. Also for low concentrations of nanoparticle dose, plant growth is smaller in case of *Vigna radiata*. Nanoparticles were not toxic to the root growth and shoot height because whether the sample was toxic or not, was concluded referring to the negative control.<sup>51</sup> The plant germination was highly conserved process with many of the nutrients, carbohydrates and proteins stored and available for seedling emergence even if cellular process to convert these compounds to more bioavailable forms are negatively affected.<sup>52,53</sup>

### Conclusion

Al<sub>2</sub>O<sub>3</sub> NPS, AgNPs and different nanomaterials of Al<sub>2</sub>O<sub>3</sub> NPS and AgNPs do not affect the seed germination as well as root length and shoot height of *vigna radiata*. It was observed that, the nanoparticle concentrations used (50 mg to 150 mg) for the experiment had no effect on plant growth and seed germination. Overall, these findings suggest that nanomaterials used in the present study exerted positive germination and growth rate on seeds depending on their

chemical composition, size, concentrations and types seeds. Our findings suggest important new avenues of research for understanding the interactions between NPs and plants and indirect and direct effects of various nanocomposites on mung plant. Applications of nanomaterial can promote earlier plant germination and improve plant production. In summary, our findings revealed the non-toxicity of Al<sub>2</sub>O<sub>3</sub> NPs, AgNPs and nanomaterials on early seedling growth of *V. radiata*. Although this study demonstrated the potential of nanomaterial for agricultural application, further exploration and research are needed to elucidate and expand these possibilities.

### Acknowledgement

Smt. Dhawale V.P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under faculty improvement program.

### References

- Roco M.C., Broader societal issue of nanotechnology, *J. Nanoparticle Res.*, **5**, 181–189 (2003)
- Handford C.E., Dean M., Henchion M., Spence M., Elliott C.T. and Campbell K., Implications of nanotechnology for the agri-food industry: opportunities, benefits and risks, *Trends Food Sci. Technol.*, **40**(2), 226–241 (2014)
- Borase H.P., Salunke B.K., Salunke R.B., Patil C.D., Hallsworth J.E., Kim B.S. and Patil S.V., Plant extract: a promising biomatrix for ecofriendly, controlled synthesis of silver nanoparticles, *Appl. Biochem. Biotech.*, **173**, 1–29 (2014)
- Khot L.R., Sankaran S., Maja J.M., Ehsani R. and Schuster E.W., Applications of nanomaterials in agricultural production and crop protection: A review, *Crop Protection*, **35**, 64–70 (2012)
- Zheng L., Hong F., Lu S. and Liu C., Effect of nano-TiO<sub>2</sub> on strength of naturally aged seeds and growth of spinach, *Biol. Trace Element Res.*, **104**(1), 83–91 (2005)
- Sarvendra-Kumar A.K., Patra S.C., Datta K.G. and Purakayastha Rosin T.J., phytotoxicity of nanoparticles to teed termination of plants, *International J. Adv. Res.*, **3**(3), 854–865 (2015)
- Yin L., Benjamin P.C., Bonnie M.M., Justin P.W. and Emily S.B., Effects of silver nanoparticle exposure on germination and early growth of eleven wetland plants, *PLoSOne*, doi: 10.1371/journal.pone.0047674, **7**, 47674 (2012)
- Pulate P.V., Ghurde M.U. and Deshmukh V.R., Cytological effects of the biological and chemical silver-nanoparticles in *Allium cepa* L., *Int. J. of Innovations in Bio Sciences*, **1**, 32–35 (2011)
- Patilola A.K., Berry A., May L. and Tchounwou P.B., Genotoxicity of silver nanoparticles in *Vicia faba*: A pilot study on the environmental monitoring of nanoparticles, *Int. J. Environ. Res. Public Health*, **9**(5), 1649–1662 (2012)
- Lin D. and Xing B., Phytotoxicity of nanoparticles: inhibition of seed germination and root growth, *Environ. Poll.*, **150**, 243–250 (2007)
- Carlson C., Hussain S.M., Schrand A.M., Brayditch-Stolle L.K., Hess K.L., Jones R.L. and Schlager J.J., Unique cellular interaction of silver nanoparticles: Size dependent generation of Reactive oxygen species, *J. Physical Chem.*, **112**(43), 13608–13619 (2008)
- Asharani P.V., Low Kah M.G., Hande M.P. and Valiyaveetil S., Cytotoxicity and genotoxicity of silver nanoparticles in human cells, *ACS Nano*, **3**, 279–290 (2009)
- Benn T.M. and Westerhoff P., Nanoparticle silver released into water from commercially available sock fabrics, *Environ. Sci. and Tech.*, **42**, 4133–4139 (2008)
- Choi O. and Hu Z.Q., Size dependent and reactive oxygen species related nanosilver toxicity to nitrifying bacteria, *Environ. Sci. and Tech.*, **42**, 4583–4588 (2008)
- Meyer J.N., Lord C.A., Yang X.Y., Turner E.A., Badireddy A.R., Marinakos S.M., Chilkoti A., Wiesner M.R. and Auffan M., Intracellular uptake and associated toxicity of silver nanoparticles in *Caenorhabditis elegans*, *Aquatic Toxicology*, **100**, 140–150 (2010)
- Tang F., Fudouzi H., Uchikoshi T. and Sakka Y., Preparation of porous materials with controlled pore size and porosity, *J. Eur. Ceram. Soc.*, **24**, 341–344 (2004)
- Armstrong R.W., Baschung B., Booth D.W. and Samirant M., Enhanced propellant combustion with nanoparticles, *Nano Lett.*, **3**, 253–255 (2003)
- Zacheis G.A., Gray K.A. and Kamat P.V., Radiation-induced catalysis on oxide surfaces: degradation of hexachlorobenzene on  $\gamma$ -irradiated alumina nanoparticles, *J. Phys. Chem. B.*, **103**, 2142–2150 (1999)
- Landry V., Riedl B. and Blanchet P., Alumina and zirconia acrylate nanocomposites coatings for wood flooring: photocalorimetric characterization, *Prog. Org. Coat.*, **61**, 76–82 (2008)
- Lu P.J., Huang S.C., Chen Y.P., Chiueh L.C. and Shih D.Y.C., Analysis of titanium dioxide and zinc oxide nanoparticles in cosmetics, *J. Food Drug Anal.*, **23**, 587–594 (2015)
- Sawyer W.G., Freudenberg K.D., Bhimaraj P. and Schadler L.S., A study on the friction and wear behavior of PTFE filled with alumina nanoparticles, *Wear*, **254**, 573–580 (2003)
- Kim J. and Van Der Bruggen B., The use of nanoparticles in polymeric and ceramic membrane structures: review of manufacturing procedures and performance improvement for water treatment, *Environ. Poll.*, **158**, 2335–2349 (2010)
- Bhargavi R.J., Maheshwari U. and Gupta S., Synthesis and use of alumina nanoparticles as an adsorbent for the removal of Zn(II) and CBG dye from wastewater, *Int. J. Ind. Chem.*, **6**, 31–41 (2015)
- Bhatnagar A., Kumar E. and Sillanpää M., Nitrate removal from water by nano-alumina: characterization and sorption studies, *Chem. Eng. J.*, **163**, 317–323 (2010)
- Kumar E., Bhatnagar A., Kumar U. and Sillanpää M., Defluoridation from aqueous solutions by nano-alumina:

characterization and sorption studies, *J. Hazard Mater.*, **186**, 1042–1049 (2011)

26. Geranio L., Heuberger M. and Nowack B., The behavior of silver Nanotextiles during washing, *Environ. Sci. Technol.*, **43**, 8113–8118 (2009)

27. Kaegi R., Simmet B., Zuleeg S., Hagedorfer H., Mueller E., Vonbank R., Boller M. and Burkhardt M., Release of silver nanoparticles from outdoor facades, *Environ. Poll.*, **158**, 2900–2905 (2010)

28. Stampoulis D., Sinha S.K. and White J.C., Assay-dependent phytotoxicity of nanoparticles to plants, *Environ. Sci. and Tech.*, **43**, 9473–9479 (2009)

29. Varghese N., Hariharan M., Cherian A.B., Sreenivasan P.V., Paul J. and Asmy Antony K.A., PVA - Assisted Synthesis and Characterization of Nano  $\alpha$ - Alumina, *International J. of Scientific and Research Publ.*, **4**(10), 1-5 (2014)

30. Kim Y.H., Kang Y.S. and Jo B.G., Preparation and characterization of Ag-Al<sub>2</sub>O<sub>3</sub> core-shell-type nanoparticles, *J. Ind. Chem.*, **10**(5), 739-744 (2004)

31. Bala T., Armstrong G., Laffir F. and Thornton R., Titania-silver and alumina silver composite nanoparticles: Novel, versatile synthesis, reaction mechanism and potential microbial application, *J. of Colloid and Interface Sci.*, doi:10.1016/j.jcis.2011.01.044, **356**, 395-403 (2011)

32. Zhang L.L., Jiang Y.H., Ding Y.L., Povey M. and York D., Investigation into the antibacterial behaviour of suspensions of ZnO nanoparticles (ZnO nanofluids), *J. Nanoparticle Res.*, **9**, 479–489 (2007)

33. US Environmental Protection Agency (USEPA), Ecological effects test guidelines: seed germination/root elongation toxicity test, OPPTS 850, 4200, EPA 712- c-96- 154, Washington, DC, Salama (1996)

34. Yang L. and Watts D.J., Particle surface characteristics may play an important role in phytotoxicity of alumina nanoparticles, *Toxicology Letters*, **158**, 122–132 (2005)

35. Ellis R.H. and Roberts E.H., The quantification of aging and survival of orthodox seeds, *Seed Sci. Technol.*, **9**, 373-409 (1981)

36. Ruan S., Xue Q. and Tylkowska K., The influence of priming on germination of rice (*Oryza sativa* L.) seeds and seedling emergence and performance in flooded soil, *Seed Sci. Technol.*, **30**, 61–67 (2002)

37. Karim M.A., Utsunomiya N. and Shigenaga S., Effect of sodium chloride on germination and growth of tetraploid triticale at early seedling stage, *Jpn. J. Crop Sci.*, **61**, 279-284 (1992)

38. Abdul-Baki A.A. and Anderson J.D., Viability and leaching of sugars from germinating barley, *Crop Sci.*, **10**, 31-34 (1970)

39. Munzuroglu O. and Geckil H., Effects of metals on seed germination, root elongation and coleoptiles and hypocotyls growth in *Triticum astivum* and *Cucumis sativus*, *Archives of Environ. Contamination and Toxicol.*, **43**, 203-213 (2002)

40. Lee C.W., Mahendra Y.S., Zedrow Y.K., Li Y.D., Tsai Y.Y.C., Braam J. and Alvarez P.J.J., Developmental phytotoxicity of metal oxide nanoparticles to *Arabidopsis thaliana*, *Environ. Toxicol. Chem.*, **29**, 669–675 (2010)

41. Lin D. and Xing B., Phytotoxicity of nanoparticles: inhibition of seed germination and root growth, *Environmental Pollution*, **150**(2), 243–250 (2007)

42. Hojjat S.S. and Hojjat H., Effect of nano-silver on seed germination and seedling growth in Fenugreek seed, *International J. of Food Eng.*, **1**(2), 106-110 (2015)

43. Jin Y., Fan X., Li X., Zhang Z., Sun L., Fu Z., Lavoie M., Pan X. and Qian H., Distinct physiological and molecular responses in *Arabidopsis thaliana* exposed to aluminum oxide nanoparticles and ionic aluminum, *Environ. Poll.*, **228**, 517–527 (2017)

44. Yanik F. and Vardar F., Toxic effects of aluminum oxide (Al<sub>2</sub>O<sub>3</sub>) nanoparticles on root, *Phys. Chem. B*, **103**, 2142–2150 (2015)

45. Tamás L., Šimonovičová M., Hutková J. and Mistrík I., Aluminium stimulated hydrogen peroxide production of germinating barley seeds, *Environ. Exp. Bot.*, **51**, 281–288 (2004)

46. Panda S.K., Baluska F. and Matsumoto H., Aluminum stress signaling in plants, *Plant Signal Behav.*, **4**, 592–597 (2009)

47. Sarvendra-Kumar, Patra A.K., Datta A.C., Rosin K.G. and Purakayastha T.J., Phytotoxicity of nanoparticles to seed germination of plants, *International J. of Advanced Res.*, **3**(3), 854–865 (2015)

48. Rao Sresty T.V.S.K.V.M., Ultrastructural alteration in response to zinc and nickel stress in the root cells of pigeonpea, *Environmental and Experimental Botany*, **41**, 3-13 (1999)

49. Huang Z., Yu T., Su L., Yu S.B., Zhang Z.H. and Zhu Y.G., Identification of chromosome regions associated with seedling vigor in rice, *Acta Genetica Sinica*, **31**, 596–603 (2004)

50. Riahi-Madvar A., Rezaee F. and Jalili V., Effects of alumina nanoparticles on morphological properties and antioxidant system *Triticum aestivum*, *Iranian J. Plant Physiol.*, **3**(1), 595-603 (2012)

51. Gubbins E.J., Batty L.C. and Lead J.R., Phytotoxicity of silver nanoparticles to *Lemma minor* L., *Environmental Pollution*, **159**, 1551-1559 (2011)

52. Basset G. et al, Folate synthesis in plants: the first step of the pterin branch is mediated by a unique bimodular GTP cyclohydrolase, I. *Proc Nat Acad Sci.*, **99**, 12489–12494 (2002)

53. Basset G.J.C., Quinlivan E.P., Gregory J.F.I. and Hanson A.D., Folate synthesis and metabolism in plants and prospects for biofortification, *Crop Sci.*, **45**, 449–453 (2005).

(Received 13<sup>th</sup> April 2019, accepted 14<sup>th</sup> July 2019)

21. Green Synthesis and Characterization of Y<sub>2</sub>O<sub>3</sub> Nano particles

ISSN: 2455-2631

© June 2020 IJSDR | Volume 5, Issue 6

Green Synthesis and Characterization of Y<sub>2</sub>O<sub>3</sub> nanoparticles<sup>1</sup>Sanjay R. Kale\*, <sup>2</sup>Dilip R. Thube<sup>1</sup>Associate Professor, Department of Chemistry, Tuljaram Chaturchand College of Arts, Science and Commerce, Baranuti, 413 102, Dist. Pune, Maharashtra.<sup>2</sup>Professor, Department of Chemistry and Research Center, New Arts Commerce and Science College, Parner, 414 302 Dist- Ahmednagar, Maharashtra.

**Abstract:** In the present study, the Green synthesis of Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>) nanoparticles was carried out using *Aegle Marmelos* (Bael) leaves aqueous extract as a precipitating and capping agent. The synthesized metal complex was calcined at 800°C. The produced nanoparticles (NPs) were characterized by using various instrumental techniques for its crystalline nature and surface morphology. The XRD and SEM analysis confirmed the presence of cubic structure of agglomerated Y<sub>2</sub>O<sub>3</sub> NPs with particle size ~ 35 nm. The EDX analysis identifies the presence of elements yttrium and oxygen. FTIR analysis gave the evidences for presence of Y–O–Y and O–Y–O metal oxide stretching in the range 450-550 cm<sup>-1</sup>. The UV-visible spectroscopic analysis showed that for the scanned suspended metal oxide was in the UV range which is an indication of the formation of nano-sized material. TGA gave the thermal stability of Y<sub>2</sub>O<sub>3</sub> NPs. This study confidently describes an eco-friendly, nontoxic, economical and effective green process to synthesis *Aegle Marmelos* leaves extract mediated Y<sub>2</sub>O<sub>3</sub> NPs, which can be useful due to their remarkable properties.

**Index Terms:** Green synthesis; *Aegle Marmelos*; Yttrium oxide; nanoparticle; calcination

## I. INTRODUCTION

Nanosized inner transition metal oxides can be effectively synthesized using with different methodologies which include chemical, electrochemical, radiation and biological techniques. The synthetic methods involve use of toxic, hazardous chemicals which are harmful and can leads to increase the risks of bioaccumulation followed by bio magnifications. Therefore, it is need of time to develop an eco-friendly method to synthesize nanoparticles. Nowadays green route can be adopted in the synthesis of metal and metal oxide nanoparticles using plant material. The leaves extract mediated method is one of the environmentally conscious as it eliminates toxic chemicals formed as by-product in certain chemical reactions and removes use of organic solvents. Also it is much more superior over some physical, chemical or microbiological methods as it is environmentally friendly, of low cost and can be adopted for large scale preparations. An eco-friendly (green) approach by employing several plants such as Alfalfa [1], Aloe Vera [2] has been reported. Green synthesis of gold and silver nanoparticles has been reported [3] to obtain a wide range of sizes and shapes of NPs. During the green synthesis, the plant extract can act both as stabilizing and capping agents and the surface morphology and size of metal oxide nanoparticles are highly depends on the plant extract material [4]. The metal and metal oxides nanoparticles have been considered as promising material that possesses remarkable antibacterial properties caused by their high surface area [5]. To control and minimize the problems caused by the bacteria, Y<sub>2</sub>O<sub>3</sub> NPs is one of the key materials which can act in a non-toxic way to environment. Therefore, in this study we use leaves extract of *Aegle Marmelos* plant to synthesize Y<sub>2</sub>O<sub>3</sub> NPs and further applied for antibacterial activity. The *Aegle Marmelos* is a traditional plant also known as Bael belongs to Rutaceae family and have been used in medicine and medical applications to cure ophthalmia, cataract, deafness, aggravations, diabetes and asthma throughout centuries in India. The leaves extract of *Aegle Marmelos* was used to synthesize ZnO nanoparticles [6] and Silver nanoparticles [7] for their antimicrobial activity had been reported. Biosynthesis of Y<sub>2</sub>O<sub>3</sub> nanoparticles using *Acalypha Indica* leaf extract and their antibacterial study [8] has been reported. Green synthesis and characterization of Y<sub>2</sub>O<sub>3</sub>, CuO and BaCO<sub>3</sub> nanoparticles using *Azadirachta Indica* (Neem tree) fruit aqueous extract has been reported [9].

Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>) is an important compound among rare earth oxides with controllable size and morphology which may have better sintering ability and unique luminescent property has been actively studied in the recent years for its applications in the field of transparent ceramics [10] luminescent devices [11] and humidity sensor [12]. Y<sub>2</sub>O<sub>3</sub> is a well-known and widely used as a host material for various rare earth dopants in the field of biological imaging and photodynamic therapy [13], still there is no report found which give green and eco-friendly synthesis of Y<sub>2</sub>O<sub>3</sub> NPs using aqueous leaves extract of *Aegle Marmelos* (Bael tree) as a precipitant and capping agent. The precipitation of yttrium hydroxides from yttrium nitrate solution takes place and the formed product after thermal decomposition and calcinations yields Y<sub>2</sub>O<sub>3</sub>. The synthesized pure Y<sub>2</sub>O<sub>3</sub> NPs were characterized by using various instrumental techniques.

## II. MATERIALS AND METHODS

Yttrium nitrate hexahydrate [Y(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O] was purchased from Alfa Aesar and used further directly without purification. The leaves of *Aegle Marmelos* (Bael tree) were collected from own field, washed thoroughly with double distilled water and dried for ten days at room temperature.

### Preparation of leaves extract by extraction process

The dried and finely cut leaves were grinded in mortar and pestle to obtained fine powder. About 30 gm powder was boiled to extract the phytochemicals in a 250 ml Erlenmeyer flask with 100 ml double distilled water for 60 minutes. Then the aqueous solution was taken for filtration using ordinary filter paper and through Whatman No. 1 filter paper. The filtrate was collected and evaporated on water bath. The extract thus formed was stored in a refrigerator and used for further synthesis of Y<sub>2</sub>O<sub>3</sub> NPs.

**Green Synthesis of Aegle Marmelos mediated Y<sub>2</sub>O<sub>3</sub> NPs**

The 0.1 M aqueous solution of [Y(NO<sub>3</sub>)<sub>3</sub>. 6H<sub>2</sub>O] was prepared and used for further experiment. About 100 ml of 0.1 M aqueous solution of [Y(NO<sub>3</sub>)<sub>3</sub>. 6H<sub>2</sub>O] was taken in 500 ml beaker and 50 ml leaves extract was added in it. This resultant solution was stirred at 70°C for three hours. The particle formed was collected by centrifugation at 10,000 rpm for 10 min. The centrifuged sample was washed with deionized water and again subjected to centrifugation at 1500 rpm for 30 min. The centrifuged particles dried in an air oven at 100°C for 2 hours and then powdered using mortar and pestle. This powdered sample was sintered and calcined in a muffle furnace at 800°C for 4 hours to obtain Y<sub>2</sub>O<sub>3</sub> NPs.

**Characterization**

The characterization of formed Y<sub>2</sub>O<sub>3</sub> NPs for its crystalline nature and surface morphology was carried out using various instruments like, X-ray Diffractometer (powder method) Pan analytical XPert Pro system using CuKα1 (1.540 Å) radiation, Scanning Electron Microscope model JSM 6100 (Jeol) with image analyzer at various magnifications. The detail elemental composition was obtained using elemental analyzer. (Thermo Scientific). The FTIR spectra were obtained using Shimadzu IR Affinity (Diamond ATR) FTIR spectrophotometer in the diffuse reflection mode. The TGA was done on VHS model under nitrogen flow condition. The UV-VIS spectra of Y<sub>2</sub>O<sub>3</sub> NPs were obtained on Shimadzu UV-1800 Spectrophotometer.

**III. RESULT AND DISCUSSION**

**Determination of crystalline nature by XRD Analysis**

The XRD result of Y<sub>2</sub>O<sub>3</sub> sample prepared by green synthesis method is shown in Fig. 1.

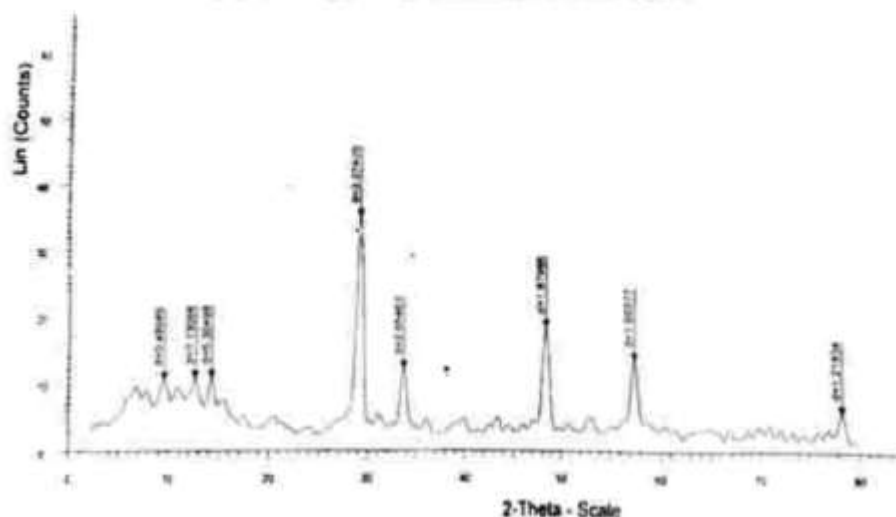


Figure. 1: XRD spectra of Aegle Marmelos mediated Y<sub>2</sub>O<sub>3</sub> nanoparticles

This result is exactly matches with standard diffraction data of cubic Y<sub>2</sub>O<sub>3</sub> as per the Joint Committee on Powder Diffraction Standards (JCPDS) Card No. 83-0927 and this can be used as the reference. The high intensity of the diffraction peaks indicates presence of good crystallites nanoparticles. The lattice d - spacing is calculated by using Bragg's equation,  $n \lambda = 2d \sin \theta$ . The lattice constants can be determined by using relation,  $a = d (h^2 + k^2 + l^2)^{1/2}$

The average crystalline size (D) was estimated from the full width at half maximum (FWHM) of the strongest diffraction peak using the Scherrer formula, [14, 15]  $D = \frac{0.9 \lambda}{\beta \cos \theta}$ , where λ is the wavelength of the incident X-ray (λ=1.544 Å), θ is the corresponding Bragg's diffraction angle (2θ = 29.1343°, θ= 14.567°) and β is the FWHM of the (222) peak (FWHM= 0.4120). The calculated crystalline size is 36.41 nm for the Y<sub>2</sub>O<sub>3</sub> sample. The calculated structural parameters are shown in table 1.

Table 1. Structural Parameters of Y<sub>2</sub>O<sub>3</sub> nanoparticles

2θ (°)	d (Å <sup>2</sup> )	Crystallite Size, D (nm)	Average D (nm)	a (Å <sup>3</sup> ) Calculated	(Å <sup>3</sup> ) Average
14.48	6.3049	34.84	34.8360	10.2686	10.06
29.14	3.0700	36.40		10.6348	
33.70	2.6646	30.96		10.6584	
48.50	1.8799	40.24		10.6343	
57.60	1.6037	31.74		11.1107	

#### Surface Morphology and Structural study by SEM Analysis

The surface morphology of synthesized  $Y_2O_3$  metal oxide was studied by SEM and the obtained images are shown in fig. 2, it gives evidence for the presence of agglomerated nanoparticles having spherical shape. This is due to high surface energy of nanoparticles which leads to quite strong tendency to form agglomerates. The image under high magnification shows the presence of several irregular shaped small particles over the surfaces of large spherical particles. This formation of small particles is may be due to liberation of large amount of gases during the sintering and calcinations at higher temperature [16].

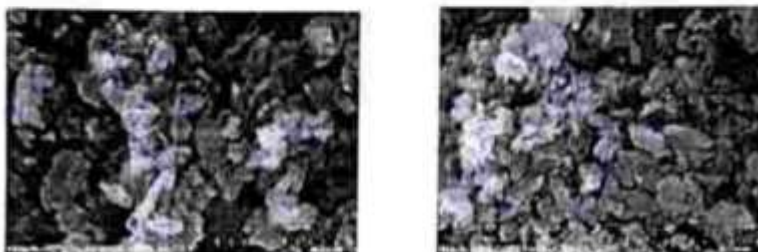


Figure. 2: FESEM images of *Aegle Marmelos* mediated  $Y_2O_3$  nanoparticles.

The SEM images under high magnification confirmed that the  $Y_2O_3$  NPs are distributed randomly containing elliptically spherical particles with various sizes. Most of the NPs are homogenous and were well arranged while some of them are partially aggregated. The SEM analysis confirms the presence of plate/sheet-like and spherical particles of nearly uniform size however, agglomeration of particles is also indicated.

#### Elemental analysis by EDX study

The EDX spectrum for elemental analysis of  $Y_2O_3$  sample is shown in Fig. 3, it represents characteristic and distinct lines for the major emission energies of elemental yttrium (L) and oxygen (K) and corresponding peaks in the spectrum.

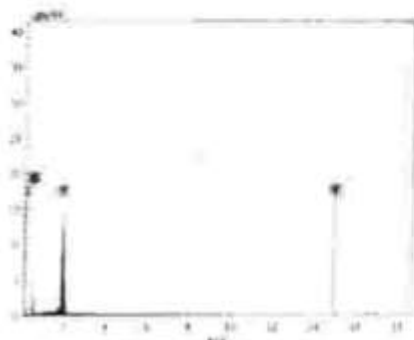


Figure 3 EDX spectrum of  $Y_2O_3$  NPs

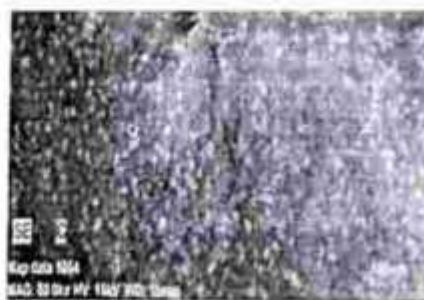


Figure 4 Image of elemental composition

Fig. 4 shows the elemental composition of synthesized  $Y_2O_3$  NPs using *Aegle Marmelos* aqueous leaves extract. These observations give confidence that yttrium and oxygen has been correctly identified in  $Y_2O_3$  sample prepared by green synthesis method.

**Functional group study by FTIR analysis**

The FTIR spectrum of  $Y_2O_3$  is shown in Fig. 5.

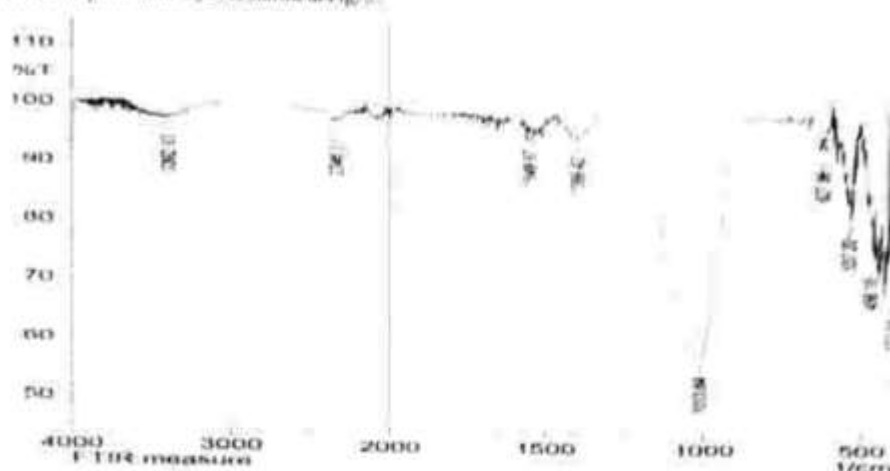


Figure 5 FTIR spectrum of *Aegle Marmelos* mediated  $Y_2O_3$  nanoparticles

There are an absorption peaks at 3393, 2346, 1550, 1399, 1014, 628, 537 and 459  $cm^{-1}$ . The peak at 3393  $cm^{-1}$  corresponds to presence of adsorbed  $H_2O$  molecule. The peak at 2346  $cm^{-1}$  is due to  $O=C=O$  stretching vibration mode while the peaks at 1550 and 1399  $cm^{-1}$  are due to presence of stretching mode of  $CO_3^{2-}$  linkage. The peak at 1014  $cm^{-1}$  is due to the characteristic stretching of vibration of  $O-H$  bonds. The peak at 628  $cm^{-1}$  indicates presence of  $C-O$  bending mode. The intense peak at 537  $cm^{-1}$  corresponds to the anti-symmetric  $Y-O-Y$  stretching mode of the surface-bridging oxide. The sharp peak appears at 459  $cm^{-1}$  assigned to symmetric stretching vibration  $O-Y-O$  linkage present in  $Y_2O_3$  nanoparticles.

In this study the aqueous extract of *Aegle Marmelos* plant leaves is used as a capping and precipitating agent. The phytochemicals such as alkaloids, phenolic and flavonoids of *Aegle Marmelos* might be a capping agent for  $Y_2O_3$  NPs synthesis. The report [17] about qualitative analysis describe that the phenolic content was high in aqueous leaves extract of *Aegle Marmelos* plant. During this study we confirmed the presence of phenolic compounds in extract by carrying out the preliminary test for phenols. In the aqueous extract of *Aegle Marmelos* we added few drops of Ferric Chloride ( $FeCl_3$ ) solution; an intense green colour was obtained. This qualitative test confirms the presence of phenolic compound in the extract.

The functional groups in *Aegle Marmelos* leaves extract was analyzed by Fourier transmission infrared spectroscopy. The FTIR spectrum of extract is represented in fig. 6

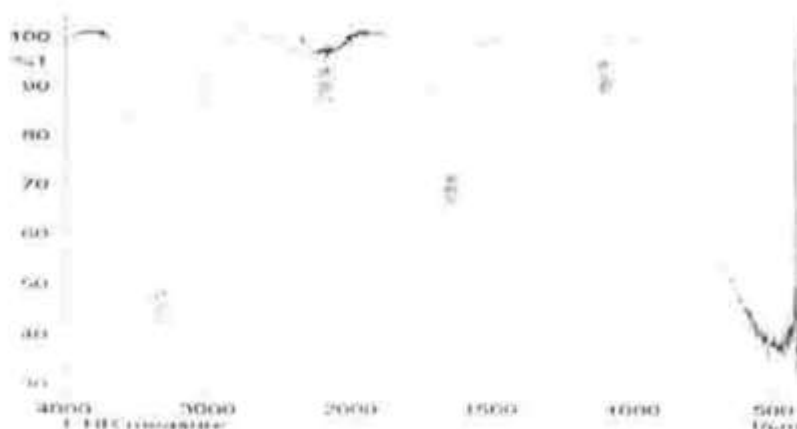


Figure 6 FTIR spectrum of the aqueous leaves extract of *Aegle Marmelos*

It shows peaks around 1091  $cm^{-1}$  which are corresponding to  $C-O$  stretching of ester. The strong peak at 1638  $cm^{-1}$  corresponding to amide and the broad peak at 3316  $cm^{-1}$  appears for the  $O-H$  group of phenolic compounds. The  $O-H$  group peak at 3316  $cm^{-1}$



ISSN: 2455-2631

© June 2020 IJSDR | Volume 5, Issue 6

was reduced and it can be seen in FTIR of  $Y_2O_3$  NPs (fig. 4). The absorption of organic composition was almost disappeared after sintering the synthesized product at 800 °C. It can be confirmed that phenolic group present in aqueous leaves extract of *Aegle Marmelos*, is responsible for the synthesis of  $Y_2O_3$  nanoparticles.

**UV-VIS Spectroscopic Analysis**

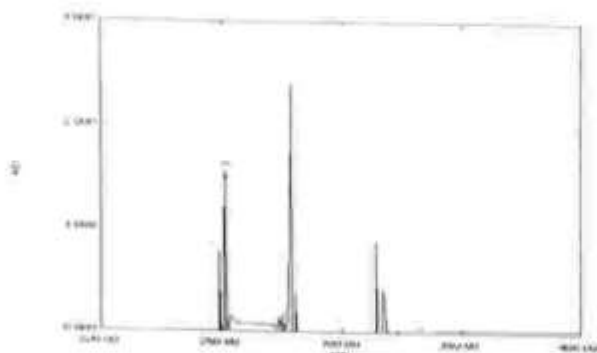


Figure 7 The UV-VIS absorption spectrum of  $Y_2O_3$  prepared by green synthesis method.

Synthesis of  $Y_2O_3$  NPs by green method was confirmed by using UV-VIS spectrophotometer in the range of wavelength from 200 to 800 nm. The formed  $Y_2O_3$  NPs are dissolved in dil.  $HNO_3$  and the obtained absorption spectrum is shown in Fig. 7. The absorption spectrum shows the sharp and intense peak at 278 nm which confirms presence of Y-O-Y linkage in  $Y_2O_3$  sample prepared by green synthesis method. This absorption strongly depends on the particle size, chemical surrounding and dielectric medium [18].

**Thermal stability study by TG analysis**

The thermal stability of synthesized nanoparticles can be studied by TGA. Fig. 8 represents TGA plot (% W w/s T) obtained during decomposition of the synthesized material.

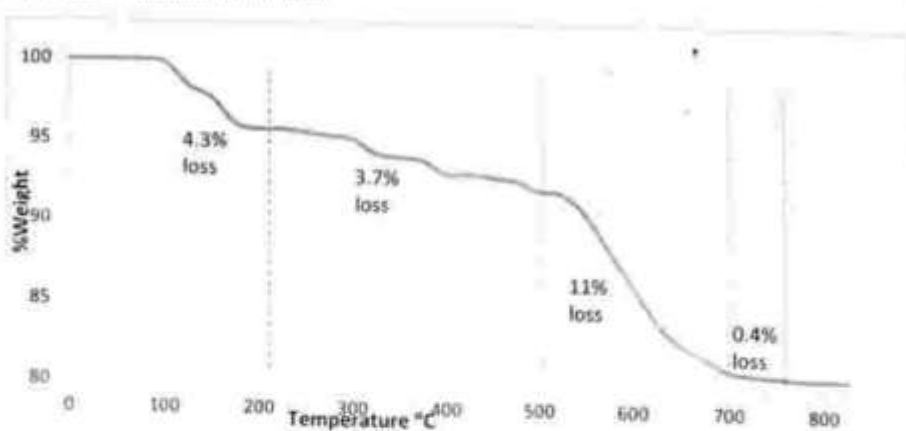


Figure 8 Thermal gravimetric analysis (TGA) curve of dried sample.

The sample is heated at a constant rate of 4 °C per min. under  $N_2$  atmosphere to avoid any premature oxidation and combustion of capping agent. In TG analysis, there is gradual weight loss about 4.3% up to 200° C indicates the removal of adsorbed water molecules from the nanoparticles and then on further heating the weight loss about 3.7% up to 500° C and about 11% at 700° C denotes the breakdown and evaporation of water of crystallization and decomposition of organic constituents. After further heating up to 775° C very less weight loss about 0.4% was observed. Afterwards no significant weight loss was observed at and above 800° C which indicates formation of metal oxide,  $Y_2O_3$ . Thus, the TG analysis confirmed the formation of crystalline  $Y_2O_3$  nanoparticles occurs at about 800° C [19].

ISSN: 2455-2631

© June 2020 USDR | Volume 5, Issue 6

**CONCLUSION**

Yttrium oxide NPs were synthesized successfully by *Aegle Marmelos* mediated green method. Characterization of powder after synthesis and calcination at 800°C, by various techniques indicates the presence of pure, crystalline, thermally stable and spherical shaped  $Y_2O_3$  nanoparticles. The mean size range of crystallites (by XRD) was about 35 nm. Also, it has been proved that these NPs are having elemental composition of Yttrium and Oxygen with Y-O-Y metal oxide linkage in their cubic structure. The achievement of such green synthesis of *Aegle Marmelos* mediated  $Y_2O_3$  nanoparticles could be the alternative and be useful in the field of biomedicine. Therefore, this green method is one of the eco-friendly, economical and effective process to synthesis  $Y_2O_3$  NPs and it may lead to the further study on *Aegle Marmelos* in the area of biomedical and nanotechnology.

**REFERENCES**

- [1] Jorge L Gardea-Torresdey, Eduardo Gomez, Jose R Peralta-Videa et al., " Alfalfa Sprouts: A natural source for the synthesis of silver nanoparticles" *Langmuir*, Vol. 19, Issue 4, pp 1357-1361 (2003)
- [2] S. Pratap Chandran, Minakshi Chaudhary, Renu Paricha et al., "Synthesis of Gold nanotriangles and Silver nanoparticles using Aloe Vera plant extract" *Biotechnology. Progress*, Vol. 22 Issue 2 pp 577-583 (2006)
- [3] Nagajyothi P.T., Sreekanth V. M., " Green Processes for Nanotechnology" Springer International Publishing, Switzerland, 99-117, (2015)
- [4] Fernandez-Garcia M, Rodriguez J A, "Metal oxide nanoparticles" *Encyclopedia Inorganic Bioinorganic Chemistry*, CSIC, Madrid, Spain and Brookhaven National Laboratory, Upton, NY, USA (2011)
- [5] Mirzaei H, Darroudi M, " Zinc oxide nanoparticles: Biological synthesis and biomedical applications" *International Journal of Ceramic*, 43, pp 907-914 (2017)
- [6] J. Fowsiya, I V Asharani, G. Madhumitha et al., " Aegle Marmelos phytochemical stabilized synthesis and characterization of ZnO nanoparticles and their role against agriculture and food pathogen" *Green Process Synth*, 8, pp 488-495, (2019)
- [7] Sunita Patil, Rajeshwari Shivraj, P. Rajiv et al., " Green synthesis of silver nanoparticles from *Aegle Marmelos* and evaluation of its antibacterial activity" *International Journal of Pharmacy and Pharmaceutical Sciences*, Vol. 7, Issue 6, pp 169-173, (2015)
- [8] S K Kannan and M Sundarajan "Biosynthesis of Yttrium Oxide nanoparticles using *Acalypha indica* Leaf extract" *Bull. Mater. Sci.*, Vol. 38, No. 4, pp 945-950 © Indian Academy of Sciences. (August, 2015)
- [9] Imad Hamadneh, Hadeel Alhayek, Ahmed Al-Mobydeen et al., " Green synthesis and characterization of Yttrium oxide, Copper oxide and Barium carbonate nanoparticles using *Azadirachta Indica* fruit aqueous extract" *Egyptian Journal of Chemistry*, Vol. 62, No. 4, pp 573-581, (2019)
- [10] B N Kim, K Hiraga, K Moryta K et al., " A high strain rate superplastic Ceramic" *Nature*, Sep 20; 413(6853) pp 288-291 (2001)
- [11] Vijay Singh, N. Singh, Nitin Jadhav et al., "Photoluminescence and electron paramagnetic response properties of phosphor" *Optik- International Journal for light and electron optic*, 176, pp 694-698, (2019)
- [12] A M Edwin, Suresh Raj, C Maria Magdalane et al., " Zinc(II) oxide -Yttrium (III) oxide composite Humidity Sensor" *Physica Status Solidi(a)* Vol. 191, Issue 1 pp 1230 (2002)
- [13] Tamar Andelman, Simon Gordonov, Prabhas V. Moghe et al., "Synthesis and cytotoxicity of  $Y_2O_3$  nanoparticles of various morphologies" *Nanoscale Res. Lett.* 5, pp 263-273 (2010)
- [14] A L Patterson, "The diffraction of X-Rays by small crystalline particles" *Physical. Review Journals Archive* 56, pp 978-982 (1939)
- [15] Nath SS, Chakdar D, Gope G, "Synthesis of CdS and ZnS quantum dots and their applications in electronics" *Nanotrends-A, Journal, of Nanotechnology Applications :2 Supplement* 3:20-8, (2007)
- [16] Vijay Singh, K N Shinde, M S Pathak et al., "Green emission from Tb<sup>3+</sup> doped Ca:Al<sub>2</sub>O<sub>3</sub> Phosphor" *Optik- International Journal for light and electron optics*: 164, pp 407-413 (2018)
- [17] Farina Mujeeb, Preeti Bajpai, Neelam Pathak, "Phytochemical evaluation, antibacterial activity and determination of bioactive components from leaves of *Aegle Marmelos*" *BioMed Research International*. Article ID 497606, 11 pages (2014)
- [18] Link S, El-Sayed M A, "Optical properties and ultrafast dynamics of metallic nanocrystals" *Annual Review Physical Chemistry* 54; 331-66, (2003)
- [19] Kwang-Jin Jeong and Dong-Sik Bae, "Synthesis and characterization of  $Y_2O_3$  powder by modified solvothermal process" *Korean Journal of Material Research* Vol. 22, No. 2 pp 78-81 (2012)

  
 DR. B. R. THUBE  
 RESEARCH GUIDE IN CHEMISTRY  
 New Arts, Commerce & Science College  
 Parner, Dist. Solapur

USDR2006049

International Journal of Scientific Development and Research (IJSDR) [www.usdr.org](http://www.usdr.org)

303

## 22. Synthesis of New Thiazole Anchored N'-Benzylidene Carbohydrazone and 1,3,4-Oxadiazole Derivatives by Conventional and Microwave Irradiation Methods

Indian Journal of Heterocyclic Chemistry

Vol. 30 - Number 04 (Oct-Dec 2020) 607-613

DocID: <https://connectjournals.com/01951.2020.30.607>

ISSN (Print) : 0971-1627

ISSN (Online) : 2456-4311

### Synthesis of New Thiazole Anchored N'-Benzylidene Carbohydrazone and 1,3,4-Oxadiazole Derivatives by Conventional and Microwave Irradiation Methods

Vaibhav P. Landage<sup>1</sup>, Hemantkumar N. Akolkar<sup>2</sup>, Dilip R. Thube<sup>1\*</sup>, Bhausaheb K. Karale<sup>2</sup>

<sup>1</sup>Department of Chemistry, Ahmednagar Jilha Maratha Vidya Prasarak Samaj's New Arts, Commerce and Science College, Savitribai Phule Pune University, Parner, Ahmednagar, Maharashtra, India

<sup>2</sup>Department of Chemistry, Rayat Shikshan Sanstha's Radhabai Kale Mahila Mahavidyalaya, Savitribai Phule Pune University, Ahmednagar, Maharashtra, India

**ABSTRACT** The 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazone (**3**) and aromatic aldehydes (**4**) were heated together in alcohol under reflux and microwave (MW) irradiation, to get new series of thiazolyl benzylidene carbohydrazides **5A-K**, which in turn under the influence of reflux and MW irradiation, cyclized with acetic anhydride and propionic anhydride to achieve thiazolyl 1,3,4-oxadiazole derivatives **6A-K** and **7A-K**, respectively. The structures of newly synthesized compounds were confirmed by spectral and elemental analysis.

**KEYWORDS** Benzylidene carbohydrazone, Oxadiazole, Thiazole, MW irradiation.

**How to cite this article:** Landage, V.P., Akolkar, H.N., Thube, D.R., Karale B.K. Synthesis of New Thiazole Anchored N'-Benzylidene Carbohydrazone and 1,3,4-Oxadiazole Derivatives by Conventional and Microwave Irradiation Methods, *Indian J. Heterocycl. Chem.*, 2020, 30, 607-613. (DocID: <https://connectjournals.com/01951.2020.30.607>)

#### INTRODUCTION

In recent years, drug resistivity of microbes has been increased tremendously; therefore, it is necessary to propose new effective drug. For design of new drug, heterocyclic compound plays an important role due to their admirable biological potential. Literature survey reveals that in last few decades 1, 3-thiazole derivatives have received much attention due to their varied range of biological activities that include antimicrobial,<sup>[1]</sup> anticonvulsant,<sup>[2]</sup> potent and selective acetyl CoA carboxylase-2-inhibitors,<sup>[3]</sup> antioxidant,<sup>[4]</sup> antitubercular,<sup>[5]</sup> anticancer,<sup>[6]</sup> antitumor,<sup>[7]</sup> antihypertension,<sup>[8]</sup> anti-HIV,<sup>[9]</sup> and analgesic.<sup>[10]</sup> Thiazole derivatives are a key component of drugs such as Cefixime (antibiotic drug),<sup>[11]</sup> Dasatinib (anticancer drug),<sup>[12]</sup> and Nitazoxanide (antiparasitic drug)<sup>[13]</sup> [Figure 1].

Among the halogen family, chlorine is the one which is commonly found in drugs. The chlorinated heterocyclic

compounds exhibit biological activities such as antibacterial and antifungal,<sup>[14]</sup> α-amylase inhibitor,<sup>[15]</sup> potent cannabinoid type 1 receptor antagonist,<sup>[16]</sup> and antioxidant and anti-urease.<sup>[17]</sup> Chlorine containing drugs have been reported in the market as Clonidine (antihypertensive)<sup>[18]</sup> and Pathocil (anti-infective)<sup>[19]</sup> [Figure 2].

Carbohydrazone derivatives are an important class in heterocyclic synthesis and have been reported to have biological activities such as antimicrobial,<sup>[20]</sup> antioxidant,<sup>[21]</sup> anticancer,<sup>[22]</sup> antitumor,<sup>[23]</sup> antiviral,<sup>[24]</sup> antifungal,<sup>[25]</sup> antitubercular,<sup>[26]</sup> antiparasitic,<sup>[27]</sup> and insecticidal.<sup>[28]</sup> Drugs that contain carbohydrazone derivatives have been reported as Nifuroxazide (antibiotic)<sup>[29]</sup> and Pymetrozine (insecticide)<sup>[30]</sup> [Figure 3].

1,3,4-Oxadiazole derivatives have been shown to possess broad range biological behavior as anticancer,<sup>[31]</sup> antiviral,<sup>[32]</sup> antibacterial,<sup>[33]</sup> anticonvulsant,<sup>[34]</sup> analgesic,<sup>[35]</sup> anti-inflammatory,<sup>[36]</sup> and antiallergic.<sup>[37]</sup> The drug molecules that

\*Corresponding author: E-mail: drthube@rediffmail.com


  
 www.connectjournals.com/ijhc

©2020 Connect Journals

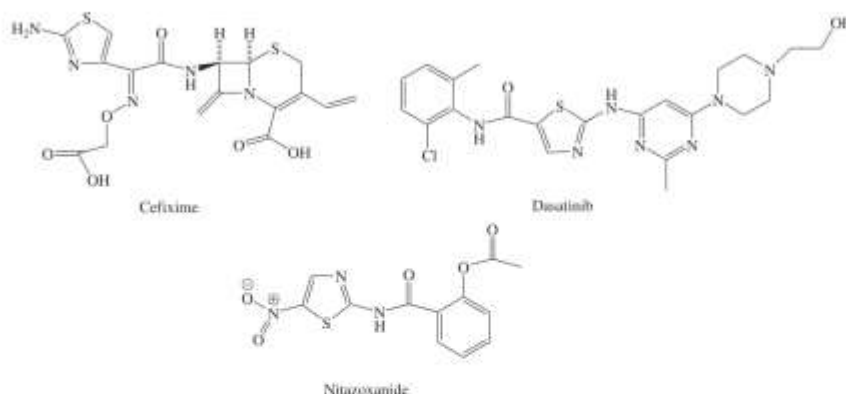


Figure 1: Drug molecules containing thiazole moiety

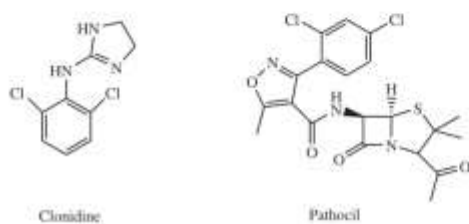


Figure 2: Chlorine containing drug molecules

containing 1,3,4-oxadiazole derivatives have been reported as Raltegravir (antiretroviral drug)<sup>[17]</sup> and Zibotentan (anticancer drug).<sup>[17]</sup> [Figure 4].

The use of microwave (MW) irradiation in organic synthesis is an emerging technique at an accelerated rate.<sup>[18]</sup> The most advantage of this method is the in-core heating of the reactant compound in a homogeneous manner<sup>[19]</sup> and chemical synthesis is pollution-free and ecofriendly.<sup>[18]</sup> Above synthetic and biological importance of carbohydrazide and oxadiazole derivatives promoted us to synthesize a new series of thiazolyl benzylidene carbohydrazide and 1,3,4-oxadiazole derivatives.

## RESULTS AND DISCUSSION

In the present study, the conventional and non-conventional synthesis of new benzylidene carbohydrazide derivatives and 1,3,4-oxadiazole derivatives were anticipated according to Scheme 1. The structures of newly synthesized compounds were recognized by taking spectral data such as proton nuclear magnetic resonance (<sup>1</sup>H NMR), fourier-transform infrared (FT-IR), and mass spectrometry (MS). Eleven benzylidene carbohydrazide derivatives 5A-K and twenty-two 1,3,4-oxadiazole derivatives 6-7A-K were synthesized and characterized [Table 1]. Data of all the FT-IR, <sup>1</sup>H NMR and liquid chromatography-MS spectra were precise according to the proposed structures of the

final compounds (5, 6 and 7 A-K). Elemental data were also in an acceptable range to confirm the formation of these derivatives.

We carried out the proposed synthesis of (*E*)-*N'*-benzylidene-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazides 5A-K by refluxing in ethanol and under MW irradiation, using an equimolar mixture of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide (3) and aromatic aldehydes 4A-K. The intermediate (*E*)-*N'*-benzylidene-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazides 5A-K underwent cyclisation with acetic and propionic anhydride by refluxing and under MW irradiation, thereby producing thiazolyl oxadiazole derivatives namely, 1-(5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-2-phenyl-1,3,4-oxadiazole-(2*H*)-yl) ethanones 6A-K and 1-(5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-2-phenyl-1,3,4-oxadiazole-(2*H*)-yl) propanones 7A-K, respectively.

Then, we set the reaction in MW irradiation in per minute using different power range from 300 to 450 W. The % yield data [Table 1] show that synthesis of these new thiazolyl-*N'*-benzylidene carbohydrazide and 1,3,4-oxadiazole derivatives using MW method is superior than the conventional one.

## EXPERIMENTAL SECTION

The chemicals used were of AR grade. Melting points were determined by an open capillary method and are uncorrected. The homogeneity of compounds was checked on silica gel thin-layer chromatography (TLC) plates. IR spectra were recorded on a FT-IR spectrophotometer RZX (Perkin Elmer) and mass spectra were recorded on a Q-TOF MICRO WATER, MS ES+3.79e3. <sup>1</sup>H NMR spectra were recorded on a BRUKER AVANCE NEO 500 NMR spectrometer with DMSO-*d*<sub>6</sub> as a solvent and chemical shift (δ) are expressed in ppm using TMS as internal standard.

Vaibhav P. Landage *et al.*

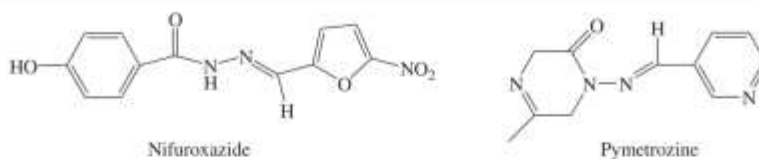


Figure 3: Drug molecules containing carbohydrazone moiety

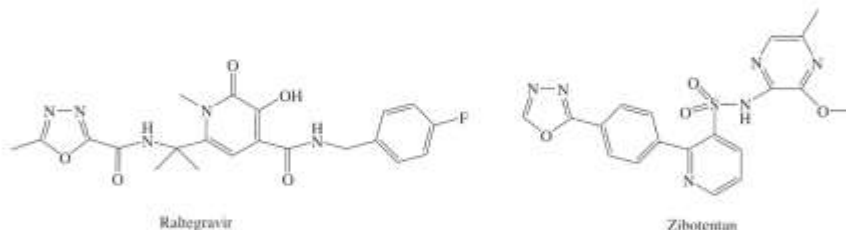
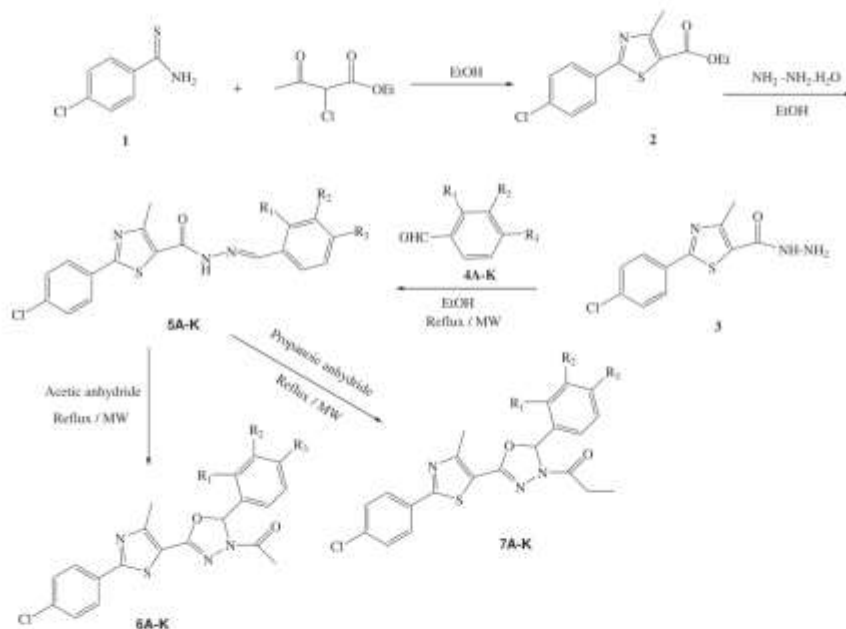


Figure 4: Drug molecules containing oxadiazole moiety



Scheme 1: Synthesis of thiazolyl N'-benzylidene carbohydrazide and 1,3,4-oxadiazole derivatives

**General procedures**

**(E)-N'-Benzylidene-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazides, 5A-K**

**Conventional method**

An equimolar mixture of 2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide (0.01 mole) **3** and aromatic aldehyde **4** (0.01 mole) with 3 drops of conc. H<sub>2</sub>SO<sub>4</sub> was refluxed in alcohol for about 1–2 h. After completion of reaction (checked by TLC), thus obtained solid product

was cooled, filtered, and recrystallized from alcohol to give benzylidene carbohydrazide **5**.

**MW irradiation, non-conventional method**

An equimolar mixture of compound **3** (0.01 mole) and aromatic aldehyde **4** (0.01 mole) with 3 drops of conc. H<sub>2</sub>SO<sub>4</sub> in the soluble amount of alcohol was MW irradiated at 450 W first about 3–4 min. Then after, per interval of 1 min till completion of reaction (checked by TLC), thus obtained solid product was cooled, filtered and recrystallized from alcohol to give benzylidene carbohydrazide **5**.



Table 1: Physical data of the synthesized compounds

Compounds	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	M.P. (°C)	Conventional method		Microwave method	
					Time (min)	Yield* (%)	Time (min)	Yield* (%)
5A	H	H	Cl	278-280	80	66	5	89
5B	H	H	Br	286-288	80	63	6	90
5C	H	H	OH	266-268	90	68	9	86
5D	Cl	H	H	280-282	80	65	6	78
5E	H	H	H	250-252	85	70	4	85
5F	H	H	OCH <sub>3</sub>	260-262	90	61	7	85
5G	H	H	NO <sub>2</sub>	288-290	75	77	3	91
5H	NO <sub>2</sub>	H	H	282-284	75	75	4	90
5I	OH	H	OCH <sub>3</sub>	276-278	90	65	8	88
5J	H	OCH <sub>3</sub>	OCH <sub>3</sub>	284-286	100	58	10	80
5K	H	H	CH <sub>3</sub>	268-270	90	61	6	86
6A	H	H	Cl	226-228	190	66	13	79
6B	H	H	Br	228-230	185	63	14	78
6C	H	H	OH	216-218	195	68	17	76
6D	Cl	H	H	224-226	185	65	14	68
6E	H	H	H	210-212	180	70	17	75
6F	H	H	OCH <sub>3</sub>	220-222	195	61	19	75
6G	H	H	NO <sub>2</sub>	200-202	175	77	10	81
6H	NO <sub>2</sub>	H	H	198-200	180	75	12	80
6I	OH	H	OCH <sub>3</sub>	218-220	190	65	14	76
6J	H	OCH <sub>3</sub>	OCH <sub>3</sub>	208-210	194	58	18	70
6K	H	H	CH <sub>3</sub>	206-208	185	61	16	77
7A	H	H	Cl	170-172	180	64	11	79
7B	H	H	Br	200-202	185	70	12	78
7C	H	H	OH	168-170	190	71	15	76
7D	Cl	H	H	172-174	180	60	12	68
7E	H	H	H	164-166	185	65	13	75
7F	H	H	OCH <sub>3</sub>	166-168	190	70	17	75
7G	H	H	NO <sub>2</sub>	174-176	170	75	09	81
7H	NO <sub>2</sub>	H	H	184-186	180	60	10	80
7I	OH	H	OCH <sub>3</sub>	188-190	185	62	12	76
7J	H	OCH <sub>3</sub>	OCH <sub>3</sub>	180-182	190	63	15	70
7K	H	H	CH <sub>3</sub>	170-172	185	60	13	77

\*Isolated yields

5D: (E)-N'-(2-chlorobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3245 (N-H), 3058 (C-H), 1653 (C=O), 1090 (Ar-Cl), 832 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 390.27 (M)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.77 (s, 3H, CH<sub>3</sub>), 7.48 (d, 2H, Ar-H), 7.54 (dd, 1H, Ar-H), 7.62 (d, 2H, Ar-H), 8.03 (m, 3H, Ar-H), 8.55 (s, 1H, N=C-H), 12.08 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>14</sub>OCl<sub>2</sub>N<sub>2</sub>S; C, 55.39; H, 3.36; N, 10.77. Found: C, 55.37; H, 3.34; N, 10.75 %.

5G: (E)-N'-(4-nitrobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3273 (N-H), 3052 (C-H), 1657 (C=C), 1522 (Ar-NO<sub>2</sub>), 1344 (C-N), 1090, 846 (Ar-Cl), 827 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 401.29 (M+1)<sup>+</sup>, 403.29 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.77 (s, 3H, CH<sub>3</sub>),

7.61 (d, 2H, Ar-H), 8.03 (d, 2H, Ar-H), 8.07 (d, 2H, Ar-H), 8.23 (s, 1H, N=C-H), 8.36 (d, 2H, Ar-H), 12.19 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>O<sub>3</sub>ClN<sub>2</sub>S; C, 53.94; H, 3.27; N, 13.98. Found: C, 53.96; H, 3.30; N, 13.96 %.

5H: (E)-N'-(2-nitrobenzylidene)-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide

IR (KBr): 3165 (N-H), 3051 (C-H), 1657 (C=O), 1528 (Ar-NO<sub>2</sub>), 1092 (Ar-Cl), 832 (*p*-disubstituted benzene) cm<sup>-1</sup>; Mass: *m/z* 401.29 (M+1)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.76 (s, 3H, CH<sub>3</sub>), 7.60 (d, 2H, Ar-H), 7.70 (dd, 1H, Ar-H), 7.89 (s, 1H, N=C-H), 8.02 (d, 2H, Ar-H), 8.11 (dd, 1H, Ar-H), 8.14 (d, 1H, Ar-H), 8.55 (s, 1H, N=C-H), 12.18 (s, 1H, NH); Elemental Analysis, Calculated: C<sub>18</sub>H<sub>13</sub>O<sub>3</sub>ClN<sub>2</sub>S; C, 53.94; H, 3.27; N, 13.98. Found: C, 53.97; H, 3.29; N, 13.95 %.



610

Vaibhav P. Landage *et al.*

**1-(5-(2-(4-Chlorophenyl)-4-methylthiazole-5-yl)-2-phenyl-1,3,4-oxadiazole-3(2H)-yl)ethanones, 6A-K**

**Conventional method**

A mixture of (*E*)-*N'*-benzylidene-2-(4-chlorophenyl)-4-methylthiazole-5-carbohydrazide (0.005 mole) **5** and acetic anhydride (5 ml) was heated under reflux about 3–4 h. After completion of reaction (checked by TLC), reaction mixture was poured in crushed ice and stirred vigorously till the solid product gets obtained. Resulted product was filtered and recrystallized from alcohol to give 1, 3-thiazolyl oxadiazole **6**.

**MW irradiation method**

A mixture of compound **5** (0.005 mole) and acetic anhydride (5 ml) was heated under MW irradiation at 450 W, first about 10 min., then after per interval of 1 min, up to completion of reaction (checked by TLC). After completion of reaction, the reaction mixture was poured in crushed ice and stirred vigorously till the solid product gets obtained. The product was filtered and recrystallized from alcohol to give 1, 3-thiazolyl oxadiazole **6**.

**1-(2-(2-chlorophenyl)-5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-1,3,4-oxadiazole-3(2H)-yl)ethanone**

IR (KBr): 3064, 2924 (C-H), 1669 (C=O), 1613 (C=C), 1090 (Ar-Cl), 835 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  4432.23 (M)<sup>+</sup>, 435.22 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.28 (s, 3H, CH<sub>3</sub>), 2.68 (s, 3H, CH<sub>3</sub>), 7.35 (s, 1H, Ar-H), 7.44 (dd, 1H, Ar-H), 7.50 (d, 2H, Ar-H), 7.59 (m, 3H, Ar-H), 8.00 (d, 2H, Ar-H); Elemental Analysis, Calculated: C<sub>20</sub>H<sub>15</sub>O<sub>2</sub>Cl<sub>2</sub>N<sub>3</sub>S; C, 55.26; H, 3.50; N, 9.72. Found: C, 55.28; H, 3.52; N, 9.75 %.

**1-(5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-(2-(4-nitrophenyl)-1,3,4-oxadiazole-3(2H)-yl)ethanone**

IR (KBr): 3054, 2926 (C-H), 1674 (C=O), 1624 (C=C), 1525 (Ar-NO<sub>2</sub>), 1090, 846 (Ar-Cl), 817 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  443.26 (M+1)<sup>+</sup>, 445.25 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.27 (s, 3H, CH<sub>3</sub>), 2.70 (s, 3H, CH<sub>3</sub>), 7.36 (s, 1H, Ar-H), 7.60 (d, 2H, Ar-H), 7.82 (d, 2H, Ar-H), 8.01 (d, 2H, Ar-H), 8.30 (d, 2H, Ar-H); <sup>13</sup>C NMR Elemental Analysis, Calculated: C<sub>20</sub>H<sub>15</sub>O<sub>2</sub>ClN<sub>3</sub>S; C, 54.24; H, 3.41; N, 12.65. Found: C, 54.22; H, 3.43; N, 12.67 %.

**6H: 1-(2-(4-nitrophenyl)-5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-1,3,4-oxadiazole-3(2H)-yl)ethanone**

IR (KBr): 3045, 2928 (C-H), 1665 (C=O), 1624 (C=C), 1535 (Ar-NO<sub>2</sub>), 1088, 831 (Ar-Cl), 813 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  443.24 (M+1)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.27 (s, 3H, CH<sub>3</sub>), 2.65 (s, 3H, CH<sub>3</sub>), 7.57 (s, 1H, Ar-H), 7.58 (d, 2H, Ar-H), 7.67 (dd, 1H, Ar-H), 7.75 (d, 1H, Ar-H), 7.83 (d, 1H, Ar-H), 8.01 (d, 2H, Ar-H), 8.11 (dd, 1H, Ar-H); Elemental Analysis, Calculated: C<sub>20</sub>H<sub>15</sub>O<sub>2</sub>ClN<sub>3</sub>S; C, 54.24; H, 3.41; N, 12.65. Found: C, 54.22; H, 3.43; N, 12.67 %.

The use of propionic anhydride in place of acetic anhydride in the above method (employed for **6A-K**) afforded **7A-K**.

**1-(5-(2-(4-Chlorophenyl)-4-methylthiazole-5-yl)-2-phenyl-1,3,4-oxadiazole-3(2H)-yl)propan-1-ones, 7A-K**

**1-(2-(2-chlorophenyl)-5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-1,3,4-oxadiazole-3(2H)-yl)propan-1-one**

IR (KBr): 3046, 2939 (C-H), 1668 (C=O), 1615 (C=C), 1092 (Ar-Cl), 832 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  446.24 (M)<sup>+</sup>, 449.23 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  1.17 (t, 3H, CH<sub>3</sub>), 2.64 (q, 2H, CH<sub>2</sub>), 2.71 (s, 3H, CH<sub>3</sub>), 7.35 (s, 1H, Ar-H), 7.44 (dd, 1H, Ar-H), 7.50 (d, 2H, Ar-H), 7.59 (m, 3H, Ar-H), 8.00 (d, 2H, Ar-H); Elemental Analysis, Calculated: C<sub>21</sub>H<sub>16</sub>O<sub>2</sub>Cl<sub>2</sub>N<sub>3</sub>S; C, 56.51; H, 3.84; N, 9.41. Found: C, 56.53; H, 3.82; N, 9.44 %.

**1-(5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-(2-(4-nitrophenyl)-1,3,4-oxadiazole-3(2H)-yl)propan-1-one**

IR (KBr): 3084, 2925 (C-H), 1651 (C=O), 1620 (C=C), 1527 (Ar-NO<sub>2</sub>), 1091, 853 (Ar-Cl), 818 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  457.25 (M)<sup>+</sup>, 458.26 (M+1)<sup>+</sup>, 460.26 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  1.06 (t, 3H, CH<sub>3</sub>), 2.65 (q, 2H, CH<sub>2</sub>), 2.69 (s, 3H, CH<sub>3</sub>), 7.35 (s, 1H, Ar-H), 7.59 (d, 2H, Ar-H), 7.81 (d, 2H, Ar-H), 8.01 (d, 2H, Ar-H), 8.30 (d, 2H, Ar-H); Elemental Analysis, Calculated: C<sub>21</sub>H<sub>16</sub>O<sub>2</sub>ClN<sub>3</sub>S; C, 55.20; H, 3.75; N, 12.26. Found: C, 55.22; H, 3.73; N, 12.29 %.

**7H: 1-(2-(2-nitrophenyl)-5-(2-(4-chlorophenyl)-4-methylthiazole-5-yl)-1,3,4-oxadiazole-3(2H)-yl)propan-1-one**

IR (KBr): 3046, 2940 (C-H), 1658 (C=O), 1613 (C=C), 1533 (Ar-NO<sub>2</sub>), 1092, 867 (Ar-Cl), 830 (*p*-disubstituted benzene)  $\text{cm}^{-1}$ ; Mass:  $m/z$  457.24 (M)<sup>+</sup>, 458.24 (M+1)<sup>+</sup>, 460.25 (M+3)<sup>+</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  1.08 (t, 3H, CH<sub>3</sub>), 2.66 (q, 2H, CH<sub>2</sub>), 2.67 (s, 3H, CH<sub>3</sub>), 7.58 (s, 1H, Ar-H), 7.60 (d, 2H, Ar-H), 7.67 (dd, 1H, Ar-H), 7.75 (d, 1H, Ar-H), 7.83 (d, 1H, Ar-H), 8.12 (dd, 1H, Ar-H); Elemental Analysis, Calculated: C<sub>21</sub>H<sub>16</sub>O<sub>2</sub>ClN<sub>3</sub>S; C, 55.20; H, 3.75; N, 12.26. Found: C, 55.22; H, 3.73; N, 12.29 %.

**ACKNOWLEDGMENT**

The authors are thankful to P.G. Department of Chemistry, Rudhabai Kale Mahila Mahavidyalaya, Ahmednagar and P.G. Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar, for providing chemicals and constant encouragement. The authors are also thankful to the Management of Anekant Education Society, Baramati, for providing necessary research facilities and to the Director, SAIF, Punjab University, Chandigarh, for providing spectral and elemental data.

**REFERENCES**

- [1] Nasr, T., Bondock, S., Eid, S. Design, synthesis, antimicrobial evaluation and molecular docking studies of some new 2, 3-dihydrothiazoles and 4-thiazolidinones containing sulfoxazole, *J. Enzyme Inhib. Med. Chem.*, **2016**, *31*, 236–246.

- [2] Amin, K.M., Rahman, A.D.E., Al-Eryani, Y.A. Synthesis and preliminary evaluation of some substituted coumarins as anticonvulsant agents, *Bioorg. Med. Chem.*, **2008**, *16*, 5377–5388.
- [3] Clark, R.F., Zhang, T., Wang, X., Wang, R., Zhang, X., Camp, H.S., Bentel, B.A., Sham, H.L., Gu, Y.G. Phenoxythiazole derivatives as potent and selective acetyl-CoA carboxylase 2 inhibitors: Modulation of isozyme selectivity by incorporation of phenyl ring substituents, *Bioorg. Med. Chem.*, **2007**, *17*, 1961–1965.
- [4] Andreani, A., Leoni, A., Locatelli, A., Rambaldi, M., Cervellati, R., Greco, E., Koudratyuk, T.P., Park, E.J., Huang, K., Breemen, R.B., Pezzuto, J.M. Chemopreventive and antioxidant activity of 6-substituted imidazo [2, 1-b] thiazoles, *Eur. J. Med. Chem.*, **2013**, *68*, 412–421.
- [5] Makam, P., Kankanal, R., Prakash, A., Kannan, T. 2-(2-Hydrazinyl) thiazole derivatives: Design, synthesis and *in vitro* antimycobacterial studies, *Eur. J. Med. Chem.*, **2013**, *69*, 564–576.
- [6] Dawood, K.M., Eldebs, T.M., El-Zahabi, H.S., Yousef, M.H., Metz, P. Synthesis of some new pyrazole-based 1, 3-thiazoles and 1, 3, 4-thiadiazoles as anticancer agents, *Eur. J. Med. Chem.*, **2013**, *70*, 740–749.
- [7] He, H., Wang, X., Shi, L., Yin, W., Yang, Z., He, H., Liang, Y. Synthesis, antitumor activity and mechanism of action of novel 1, 3-thiazole derivatives containing hydrazide-hydrazone and carboxamide moiety, *Bioorg. Med. Chem. Lett.*, **2016**, *26*, 3263–3270.
- [8] Gyoba, J., Shan, S., Roa, W., Bedard, E.L.R. Diagnosing lung cancers through examination of micro-RNA biomarkers in blood, plasma, serum and sputum: A review and summary of current literature, *Int. J. Mol. Sci.*, **2016**, *17*, 494–508.
- [9] Mauss, G., Immendoerfer, U., Koenig, B., Leser, U., Mueller, B., Goody, R., Platt, B. Viral resistance to the thiazolo-iso-indolinones, a new class of non-nucleoside inhibitors of human immunodeficiency virus Type 1 reverse transcriptase, *Antimicrob. Agents Chemother.*, **1993**, *37*, 2612–2617.
- [10] Kalkhambkar, R.G., Kulkarni, G.M., Shivkumar, H., Rao, N.R. Synthesis of novel triheterocyclicthiazoles as anti-inflammatory and analgesic agents, *Eur. J. Med. Chem.*, **2007**, *42*, 1272–1276.
- [11] Moghadam, M.S., Maleki, S., Darabpour, E., Motamedi, H., Nejad, S.M.S. Antibacterial activity of eight Iranian plant extracts against methicillin and cefixime resistant *Staphylococcus aureus* strains, *Asian Pac. J. Trop. Med.*, **2010**, *3*, 262–265.
- [12] Chan, C.M., Jing, X., Pike, L.A., Zhou, Q., Lim, D.J., Sams, S.B., Lund, G.S., Sharma, V., Haugen, B.R., Schweppe, R.E. Targeted inhibition of src kinase with dasatinib blocks thyroid cancer growth and metastasis, *Clin. Cancer Res.*, **2012**, *18*, 3580–3591.
- [13] Zhu, G.F., Leng, J., Darshini, N., Shubhavathi, T., Vivek, H.K., Asiri, A.M., Marwani, H.M., Rakesh, K.P., Mallesha, N., Qin, H.L. Synthesis, SAR and molecular docking studies of benzod[thiazole]hydrazones as potential antibacterial and antifungal agents, *Bioorg. Med. Chem. Lett.*, **2017**, *27*, 3148–3155.
- [14] Tahaa, M., Baharudin, M.S., Ismail, N.H., Imran, S., Khand, M.N., Rahime, F., Selvaraj, M., Chigurupati, S., Nawaz, M., Qureshi, F., Vijayahalan, S. Synthesis,  $\alpha$ -amylase inhibitory potential and molecular docking study of indole derivatives, *Bioorg. Chem.*, **2018**, *80*, 36–42.
- [15] Szabo, G., Varga, B., Payer-Lengyel, D., Szemzo, A. Chemical and biological investigation of cyclopropyl containing diaryl-pyrazole-3 carboxamides as novel and potent cannabinoid Type 1 receptor antagonists, *J. Med. Chem.*, **2009**, *52*, 4329–4337.
- [16] Karaali, N. Synthesis of some new benzimidazole derivatives containing chlorine and investigation of their antioxidant and anti-urease activities, *J. Turk. Chem. Soc. A Chem.*, **2018**, *5*, 971–980.
- [17] Fang, W.Y., Ravindar, L., Rakesh, K.P., Manikumar, H.M., shantaram, C.S., Alharbi, N.S., Qin, H.L. Synthetic approaches and pharmaceutical applications of chloro-containing molecules for drug discovery: A critical review, *Eur. J. Med. Chem.*, **2019**, *173*, 117–153.
- [18] Fox, L.M., Saravolatz, L.D. Nitazoxanide: A new thiazolidine antiparasitic agent, *Clin. Infect. Dis.*, **2005**, *40*, 1173–1180.
- [19] Mulu, M.B., Phatak, P.S., Pawar, S.B., Dhimal S.T., Rehman, N.N.M., Dixit, P.P., Choudhari, P.B., Haval, K.P. Synthesis, antimicrobial, and antioxidant activities of new pyridyl- and thiazolyl-bearing carbohydrazides, *J. Chin. Chem. Soc.*, **2019**, *66*, 1–11.
- [20] Nastasa, C., Tiperciuc, B., Duma, M., Benedec, D., Oniga, O. New hydrazones bearing thiazole scaffold: Synthesis, characterization, antimicrobial and antioxidant investigation, *Molecules*, **2015**, *20*, 17325–17338.
- [21] Gomha, S.M., Kheder, N.A., Abdelaziz, M.R., Mabkhot, Y.N., Allhajoj, A.M. A facile synthesis and anticancer activity of some novel thiazoles carrying 1, 3, 4-thiadiazole moiety, *Chem. Cent. J.*, **2017**, *11*, 1–8.
- [22] Barbosa, V.A., Nazari-Formaggio, A.S., Savariz, F.C., Foglio, M.A., Spindola, H.M., de-Carvalho, J.E., Meyer, E., Sarragiotto, M.H. Synthesis and antitumor activity of  $\beta$ -carboline 3-(substituted-carbohydrazide) derivatives, *Bioorg. Med. Chem.*, **2011**, *19*, 6400–6408.
- [23] Formaggio, A.S.N., Santos, P.R., Zanoli, K., Ueda-Nakamura, T., Tonin, L.T.D., Nakamura, C.V., Sarragiotto, M.H. Synthesis and antiviral activity of  $\beta$ -carboline derivatives bearing a substituted carbohydrazide at C-3 against poliovirus and herpes simplex virus (HSV-1), *Eur. J. Med. Chem.*, **2009**, *44*, 4695–4701.
- [24] Telvekar, V.N., Belubbi, A., Bairwa, V.K., Satardekar, K. Novel N'-benzylidene benzofuran-3-carbohydrazide derivatives as antitubercular and antifungal agents, *Bioorg. Med. Chem. Lett.*, **2012**, *22*, 2343–2346.
- [25] Thomas, K.D., Adhikari, A.V., Telkar, S., Chowdhury, I.H., Mahmood, R., Pal, N.K., Row, G., Sumesh, E. Design, synthesis and docking studies of new quinoline-3-carbohydrazide derivatives as antitubercular agents, *Eur. J. Med. Chem.*, **2011**, *46*, 5283–5292.
- [26] Jantova, S., Greif, G., Spirkova, K., Stankovsky, S., Oravcova, M. Antibacterial effects of trisubstituted



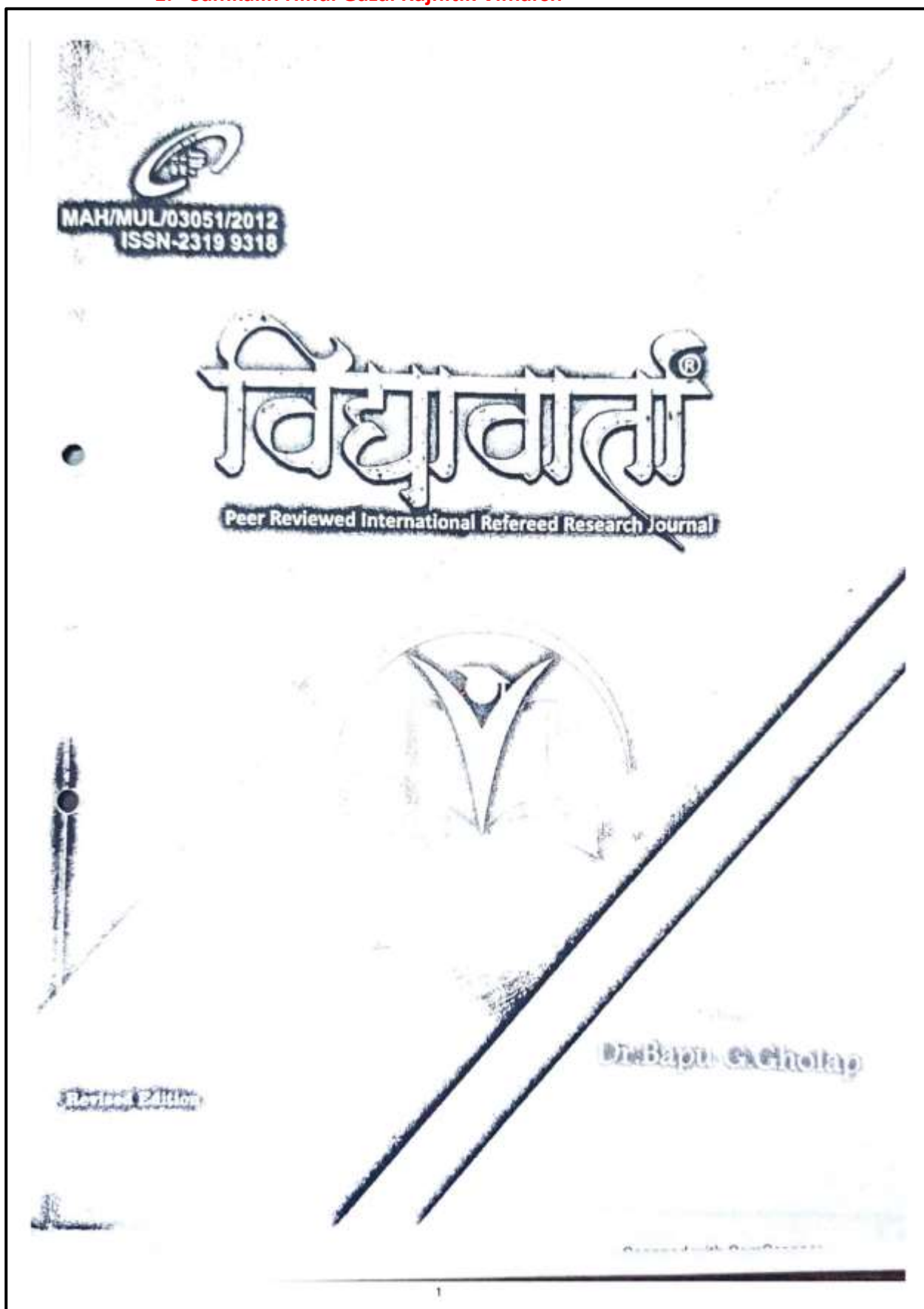
Vaibhav P. Landage *et al.*

- quinazoline derivatives, *Folia Microbiol.*, **2000**, *45*, 133–137.
- [27] Farghaly, A.O., Moharram, A.M. Synthesis and *in vitro* antifungal activity of some N, N-disubstituted dithiocarbamic acid esters derived from 2-methylquinazolinones, *Boll. Chim. Farm.*, **1999**, *138*, 280–289.
- [28] Rollas, S., Kucukguzel, S.G. Biological activities of hydrazone derivatives, *Molecules*, **2007**, *12*, 1910–1939.
- [29] Fuog, D., Fergusson, S.J., Flickiger, C. Pymetrozine: A novel insecticide affecting aphids and whiteflies. In: *Insecticides with Novel Modes of Action*, Springer, Berlin, **1998**, p40–49.
- [30] Gudipati, R., Anreddy, R.N., Manda, S. Synthesis, characterization and anticancer activity of certain 3-[4-(5-mercapto-1,3,4-oxadiazole-2-yl)phenylimino]indolin-2-one derivatives, *Saudi Pharm. J.*, **2011**, *19*, 153–158.
- [31] Gan, X., Hu, D., Chen, Z., Wang, Y., Song, B. Synthesis and antiviral evaluation of novel 1, 3, 4-oxadiazole/thiadiazole-chalcone conjugates, *Bioorg. Med. Chem. Lett.*, **2017**, *27*, 4298–4301.
- [32] Chandrakantha, B., Shetty, P., Nambiyar, V., Isloor, N. Synthesis, characterization and biological activity of some new 1, 3, 4-oxadiazole bearing 2-flouro-4-methoxy phenyl moiety, *Eur. J. Med. Chem.*, **2010**, *45*, 1206–1210.
- [33] Harish, K.P., Mohana, K.N., Mallesha, L., Kumar, B.N.P. Synthesis of novel 1-[5-(4-methoxy-phenyl)-[1,3,4]oxadiazol-2-yl]-piperazine derivatives and evaluation of their *in vivo* anticonvulsant activity, *Eur. J. Med. Chem.*, **2013**, *65*, 276–283.
- [34] Dewangan, D., Nakhate, K.T., Tripathi, D.K., Kashyap, P., Dbongde, H. Synthesis, characterization and screening for analgesic and anti-inflammatory activities of 2, 5-disubstituted 1, 3, 4-oxadiazole derivatives, *Antiinflamm. Antiallergy Agents Med. Chem.*, **2015**, *14*, 138–145.
- [35] Singh, A.K., Lohani, M., Parthsarthy, R. Synthesis, characterization and anti-inflammatory activity of some 1, 3, 4-oxadiazole derivatives, *Iran J. Pharm. Res.*, **2013**, *12*, 319–323.
- [36] Connor, D.T., Cetenko, W.A., Mullican, M.D., Sorenson, R.J., Unangst, P.C., Weikert, R.J., Adolphson, R.L., Kennedy, J.A., Thueson, D.O., Wright, C.D., Conroy, M.C. Novel benzothiophene-, benzofuran-, and naphthalene carboxamido tetrazoles as potential antiallergy agents, *J. Med. Chem.*, **1992**, *35*, 958–965.
- [37] Oliveira, C.S., Lira, B.F., Barbosa-Filho, J.M., Lorenzo, J.G.F., Athayde-Filho, P.F. Synthetic approaches and pharmacological activity of 1, 3, 4-oxadiazoles: A review of the literature from 2000–2012, *Molecules*, **2012**, *17*, 10192–10231.
- [38] Hutchison, J.E. *Microwaves in organic synthesis* edited by André Loupy, *J. Am. Chem. Soc.*, **2004**, *126*, 978–982.
- [39] Singh, R.V., Chaudhary, P., Chauhan, S., Swami, M. Microwave-assisted synthesis, characterization and biological activities of organotin (IV) complexes with some Thio-Schiff Bases, *Spectrochim. Acta A Mol. Biomol. Spectrosc.*, **2009**, *72*, 260–268.
- [40] Srivastava, K.P. Chemistry approach of pollution of prevention: Green chemistry, *Res. J. Chem. Environ.*, **2001**, *5*, 77–81.

Received: 07 Sep 2020; Accepted: 08 Oct 2020

D. 2018-19

1. Samkalin Hindi Gazal Rajnitik Vimarsh



105	प्रा.विजय लोहार	२१ वीं सदी की हिंदी गजलों में आर्थिक विमर्श	254
106	डॉ.बीबेठे लीला शिवाजी	समकालीन हिंदी गजल राजनीतिक विमर्श परमेश्वर विलास जी के सदर्भ में	259
107	डॉ.राजू धर्म कदम	समकालीन हिंदी गजल में सामाजिक जगत्	261
108	डॉ. महादेवी गुरुव	२१ वीं सदी की हिंदी गजलों में सामाजिक विमर्श	265
109	डॉ.दत्तात्रय रिजेकर	कै.ज.अहमद कै.ज.की गजलों में सामाजिक-मासिकवादी चिंतन	268
110	डॉ.अशोक बापूकर	अनंतराज मिश्र अनंत की गजलों में युगकोश	271
111	डॉ. सुधाव नाथदेव जगज	हिंदी गजल और युगकोश	273
112	प्रा. डॉ. झेलम डोडे	२१ वीं सदी की हिंदी गजलों में नारी विमर्श	275
113	डॉ.हनुमंत जगताप	समकालीन हिन्दी गजल रवी चेतना की अभिव्यक्ति	277
114	डॉ. विजयकुमार राऊत	समकालीन हिन्दी गजल राजनीतिक विमर्श	279
115	प्रा.काले सुभाष अप्पासाहेब	दुष्यंत कुमार की साये में गूघ गजलसंग्रह में अभिव्यक्त राजनीतिक विमर्श	282
116	प्रा. भरत सुरेशराय जवजाले	हिंदी गजल एव संवेदना	284
117	प्रा.डॉ.अशुमान वल्लभ मिश्रा	गजल से गजल तक	286
118	प्रा.डॉ. वसंत मकानी	डॉ.गिरीराज शरण अग्रवाल के 'रोसनी बनकर लिखो' गजल संग्रह में व्यक्ति का हीसला बढती गजलें	288
119	डॉ. अरुण गभीरे	सांघिक उर्मा के गजल मेरी इबादत है में भावसौंदर्य	291
120	डॉ. महेंद्रसिंह अजितसिंह पवार	गजल एक परिचय	292

समकालीन हिन्दी गूज़ल राजनीतिक विमर्श

जी. विजयकुमार संकाई

दुष्काटकृष्णर से लेकर आज के अनेक गूज़लकर्तों ने अपनी गूज़लों के माध्यम से राजनीति पर व्यंग्य किए हैं। वर्तमान युग में राजनीति का नीति से सम्बन्ध हट गया है। कभी यह देश कृषि प्रधान का रूप में जाना जाता था, अब कृषिप्रधान हो गया है। कृषि अर्थात् सत्ता प्राप्ति के लिए नीति- नीति, सभी इयक्तों का आश्रय दिया जाता है। दल बदल की प्रवृत्ति से सत्ताई विचार और पानिष्ठा को समाप्त किया है। स्थानीयता के पहले राजनीति में प्रवेश करना सर्व का विषय हुआ करता था, अब राजनेता का त्याग, ईशानदारी, बलिदान, सेवा समाज में आदर्श का निर्माण करता था। परंतु आजकी के बाद राजनीतिक गूज़लों में इतना बदलाव आया कि आज राजनीति सुरसंकृत लोगों का हीच नहीं रहा। राजनेता मतलब चपटाकारी, मुँहा, बदमाश, पैर-बन्दु-ति व्यवसाय करने वाला, चढ़ी छवि बन गयी है। हमारे हिंदी गूज़लकर्तों ने इन सभी बातों को अपनी गूज़लों में उल्लेख दिया है। इन्हीं कभी भावनात्मक या कभी व्यंग्यात्मक दंग से भरपूर करने का प्रयास किया है। उन्होंने अपनी गूज़लों में अनेक स्थानीय युग एवं सामाजिक संकेतों और प्रतिकों के माध्यम से राजनीतिक विद्वत्ताओं पर कड़े व्यंग्य किए हैं। आज राजनीति देश की सेवा करने का नहीं चलन सत्ता पर अपना प्रभुत्व स्थापित करने का माध्यम बन गई है। सत्ता का सेवा इतना विभाक्त हो गया है कि जो भी उसकी संपर्क में आता है उस विषय का प्रभाव उस पर भी निश्चित रूप से पड़ता है।

आज राजनीति देश की सेवा करने का नहीं चलन सत्ता पर अपना प्रभुत्व स्थापित करने का माध्यम बन गई है। सत्ता का सेवा इतना विभाक्त हो गया है कि जो भी उसकी संपर्क में आता है उस विषय का प्रभाव उस पर भी निश्चित रूप से पड़ता है। जनता ने जिन लोगों को चड़ी आशाओं और अपेक्षाओं के साथ देश की सत्ता सौंपा है वही नेता आज देश का शोधन कर रहे हैं। मनोज सोनकरजी अपनी गूज़ल में कहते हैं—सेवक बनकर कोई नुं, भा राजनीति अपनी स्वभाविक तादे गर्दन मोड़ि, आगे बढ़कर आए आप। आग आदमी तक नेता लोग योजनाएँ पहुँचाने नहीं देते वह योजनाएँ आम आदमी तक आते-आते सुख जाती है। क्योंकि जिस कार्यालय से वह योजना निकलती है वही से चपटाकार शुरू हो जाता है। इस योजना के सत्ते में हर जगह दजाल बैठे हुए हैं। ये भौक पाते ही द्रष्ट पड़ते हैं और दवेभाव पसार हो जाते हैं। ऐसा कहा जाता है कि, नेतृत्व करनेवाले देश की छत होते हैं। वो देश और जनता का संरक्षक होना चाहिए। लेकिन नेतृत्व की छत में आज कुछ खासी दरारें बढती जा रही हैं। उन दरारों से देश और जनता पर समस्याएँ आक्रमण करती हैं। नेता लोग गरीब जनता तक योजनाएँ पहुँचाने नहीं देते देश के विकास की योजनाओं का धन उनकी तिजोरीयों और बैंक लॉकरों में जमा हो रहा है। इस प्रकार चपटाकारियों ने इस देश को लुटना प्रारंभ कर दिया है।

स्वार्थ भावना और सत्ता से प्रेरित होते हुए भी नेता अपने ऊपर पवित्रता का आवरण डाले रहते हैं। आज जीवन के प्रत्येक क्षेत्र में राजनीति व्याप्त हो गई है। लोकतंत्र के नाम पर देश की भौली-भौली जनता को हर बार छला जाता है। सोनकर जी कहते हैं—यस जग खीसे पउआ खाए पीए खूब पडे। पीए बहुत गरीबीपर, दाने सोना भरे घडे।

नेताओं के पास बहुत दौलत है वे बहुत अमीर हैं। चुनाव में जीतने के लिए गरीबी पर रोते हुए, गरीबी का बोट हासिल करने की कोशिश करते हैं। गरीबी हटाओ! जैसे नारे उछालते हैं। वर्तमान समाज में हर दल का दोहदा धरिच दिख रहा है और हर नेता के दो चेहरे बन गए हैं। एक है चुनाव के समय का चेहरा और धरिच और दूसरा है सत्ता में सहभागी होने के बाद का व्यवहार दोनों के बीच इतना लंबा फासला हो गया है कि, दलो और व्यक्तियों की पहचान कर पाना काफी मुश्किल हो जाता है। सोनकर जी अपने गूज़ल में कहते हैं, आजादी ना रानी लगे, हाथ कटोरी कहानी लगे,

राजा खाए माल पचाए, रोटी तो छटकती जाए।

साहित्यिकता तो यह है कि, आज आजादी का, कबेब जैसे जगती है। आजादी के आनंद में डूबने, बाते देश की जगती को भारत में शोधन, श्रद्धा और होने मिलाने के अन्तर्गत कुछ भी शामिल नहीं हुआ है। स्वातंत्र्य भारत में श्रद्धाकार का स्वल्प इतना बढ़ गया है कि आज लोगों के हाथ में कटोरा लेकर वे शोक मीन से हैं तो दूसरे और आज जगता के नाम पर अन्तर्गत विवेक शोधनको के पैसे आ रहे हैं। वे सब पैसे और अन्तर्गत में श्रद्धाकार करके नेता लोग जगती और कर रहे हैं। आज प्रत्येक कार्यलय में किसी भी छोटे से काम को दिए पुरस देनी पडती है। इसके विना कोई भी काम आज बढ़ नहीं सकता। हमारे दम की नेताओ को अन्तर्गती से मिलकर श्रद्धाकार की आदत भी लग गई है। यह स्थिती मनुष्य के जीवन को अन्तर् से खींचता कर रही है।

आज समाज में अन्तर्गती की संख्या में काफी कृती हुई है। इसका एक महत्वपूर्ण कारण पुत्रिय अन्तर्गती की स्थितिगतता की है। जगती की पंक्तिओ में पुत्रिय की काली करतुओ का पदोपार्श कालि ने किया है। उती तरह पुत्रिय अन्तर्गतीओ में, नेताओ में पिकी हुई है। अन्तर्गतीओ से इतना नरुज करती है और अपने नरुज भूल जाते हैं। पुत्रिय ने खुद ही अपनी जीवित काम कर रही है लेकिन इसमें आज जगता परेशान है मनुष्य सोनकर की गजलों में आज आदमी की सामाजिक सध्याई का उपायवती है। इस की सामाजिक स्थितिओ एवं विवेकवतीओ को उजागर करने का प्रयास किया है। गजलकार में अपनी जगती से जुड़ने का ध्यायक संकेत है। सोनकर की जिस जगती से जुड़े है जिस समाज में रहते हैं वहाँ के आज आदमी से उनका बराबर संबंध है। आज आदमी की धारणाएँ स्वभाव, व्यवहार सामाज्याएँ एवं प्रतिधियाएँ जिस सामाजिक स्थितिओ परिधित होती है उसे सोनकर जी ने महसूस किया है।

आज देश में शोरो को ही न्याय मिल रहा है। उन्होंने न्याय देने वाला ही खरीद लिया है। इसलिए आज न्याय उन्ही के पास में चला गया है जिन पर अन्तर्गत किया है सोनकर जी ने ऐसे ही दने-मुपले अन्तर्गत के अन्तर्गत में रहे आदमी का पक्ष अपनी गजलों में लिया है। देश में राजनीतिक व्यवस्था भयानक है। आजादी के बाद हमने जो सपने देखे थे वे बंग हुए हैं। नेताओ ने सत्ता का उपदोग अपने रिशतेदारी के स्वार्थ के लिए किया है। नेता लोग आज जगता को भाषणों से मुपराह कर रहे हैं। सम्बन्धवती, राजनीतिक पुँजीवाद की घोषक है। देश की राजनीति में संशय का बीजपाता है। वर्तमान राजनीतिक पार्टीया किसीभी परिधिति में सत्ता पाने की, कोशिस में लगी हुई है। प्रतिक्रिया राष्ट्रीयता को निगल रही है। आतंकवाद जोर पकड़ रहा है अन्तर्गत का समर्थन भी हो रहा है और विरोध भी हो रहा है। सोनकर जी ने अपनी गजलों में राजनीतिक भ्रमण का घद्यार्थ विव्रण किया है। राजनीति और साहित्य का सम्बन्ध प्रारंभ से परिधित रहा है। हर युग के साहित्यकारों ने दुपीय राजनीती का प्रत्यक्ष अन्तर्गत विव्रण किया है। मन्त्रकारी जैसा ही साहित्य ने भी राजनीति और राजाओ पर प्रत्यक्ष अन्तर्गत अंकुश रखने का कार्य किया है। श्रद्धाकारों से लेकर सुलसीदार, और बिहारी से लेकर प्रेमचंद जैसे प्रसिध हिंदी साहित्यकारों का साहित्य राजनीति और राजव्यवस्था को अपने साहित्य का विषय बनाता है। विवे राजनीति मनुष्य जीवन का आज अविण्य हिरता रही है, वर्तमान युग के प्रजातंत्र में तो समाज और राजनीति का सम्बन्ध धनिष्ठ ही नहीं तो अनिवार्य बना है। समाज या लोग ही राजनेता को चुनते हैं, सरकारें बनती हैं, बिगडती हैं, यह सब लोगों के मत पर निर्भर है। सरकारों का बनना, बिगडना, समाज का मत परिवर्तन करना या राजनीतिओ के कार्य का, उनकी अग्रई, दुराई का विव्रण जिस प्रकार पत्र - कविता में होता है, उती प्रकार उसे अन्तर्गत भावात्मक रूप में साहित्य भी व्यक्त करता रहा।

गुजल में राजनीति का घद्यार्थ विव्रण करनेवाले गुजल कारों में दुधंतकुमार का नाम अग्रक्रम से लिया जाता है। उनका गुजल संग्रह 'सामे में घूर' में विश्वरतर पर प्रसिध हुआ। इस संग्रह कि गुजले स्वतंत्रतोर भारत की राजनीतिक और सामाजिक गुजले नहीं, बल्कि आपात्काल के दौरान उभरी कहापोह, बीखलाहट और तरुप की रघनाएँ हैं वे गुजलजग आदमी का दर्द, उसकी आकांक्षा, उसकी पीडा और बेचीनी को सरस भाषा में बयान करनेवाला दर्शावेज है। आज सभी लोगों को इस बात का पता चल चुका है। भारत की जनता को यह भासू हुआ है कि बालीके पैसे कहां पावब हो रहे हैं। दुधंतकुमार ने इसी बात को लेकर लिखा था- 'घड़ी तक आते आते सूख जाती है कई नदियाँ/ मुझे भासू है पानी कहीं चहल हुआ होगा'।

MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Ir. No 41012

Vidyawarta®

Desember 2018  
Issue 29.1

0281

1975 में आपातकाल की घोषणा करके सामान्य लोगों के अधिकारों को समाप्त किया गया जैसे में बंद कर दिया गया और प्रजातंत्र में ही प्रजा के अधिकारों को नष्ट किया गया प्रजातंत्र में जनता की सरकार होती है, जनता की हुकूमत होती है, लेकिन आपातकाल में जनता को ही बंदी बनाया गया। दुध्यांतकुमार ने इस बात को रेखांकित करते हुए कहा था

हमको पता नहीं था, हमें अब पता चला, / इस मुक्त में हमारी हुकूमत नहीं रही ।

पदों के पिछे की राजनीति में जनता को छोटा करके अस्थिरता से दूर रखा है। कौन किसका दोस्त और कौन किसका विरोधी यह सामान्य लोगों की समझ से परे है। दिनभर एक दूसरे पर टिका टिपणी करनेवाले शासकों को एक साथ खाने का पता लेते हैं अपने स्वार्थ के लिए एक दूसरे से समझौते करते हैं। आज जनता एक दूसरे से लड़ती प्रगल्भी है। इस राजनीति में शिर्ष-बाला कुछ जाता है, कटा जाता है लेकिन किया कुछ और ही जाता है। आज की राजनीति में यह पता ही नहीं चलता रहा है कि कौन किसका विरोधी और कौन किसका साथी। दुध्यांतकुमार जीने इस बात को बसुंधी समझा था। इसलिए उन्होंने अपनी गजल में लिखा था

दोस्तों अब मंच पर बुकिया नहीं है, / आजकल नेपथ्य में संभायना है ।

सांख्यिकी आधारितता और शब्दजाल में लोग घंसे जाते हैं। उन्हें अपने शब्दजाल में फंसाकर राजनेता अपना स्वार्थ साध लेते हैं। शब्दों का जादू लोगों पर छा जाता है और फिर एक बार पंचसाल के लिए लोगों को वादी और सपनों के बीच घेरा जाता है। कोइली पाटी और राजनेता आकर यहाँ की जनता को मूर्ख बनाकर बला जाता है। दुध्यांतकुमारने इसी षडयंत्र को पहचाना था। राजनेताओं को यह पता चल चुका है कि जनता को कैसे बहकाया जाय। भूमिल ने इसी पहले कहा था कि हमारा प्रजातंत्र एक तमाशा है जिसकी जान मधारी की भाषा है। दुध्यांतकुमार ने इसी बात को अपनी गजल में उठाया और कहा

जिस तरह बाहो बजाओ इस सभा में, / हम नहीं हैं आदमी, हम दून दून हैं

आपातकाल और उससे निर्माण हुई परिस्थिति के परिणाम स्वरूप लोगों पुनिपादी अधिकारों पर प्रतिबंध लगाया गया। कुछ लोगोंने इसके विरुद्ध आवाज उठाने कि कोशिश किई लेकिन उन्हें भी कालकोटरी के बंद कर दिया गया। उनकी आवाज को बंद करने कि कोशिश होती रही। तापर यह खेल तमाशा अपनी आँखों से देख रहा था। तबसमय - जयप्रकाश जी का आंदोलन और उनका व्यक्तित्व एक आशा कि किरण नजर आ रही थी

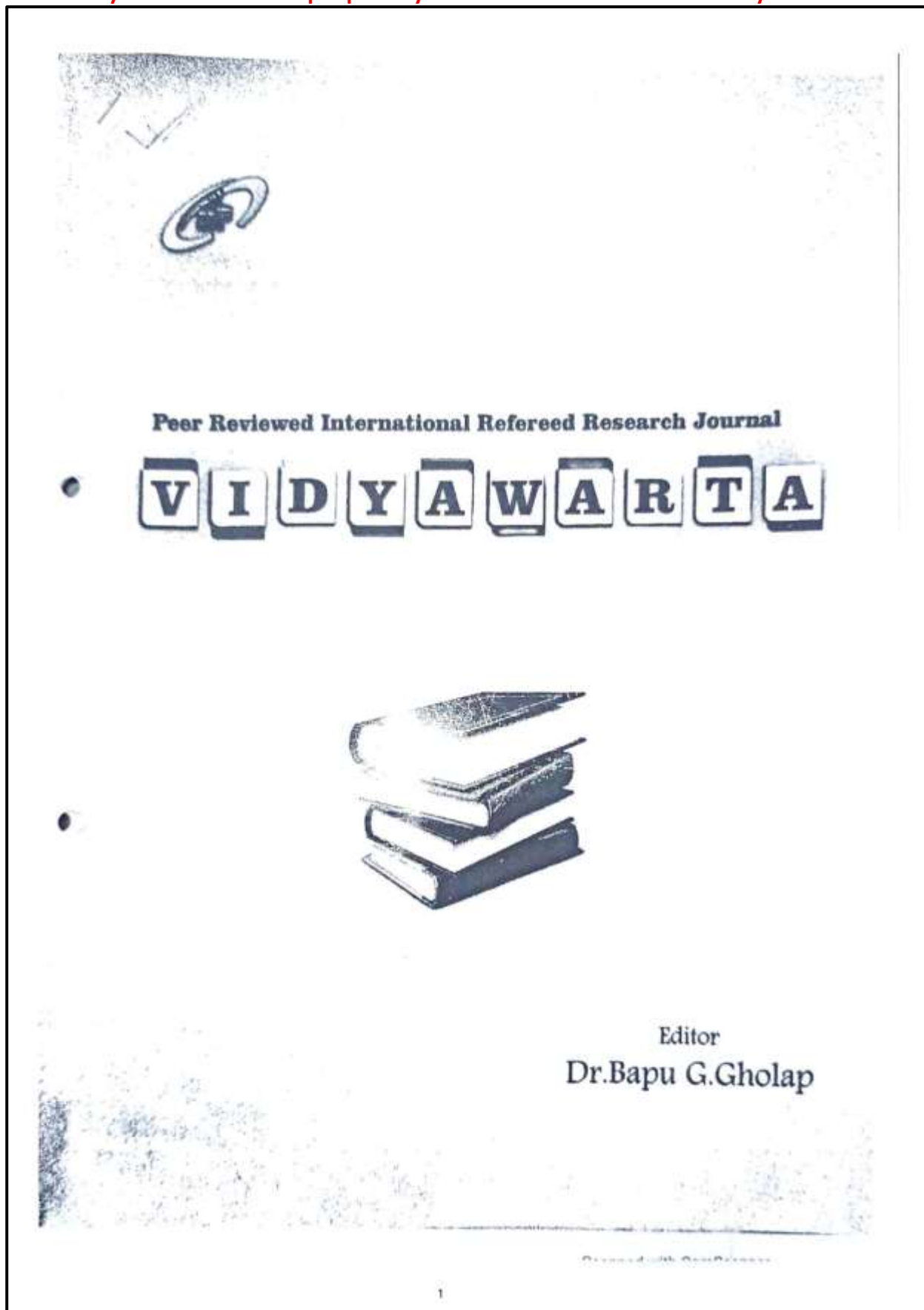
मैं बहुत कुछ सोचता रहता हूँ, पर कहता नहीं, / बोलना भी मना, सच बोलना तो घर किनार

सामान्य जनता की अपेक्षा होती है कि यह नेतागण हमारा कल्याण करेंगे, हमारी सारी समस्याओं का निराकरण करेंगे, समाज में सौहार्द एवं समन्वय स्थापित करेंगे, विकास करेंगे आदि। नेतागण भी चुनावों के समय आश्वासनों पर आश्वासनों की बीछार करते हैं परंतु चुनाव के बाद विकास और कल्याण के आश्वासनों की भूल कर अपनी शिथिलता और उसके बीच पैचों में व्यस्त हो जाते हैं। विकास की नारेबाजीयों चलती ही रहती हैं। और विकास की योजनाएँ प्रारंभ भी हो तो उसमें भी सत्ता के ठेकेदारों की अपनी अपनी स्वार्थ लिप्सा उसे जनता तक सीधे पहुँचाने नहीं देती। उपर से नेता विकास की योजनाओं को हाने के श्रेय का विज्ञापन कर जनता को यह जताना चाहता है कि वह जनता के लिए, जनता के हित का काम कर रहा है।

श्री. आर्टर्स, कॉमर्स अँड सायन्स कॉलेज,  
पारनेर, तहसील-पारनेर, जिला-अहमदनगर

Vidyawarta : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IUIF)

2. Paryavaran Chetana ke pariprekshya me Sumitranandan Pant ka Kavya



MAH MUL03051/2012  
ISSN: 2319 9318

Vidyawarta®

Oct. to Dec. 2018  
Issue-25, Vol-03

07

28)	बाल कहानी संग्रह 'अपलक दी गैर' का मातृकीकरण Dr.Surita Sharma, Jammu.	119
29)	पंचायती राज व्यवस्था का राष्ट्रीय संविधानों पर प्रभाव जयेन्द्र कुमार, इलाहाबाद	121
30)	पर्यावरण गैरलाभ के परिप्रेक्ष्य में सूक्ष्मकृषि पर फल का प्रभाव डॉ. विजय कुमार राऊत, पारनेर	125
31)	ब्रिटिश उपनिवेशवादी नीतियों का भारतीय शिक्षा पर प्रभाव: एक अध्ययन कृष्ण कान्त लाल	128
32)	भारतातील जलव्यवस्थापनाचा ऐतिहासिक अभ्यास शा.प्रविण व्ही. चव्हाण,औरंगाबाद	133
33)	सह्याद्रीतील राजस्थान में धार्मिक सन्निभुता और भक्ति आंदोलन डा. राजश्री सेठी, भीलवाड़ा (राज.)	137
34)	उच्च माध्यमिक स्तर की छात्राओं के आत्मनिर्भरता पर उनकी अध्ययन श्रीमती आर्या शर्मा, डॉ. (श्रीमती) कमलेश सिंह,खालियर (म.प्र.)	142
35)	गढ़वाल की शीर्ष गाथा कु० अर्चना, श्रीनगर (गढ़वाल)	149
36)	हिंदी सिनेमा के विषयों का भारतीय समाज से संबंध प्रा. डॉ. रामदास नारायण तोडे,वसई (महाराष्ट्र)	153
37)	बी.एड. प्रशिक्षणार्थियों की शैक्षिक-उपलब्धि पर समायोजन ..... गोविंदकुमार वर्मा,देवरिया (यु.पी.)	165
38)	बौद्ध शिक्षा के प्रमुख केंद्र नालन्दा विश्वविद्यालय डा० सुरेन्द्र सिंह यादव,इलाहाबाद.	171
39)	भाषा विज्ञान और भाषा प्रौद्योगिकी : परिचय धनंजय विलास झालटे	172

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal | Impact Factor 5.131(IJIF)



MAH/MUL/03051/2012  
ISSN: 2319 9318

Vidyawarta®

Oct. To Dec. 2018  
Issue-25, Vol-03

0125

30

महिलाओं के पर्यावरण के प्रभाव से प्रतीक अंगुली में  
'श्रीमती' के प्रोत्साहन मिला है। उक्त महिला  
नव-७ परिकल्पना नव-७ के साथ एवं सार्थक  
सिद्ध करती है।

इस प्रकार उक्त प्राप्त प्राथमिक तथ्यों के  
विवरण के प्रकाश में एक विहंगम दृष्टि में कहा जा  
सकता है कि पंचायती राज व्यवस्था से ग्रामीण महिलाओं  
का रहने वाले कुछ प्रमुख प्रभाव निम्नवत् है—

(१) "अनुसूचित व अनुसूचित जनजाति तथा  
महिलाओं को पंचायतराज में आरक्षण मिलने से राजनीति  
में ग्रामीण महिलाओं की भागीदारी सुनिश्चित हुई है।"

(२) "पंचायती राज व्यवस्थान्तर्गत महिलाओं  
के पर्यावरण से ग्रामीण महिलाओं की राजनीतिक चेतना  
बढ़ी हुई है।"

(३) "७३वें संविधान संशोधन से राजनीति में  
एक स्तर पर ३३.३३ प्रतिशत महिला आरक्षण  
मिल जाने से महिलाओं की भागीदारी सुनिश्चित हुई है  
एवं ग्रामीण महिलाओं की राजनीति के अवसर सुलभ  
हुए हैं।"

(४) "ग्रामीण पंचायतों में राज व्यवस्था के तहत  
आक्रमण मिल जाने के कारण ग्रामीण महिलाओं में  
राजनीतिक सहभागिता बढ़ी है।"

(५) "पंचायती राज व्यवस्था के तहत महिलाओं  
को पुरुषों के समकक्ष बैठकर अपनी समस्याएँ सुलझाने  
एवं विकास के अवसर सुलभ हुए हैं।"

संदर्भ-ग्रन्थ सूची

१. सामना एस.डी. (१९६७) 'वि लगे ज  
पंचायत एज लोकल सेल्फ गवर्नमेंट, औरी प्रकाशन  
सन् १९५५

२. कोटारी राजनी (१९७०) पॉलिटिक्स इन  
इंडिया, ओरिएण्ट लाँगमेन्स नई दिल्ली, पृ. ९५

३. सिंह एस.डी. (१९८०) वैज्ञानिक सामाजिक  
अनुसंधान एवं सर्वेक्षण के मूल तत्व, कमल प्रकाशन  
दिल्ली (म.प्र.) पृ. ५२

४. मुकजी अर.एन. (१९९०) सामाजिक  
संघ एवं सांख्यिकीय, विवेक प्रकाशन जवाहर नगर  
दिल्ली, पृ. २५६

५. भट्टरिया पी.पी.एस. (१९८९) पंचायतीराज  
एवं सरल डबलपेजेट, कॉमनवैल्थ पब्लिशर्स, नई  
दिल्ली

## पर्यावरण चेतना के परिदृश्य में सुमित्रानंदन पंत का काव्य

डॉ. विजय कुमार उड्डत

विभागाध्यक्ष,

न्यू आर्ट्स, कॉमर्स और डी सायन्स कॉलेज, पारनेर

मानव और निसर्ग का रिश्ता परमगहन और  
पुराना रहा है। वह दोनों भी एक दूसरे के बगैर अस्तित्व  
माने जाते हैं। इन दोनों का अस्तित्व एक दूसरे पर  
निर्भर है। इन दोनों को स्वतंत्र रूप से देखना कठिन है  
क्योंकि इन दोनों का संबंध परस्पर पुरक दिखाई देता  
है। न मानव के सिवा प्रकृति के सिवा मानव को है।  
प्रकृति पर सभी का हक है उसकी सुंदरता को देखना  
और उसका उपयोग लेना मानव अपना अधिकार  
समझता आया है और वह उसका लाभ भी उठाता  
रहा है। प्रकृति सभी के लिए समान रूप से उपलब्ध है।  
मानव ने प्रकृति का अपनी इच्छा के अनुसार हजारों  
सालों से लाभ उठाया है लेकिन उसको देखभाल का  
खयाल बहुत कम किया नजर आता है। इसलिए  
आज के जमाने में प्रकृति के परिवर्तन को लेकर  
केवल अपना देना ही नहीं बल्कि पुत्र विषय स्थिति  
और भयभीत नजर आ रहा है। वह उस पर अब  
संशोधन कर रहा है, उसके कारणों को ढूँढने की  
कोशिश कर रहा है। उसके लिए प्रकृति का बहुत कम  
जिम्मेदार नजर आ रही है मानव का उस पर हो रहा  
आक्रमण अधिक जिम्मेदार नजर आ रहा है। मानव ने  
हर क्षेत्र में प्रकृति के अनेक स्रोतों पर किये नजर  
आये हैं लेकिन वह पार करते समय उसने प्रकृति का

□□□

Vidyawarta: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131(IJIF)

Vidyawarta® Oct. To Dec. 2018  
Issue-25, Vol-03 0126

MAH MUL03051/2012  
ISSN: 2319 9318

बहुत कम विचार किया नजर आयेगा। वह केवल सहज उपलब्ध प्रकृति का अपनी इच्छा के अनुरूप लम्ब लेता रहा लेकिन उसके बाद होनेवाले परिणामों को चिन्ता उसने हाथियों पर छोड़े दि और आज उसके परिवर्तन पर चर्चा और चिन्ता जरूरी नजर आ रहा है। इसके उत्तर को तलाश में प्रकृति से अधिक मानव जिम्मेदार नजर आयेगा इसमें शौ गय नहीं।

आज प्रकृति पर अनेक काव्य निर्माण हुआ है लेकिन यह कहना गलत नहीं होगा वह प्रकृति ही लिखा होगा। प्रकृति और मानव के संबंध को लेकर आचार्य रामचंद्र शुक्ल जी ने लिखा है— "वन, पर्वत, नदी, नाले, निर्झर, काशर, पटपर, चट्टान, वृक्ष, रस्ता, झाड़ो, फूल, शाख, पशु-पक्षी, आकाश, मेघ, नक्षत्र, सज्ज इत्यादि भी ऐसे ही सहचर रूप है।" स्पष्ट है की मानव और प्रकृति चित्रण का दूसरे से गहरा रिश्ता है। दुनिया भर के साहित्य में प्रकृति चित्रण का आदर्श माना है। प्राचीन काल से लेकर आधुनिक काल तक के हिंदी कवियों और लेखकों ने प्रकृति चित्रण का काव्य लिखा है और आज भी लिख रहे हैं। हिंदी साहित्य में छायावादी काव्य प्रकृति चित्रण का आदर्श काव्य माना जा सकता है। छायावाद के आधारस्तंभ प्रकृति के चित्तो मुमिन्नानंदन पंत का काव्य सर्वोत्कृष्ट प्रकृति चित्रण का काव्य माना जात है। पंत जी का काव्यकाल 1900 से 1970 का माना जात है। उनका जन्म प्रकृति की कोख में तमसे उत्तरांचल के 'कौसानी' नामक गाँव में हुआ था। उन्हें बचपन में अपने माँ की साथ बहुत कम मिला और प्रकृति का अधिक मिला। अपने जन्मगाँव कि प्रकृति ने उन्हें बचपन से ही आकर्षित किया इसलिए उनके व्यक्तित्व पर प्रकृति का गहरा असर रहा। पंत स्वयं कहते थे कि काव्य कि प्रेरणा उन्हें प्रकृति से ही मिलती रही। उमाकांत गोयल जी ने सटिक लिखा है— "पंत काव्य में प्रकृति के मनोमग रूपों का सभूर और सरस चित्रण मिलता है। 'अंगु की बालिका' 'पर्वत प्रदेश में पाषाण' आदि कविताओं में प्रकृति के मनोहर चित्र चित्रण है, जिनमें कवि की जन्मभूमि के प्राकृतिक सौंदर्य का वैभव दिखायी देता है।" पंत मानवी सौन्दर्य से अधिक आकर्षित दिखाई देता है उन्ही के शब्दों में—

'छोड़ दुगों की मृदु माया, मोड़ प्रकृति से भी माया, बाले, नरे बाल जाल में, कैसे उलझा दूँ गेवत? तज कर तरल नरगों को, इन्द्रधनुष के रंगों को तरे धू-भंगों से कैसे, विभवा दूँ निज मृग —सा मर?"

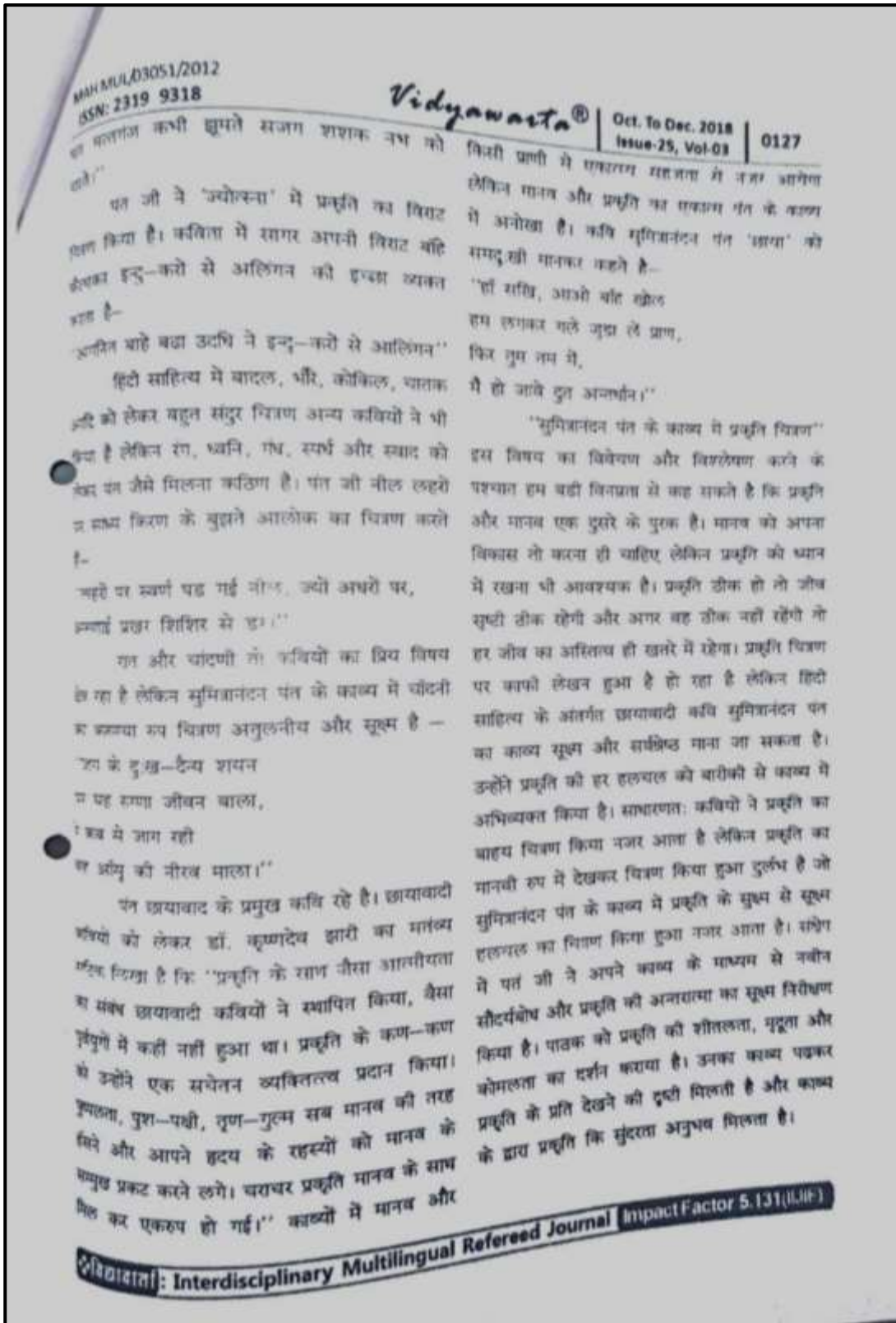
प्रसन्न काव्य पंक्ति में कवि का प्रकृति के प्रति सहज अनुराग और उसकी सूक्ष्म दृष्टि नजर आती है। पंत की 'नीका विहार' कविता में प्रकृति का स्मि और संश्लिष्ट चित्रण हुआ है देखिए—

'नीका से उड़ती जल हिलोरे,  
हिल पड़ने नभ के ओर छोर,  
समने शुक को छाँचि झल—मल,  
पैरती परी—सी जाल में कल,  
रुपहले कुचों में हो ओझल!  
लहरी के घूँघट से झुक—झुक,  
दशमी का शशि निज तिर्यक मुख,  
दिखलाता, मुग्धा—सा—रुक—रुक।"

पंत जी ने प्रकृति का मानवीकरण रहस्यमयी और अनोखा किया हुआ दिखाई देता है। आधुनिक काल के कवियों में सबसे सटिक और सहज प्रकृति का मानवीकरण पंत जी ने अपने काव्य में किया हुआ नजर आता है। पंत जी ने संभ्या, प्राप्त चन्द्रिका, छाया आदि प्रकृति के अनेक रूपों का नारी रूप में चित्रण किया है। प्रकृति के हिस्से बादल, पवन, निर्झर आदि मानों नाटकों के पात्रों की भाँति खुद अपना परिचय देते हैं। सचेतन बादल को लेकर चित्रण देखने लायक है—

'कभी चौकड़ी भरते मृग से धू पर चरण नहीं भरते।

❖ विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)



MAH MUL/03051/2012  
ISSN: 2319 9318

Vidyawarta®

Oct. To Dec. 2018  
Issue-25, Vol-03

0128

संदर्भ ग्रंथ:

१. सुभिसार्वदन पंत का काल्प, डॉ. शैलेन्द्र
२. पर्यावरण और साहित्य, प्रो. लणसिंग
३. कविता और पर्यावरण, श्रीमति उषा शर्मा

31

## ब्रिटिश उपनिवेशवादी नीतियों का भारतीय शिक्षा पर प्रभाव : एक अध्ययन

□□□

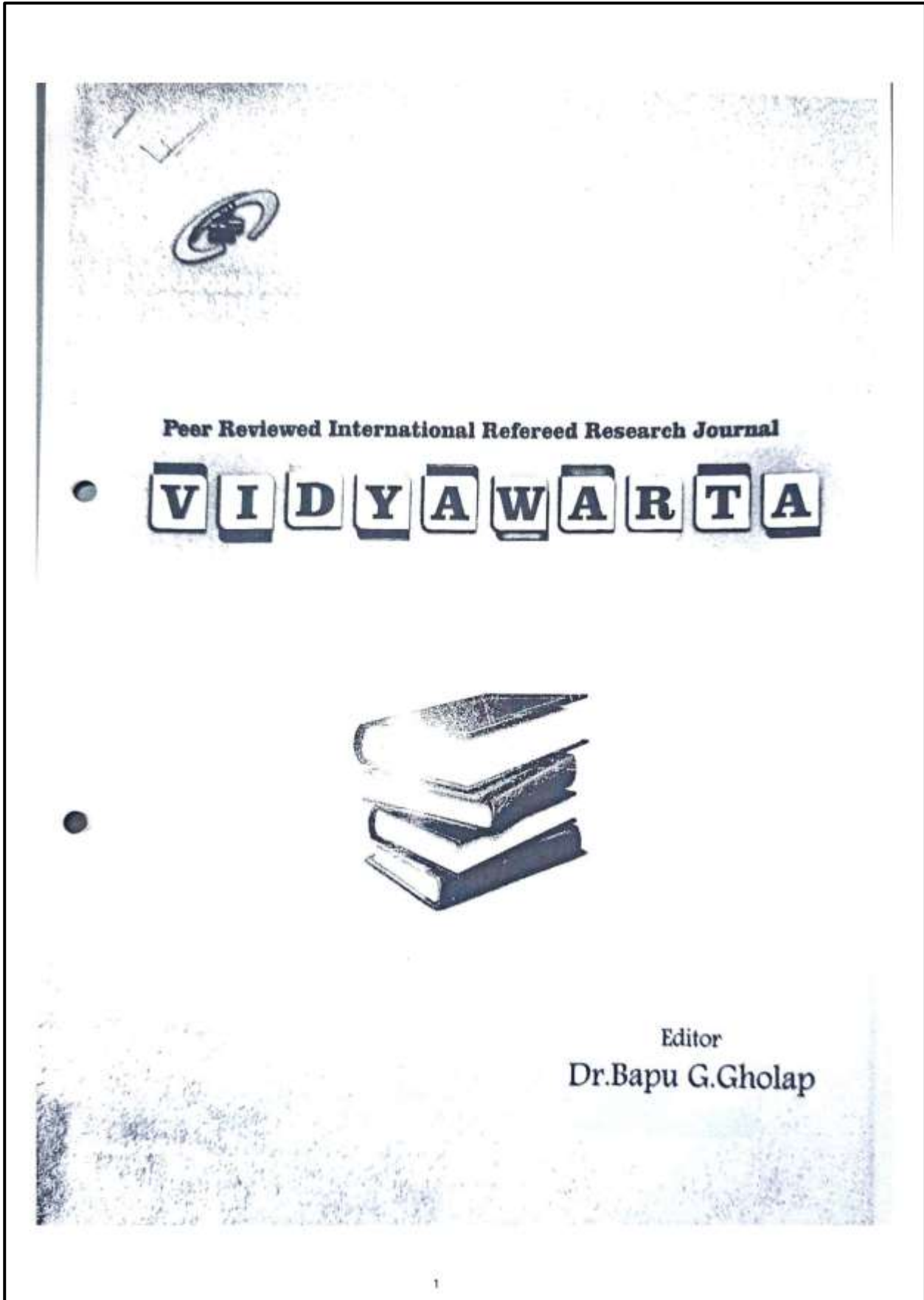
कृष्ण कान्त लाल

भारत में प्रारम्भ आने वाले यूरोपीय व्यापारियों का एक नई सभ्यता के प्रतिनिधि थे। उनके आर्थिक उद्यम के लक्ष्य और तरीके, व्यापारिक संगठन व व्यावसायिक आचरण भारतीयों से बहुत भिन्न थे। वे यूरोपीय गण्टो से आए थे जिनकी राजनीतिक और सामाजिक संस्कृति पुष्टभूमि भिन्न थी। नैतिकता और रीति-रिवाजों, धर्म तथा सांस्कृतिक और बौद्धिक प्रवृत्तियों और दृष्टिकोण के क्षेत्रों में उनमें और भारतीयों में व्यापक विरासत थी। यूरोपीय व्यापारिक और मिशनरियों के आगमन और भारतीयों से उनके संपर्क ने सामाजिक परिवर्तन की प्रक्रिया को जन्म दिया जो समय के साथ तथा पूर्व और पश्चिम के बीच बढ़ते हुए व्यापार और संपर्क के साथ तीव्र होती गई। इस प्रक्रिया में एक नई अवस्था १८वीं शताब्दी में अंग्रेजों द्वारा बंगाल पर विजय के साथ प्रारम्भ हुई। फिर तो भारतीय राजनीति, सामाजिक जीवन और अर्थव्यवस्था तथा संस्कृति पर पड़ने वाला प्रभाव और अधिक गहन तथा व्यापक होत गया।

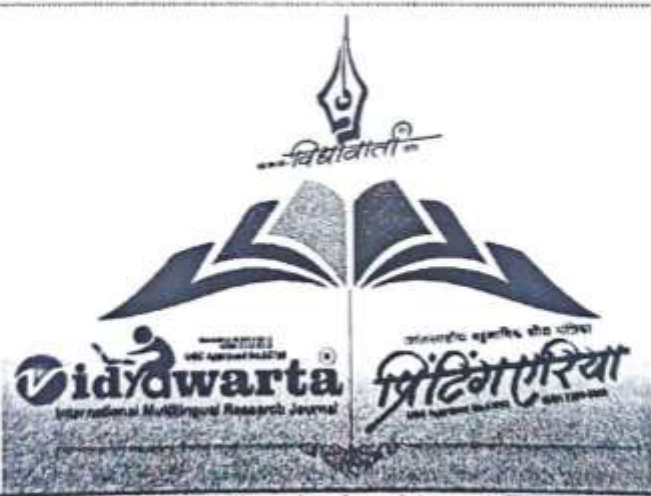
इस काल में, भारत के विभिन्न प्रांत समीप आए और सामाजिक समूहों की प्राचीन श्रेणीबद्धता टूटने लगी। जाति-व्यवस्था उदार होने लगी और पारंपरिक ग्रामीण अर्थव्यवस्था ने आत्मनिर्भरता और अलगव की अपनी विशिष्टताओं को खोना आरम्भ कर दिया। विवाह और जाति-प्रथा में अनेक सुधार किए गए। संयुक्त परिवार बिखरने लगे। धर्म और संस्कृति के क्षेत्र में पुनरुत्थान और पुनर्जागरण आंदोलन प्रारंभ हुए। भारतीय समाज के एक वर्ग ने प्राचीन

❖ विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal | Impact Factor 5.131 (IJIIF)

3. Nirgun Sampraday aur Sant Namdev



MAH MUL/03051/2012 ISSN: 2319 9318	UGC Approved Jr. No. 02759	Vidyawarta®	Jan. To March 2018 Issue-21, Vol-07	09
37) जिस लक्ष्मी नह देख्या ओ जग्गाई नई नाटक चर मूल्यांकन डॉ. बळीराम संभाजी भुक्तेरे, उदगीर, जि-सातुर				156
38) निर्गुण संघटाय और स्तं नगरेन डॉ. विजय कुमार राजत, पारनेर				160
39) ग्लोबल संस्कृति की आपदा डा. डॉ. गायकवाड साहेबराव., जिला अहमदनगर (महाराष्ट्र)।				163
40) जयप्रकाश नारायण और समाजवाद सचिन कुमार, मेरठ				165
41) शिशु मृत्यु दर एवं उसके प्रभावक तत्व डॉ. महिमाती सालेन टोप्यो, अभनपुर (छ.ग.)				168
42) पुरुष रचनाकार की दृष्टि में आधुनिक नारी का स्वरूप डॉ. सुरेश ए., एर्णाकुलम, केरल				172
43) काँग्रेस अध्यक्ष के रूप में मौलाना आजाद नितिन त्यागी, मेरठ				176
44) हिन्द महासागर की ऐतिहासिक पृष्ठभूमि डॉ.राम प्रसाद यादव, गोरखपुर				179



**विद्योविती**  
International Multilingual Research Journal

**विद्योविती**  
International Multilingual Research Journal

विद्योविती: Interdisciplinary Multilingual Refereed Journal | Impact Factor 5.131 (IJIIF)

MAH MUL03051/2012  
ISSN: 2319 9318UGC Approved  
Jr.No.62759

Vidyawarta®

Jan. To March 2018  
Issue-21, Vol-07

0160

38

## निर्गुण संप्रदाय और संत नामदेव

डॉ. विजय कुमार शकत

विभागाध्यक्ष,

न्यू आर्ट्स, कैंपस ऑफ सायन्स कॉलेज, पारनेर

संत काव्यधारा के प्रवर्तक तथा महाराष्ट्र के बरकरी संप्रदाय के प्रचारक संत नामदेव का जन्म सातारा के कण्ठ क्षेत्र के अनर्गत कृष्णा नदी पर बसे नरसी ब्राम्हणी ग्राम में सन १२७० ई.पू. हुआ। नामदेव के पिता का नाम ठानारोटटी तथा माँ का नाम गुनाबाई था। नामदेव छोपी अर्थात् दर्जी (महाराष्ट्र में शिंपी) परिवार के थे। नामदेव का विवाह ९ वर्ष की आयु में ही राजाबाई से हुआ। राजाबाई सांसारिक महिला थी। नामदेव के पिता विठ्ठल भक्त थे। वे प्रतिवध पंढरपुर की यात्रा(धारी) करते थे। परिणामतः नामदेव भी बचपन में विठ्ठल की उपासना करने लगे। माता-पिता की कृपाकर्म के कारण नामदेव पर कायेबा संभलणे की जिम्मेदारी आ गयी थी परंतु वे कायेवार की अपेक्षा विठ्ठल भक्ति में ज्यादा लीन हो गये। माता-पिता, पत्नी, मनान, मित्र, परिवार के आग्रह के बावजूद नामदेव सांसारिक व्यवहार से दूर ही रहे। उन्होंने अपने माता-पिता से स्पष्ट कहा— विवाह तो आपने मेरा कर दिया परंतु मेरा मन भक्ति में सदैव लगा रहता है। अतएव वे पंढरपुर में जाकर विठ्ठल की सेवा में रहने लगे। वहाँ उनके भेंट ज्ञानेश्वर तथा उनके भाई-बहनो से हुई। ज्ञानेश्वर के आग्रहपर उन्होंने ज्ञानपंथी संत विन्सेबा खेचर से दीक्षा ली। सन १३५० ई.पू. पंढरपुर के महाद्वार पर ८० वर्ष आयु में समाधी ली, जिसे आज भी लोग 'नामदेव की पायरी' के नाम से जानते हैं।

नामदेव निर्गुण संप्रदाय के प्रमुख संत के रूप

में जाने जाते हैं। १२०९ ई.पू. के लगभग ब्रम्ह संत पृथ्वीक ने पंढरपुर में विठ्ठल संप्रदाय का प्रचार किया। विठ्ठल संप्रदाय वैष्णव संप्रदाय और शैव संप्रदाय का मिश्रण है। इस संप्रदाय में विष्णु और शिव में कोई अंतर नहीं। पंढरपुर में शिवलिंग को शोशण रखकर हुए विष्णु की मूर्ति है। इसी मूर्ति का नाम विठ्ठल है। यह विठ्ठल सर्व व्यापी ब्रम्ह का प्रतीक बनकर समस्त महाराष्ट्र के आग्रह शैव है। आठवीं शताब्दी के शैव और प्यारहवीं शताब्दी के वैष्णव संप्रदाय के बीच हुए समझौते में विठ्ठल संप्रदाय अस्तित्व में आया और संत नामदेव विठ्ठल संप्रदाय के प्रतिनिधि भक्त, कवि, संत हुए। उन्होंने २५०० अंशों की रचना की। मराठी के अनिर्गुण उन्होंने हिंदी में भी रचनाएँ कीं। नामदेव की कुछ रचनाएँ 'श्री गुरु ग्रेण साहब' में संग्रहीत हैं। जिनकी संख्या ६१ है। मराठी अंशों का संग्रह 'नामदेव गाथा' नाम से प्रसिद्ध है, जिसमें १०२ पद संग्रहित हैं।

भारतीय दर्शन में ब्रम्ह स्वरूप का विवेचन जिन दो रूपों के अन्तर्गत पर हुआ है उस मध्यकालिन भक्ति दो पद हैं— सगुण और निर्गुण। संत काव्य परंपरा को विभिन्न विद्वानों ने विभिन्न नामों से पुकारा है। निर्गुण नाम के नामकरण के विषय में विद्वानों में मत भिन्नता है। नामदेव एवं कबीर द्वारा प्रवर्तित भक्तिधारा को आचार्य शुक्लराजी ने 'निर्गुण ज्ञानाश्रयी शाखा' के नाम से संबोधित किया है। डॉ. हज्जतप्रसाद द्विवेदी ने इस निर्गुण-भक्ति-साहित्य नाम दिया है तो डॉ. रामकुमार वर्मा ने इस 'संतकाव्य परंपरा' के नाम से अभिहित किया है। सगुण तथा निर्गुण ब्रम्ह अलग-अलग नहीं हैं। वह एक ही सत्ता है परंतु दृष्टिकोण भिन्नता के कारण उसे सगुण और निर्गुण नाम से पुकारा जाता है। सगुण ईश्वर तथा निर्गुण ब्रम्ह में भेद मानना विज्ञान भ्रामक है। निर्गुण ब्रम्ह ही वास्तविक पारमार्थिक सत्ता है। परंतु व्यवहार के लिए उपासना से सगुण पूजन से वित्त की शुद्धि होती है, सभी साधक विशुद्ध मार्ग का अवलंब कर निर्गुण ब्रम्ह को पा सकता है। ब्रम्ह चाहे सगुण हो या निर्गुण वह सर्वव्यापी है। सभी जीवों का

❖विद्यारतः❖ Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIIF)

MAH MLID3051/2012  
ISSN: 2319 9318

UGC Approved  
Jr.No.62759

Vidyawarta®

Jan. To March 2018  
Issue-21, Vol-07

0161

तत्काल पालनहार विठठल है जो इन सब में मूल भी है और अमूर्त है और भी इसीलिए नामदेव कहते हैं-  
जब जाऊं तब विठठल भेला।  
विठठल लियो राजाराम देवा।।”

नामदेव का व्यक्तिगतत्व बहुमुखी था। वे जगत् बहुमत थे। नामधारी संत किसोबा खेनर के उपदेश को ग्रहण कर नामदेव सगुणाधारक से निर्गुणाधारक हो गए। उदार अन्तःकरण से जब उन्होंने देखा कि सगुण ध्वनि उपनुक्त नहीं है तब उन्होंने उसका त्याग कर निर्गुणोपासना में लग गये। इससे एक बान स्पष्ट हो जाती है कि नामदेव किसी सिध्दान्त के प्रति दृढ़ात्मी नहीं थे, वे विचारशील भक्त थे। डॉ. राजेन्द्रकुमार वर्मा जो नामदेव की कविता को उनके जीवन काल की दृष्टि से तीन भागों में विभाजित करते हैं—

1. प्रथम उन्मेषकी रचनाएँ— जब वे मुर्ति पूजक थे।
2. मध्यकालीन रचनाएँ—जब वे परंपरा से रहित थे।
3. उत्तरकालीन रचनाएँ— जब वे ईश्वर का व्यापक रूप सर्वत्र देखने लगे थे।

पहली उत्तरकालीन रचनाएँ नामदेव के निर्गुण मार्ग की संपादिका हैं।

साधारणतया निर्गुण काव्यधारा के प्रवर्तक संत कबीर माने जाते हैं परंतु मान्य तो यह है कि निर्गुण काव्यधारा का बीजारोपण कबीर से पहले नामदेव, जयदेव, बिलोचन, रामानंद, धन्ना, पीपा, सेन आदि कर चुके थे। कबीर ने केवल उसे व्यवस्थित रूप देकर उसका विस्तार एवं प्रसार किया। डॉ. पीताम्बर दत्त बडधवालजी ने अपने गौध प्रबंध में निर्गुण कवियों का अध्ययन प्रस्तुत कर यह सिद्ध किया है कि नामदेव ही निर्गुण काव्यधारा के प्रवर्तक हैं। “डॉ. बडधवाल के पूर्व तक निर्गुण काव्यधारा के प्रवर्तक संत कबीर माने जाते रहे। यद्यपि आज भी निर्गुण काव्यधारा के प्रवर्तक के रूप में कबीर को ही मान्यता है किन्तु संभवतः डॉ. बडधवाल पहले विद्वान थे जिन्होंने निर्गुण काव्यधारा के प्रवर्तक के रूप में नामदेव की ओर संकेत किया है।”

जीवन सार को आत्मगत कर उन्हीं के अनुकूल आचरण करना संतो की प्राणभूत विशेषता मानी जाती है। उन्हीं तत्कालिन समाज प्रचलित धार्मिक और दार्शनिक विचारधाराओं को, साधकों के साम्यपूर्ण तत्व को आत्मगत कर प्रतिभा के बलपर एक विशिष्ट मंथि में बदल दिया। यही उनकी मौलिक देन है। वे ग्राम्य में ही सत्य के उदाररस और झूठ के प्रखर विरोधक थे। इसी कारण तो उन्होंने उत्तर भारत में जब अंगजकाफा फैली हुई थी। विदेशी आक्रमण से जनता प्रन्न थी तब कालखंड में पंजाब में रहकर जनता को बहुदेवायामना, बाबाडम्बर, जातिभेद आदि के प्रति सावधान कर भागवत धर्म का झंडा लहराया। तत्कालिन स्थिति में प्रचार साधकों के अभाव में नामदेव जो कुछ किया वह निश्चित ही कठिन था। भारतीय जनता के अंधविश्वास का लक्ष्य उठाकर विदेशी संस्कृति विस्तार के साथ पैर जमा रही थी, उस वक्त भारतीय संस्कृति तथा धर्म को रक्षा नामदेव ने की। डॉ. शं. के. आडकर जी ने नामदेव के इस महान कार्यपर टिप्पणी देते हुए कहा है—“सचमुच नामदेवने एक गुण प्रवर्तक का कार्य किया। प्रचार तथा यातयात के साधनों का जिस काल में अभाव था, उस काल में नामदेव ने जो महान कार्य किया उसे देखकर हम आश्चर्य बकित हो जाते हैं। इस्लाम के आक्रमण की छाया में उन्होंने उत्तर के हिन्दू को भागवत धर्म के झंडे के नीचे एकत्रित किया। इतिहास में इसका मुश्किल से मिलेगा। मु. महाराष्ट्र इस संत कवि के ऋण से पंजाब ऋण नहीं हो सकता। नामदेव ने यह कार्य स्वार्थश नहीं बल्कि भक्तिप्रेम तथा मानवता प्रेम के कारण किया।”

संत नामदेव के सिध्दान्त और दृष्टीकोण अत्यन्त सरल और उदार और व्यापक है। वे भारत के लोकप्रिय संत हैं। उन्होंने अध्यात्मिक अनुभूति को बोधगम्य बनाने के लिए दृष्टान्तों का प्रचुर मात्रा में प्रयोग किया। उनकी रचनाओं में तत्सम शब्दों की उपेक्षा तद्भव शब्दों की मात्रा अधिक है। उनकी रचनाओं में अरबी, फारसी, राजस्थानी, पंजाबी शब्दों की बहुलता पायी जाती है वह उनकी पुमक्कड़ी वृत्ति का परिणाम है।

❖विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IUIF)



MAH MUL/D3051/2012  
ISSN: 2319 9318

UGC Approved  
Jr. No. 62759

Vidyawarta®

Jan. To March 2018  
Issue-21, Vol-07

0162

नामदेव सभ्यसूचीन नरुजागरण के प्रणेता है। नतीने उतर भारत की गाथा कर सिधुते और नाथी के निर्गुन मत मे भक्ति का सन्निवेश कर कबीर का मार्ग प्रशस्त किया। नामदेव ने अगर हिंदी फलो की रगनार्त न की होती और नामदेव उतर भारत की गाथा पर न गए होते तो उतर भारत की जनता और साहित्य जगत नामदेव के महान व्यक्तित्त्व से अपरिचित ही रह जाते। हिंदी की शक्ति और उसके विकास के लक्षण को पहचाने का सामर्थ्य नामदेव में था इसीलिये हिन्दी में आगे तीन-चार सौ वर्षों तक संत काव्य लिखा जाता रहा। नामदेव के समकालीन (गोय मुंभार, नरहरी सोनार, परिसा भागवत जनी, जगनिमनागा, कान्दूपात्रा, जानदेव, सागदेव, जोगा परमानंद, चौखामेळा, सावतामाळी) तथा परवर्ती (कबीर, रज्जबजी, सुन्दरदास, दादू, दयाल, रैदास आदि) महाराष्ट्रीय तथा उतरभारत के अनेक संतो ने बड़ी श्रद्धा के साथ उनका स्मरण किया है। इस दृष्टी से डॉ. रामचंद्र मिश्र का कथन विचारणीय है—हिंदी के संत कवियों में अग्रगण्य प्रसिध्द संत कबीर ने संत नामदेव का नाम बड़ी श्रद्धा के साथ लिया है। उन्होंने इन्हे कलियुग के अनन्तर्गत सजग रहने हुए भक्ति करनेवाले भक्त जयदेव के साथ गिना है। नाममात्रान्त्य, निर्गुन भावना, गुरु महिमा, बाह्यइंदवरका खंडन, एकेश्वरवाद का प्रतिवादन, जाति-पाति का विरोध, भक्ति की असाधारणता, संत संगति आदि निर्गुन मत की प्रमुख प्रवृत्तियाँ पहले नामदेव की रचनाओं में प्राप्त होती है और बाद में कबीर तथा परवर्ती संतो में। नामदेव की इन्ही विशेषताओं के कारण उन्हें ज्ञानाश्रयी शास्त्रा के प्रेरक और अग्रणी कहा जाता है।

**संदर्भ संकेत :**

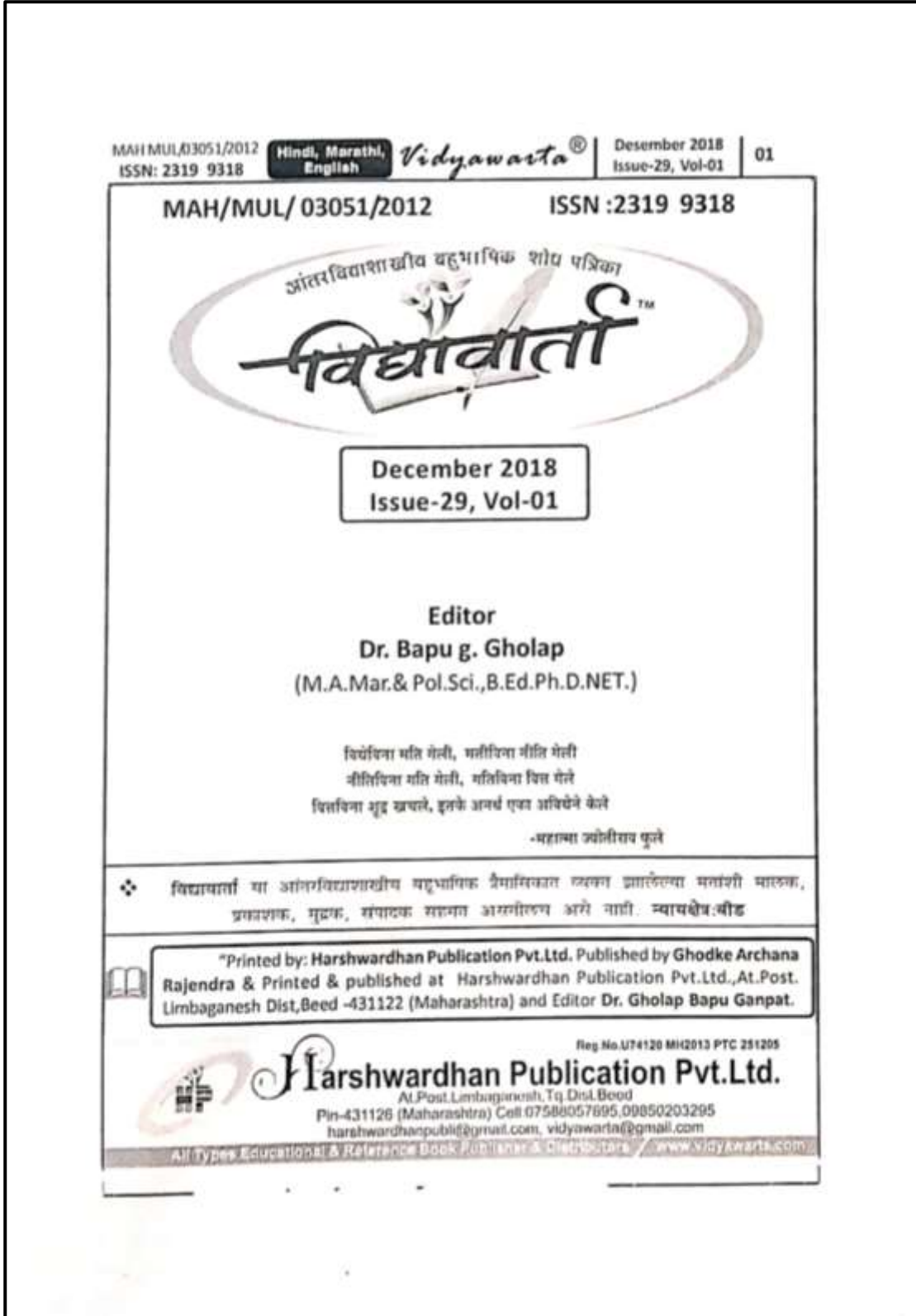
१. हिन्दी साहित्य का इतिहास— डॉ सज्जन राम केंणी—पृष्ठ ६९
२. अभंगाची गाथा — विष्णु नरसिंह जोग पृ—६०९
३. हिंदी साहित्य कोश भाग -२, संपा- धारेंद्र वर्मा पृ.३०२

द. हिंदी निर्गुन काव्य का प्रांच और जगदल  
हिंदी कविता — डॉ. शंके आदरकर, पृ. २६६  
५. पत्ती—पृ ३००

□□□

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJRF)

## 4. Samkalin Hindi Gazal: Samajik Chetana



79	डा सुमित रायकबाब	दुधन कुमार की गजलों में विंक्ति संन्दर्भ विमर्श	200
80	डा डॉ कल्पना एन पाटील	हिंदी गजलों में नारी विमर्श	201
81	डॉ अमोल अघवले	21 वीं सदी की हिन्दी गजलों में नारी विमर्श	204
82	डा डॉ महेसुख सखदे	दुधन कुमार की गजलों की राजनीतिक प्रसंगिकता	206
83	दहासीई अमोल खडिखे	दुधनकुमार की गजलों में सामाजिक एवं राजनीतिक चेतना	208
84	डा डॉ कवीराम राव	समकालीन हिंदी गजल राजनीतिक विमर्श (दुधनकुमार के विरोध सदर्भ में)	209
85	एच डी टोपारे	दुधनकुमार की गजलों का राजनीतिक परिदृश्य	211
86	डॉ. कुशांत पाटील	नए परिवेश की नई गजले	213
87	डॉ प्रवीण देशमुख	21 वीं सदी की हिन्दी गजल - सामाजिक दशा व दिशा	215
88	डा प्रीतिता तमपुरे	समकालीन हिंदी गजल में राजनीतिक एवं सामाजिक बोध	218
89	डा राजीवजी पाटील	21 वीं सदी की गजलों में सुरील चेतना (भीड़ में खड़ी अलग एव पीठ तनकर भी नहीं घुटा के सदर्भ में)	220
90	इगडे कितल कंधल	दुधन कुमार की गजलों में सामाजिक विमर्श	223
91	डा शुभदा शिवाजी आडे	समकालीन हिंदी गजल - सामाजिक चेतना	225
92	डा मायाकर बालना उरुमवार	दुधनकुमार की गजलों में सामाजिकता	227
93	डॉ सुनील मुरलीधर पाटील	इक्कीसवीं सदी की हिन्दी गजलों में राजनीतिक विमर्श डॉ सुनील मुरलीधर पाटील	229
94	डा डॉ सविता तायडे	दुधनकुमार की गजलों में राजनीतिक चेतना	232
95	डॉ।।। गुलाबराव जाधव	21 वीं सदी की गजलकार मनाज शोभकर की गजल गज में विंक्ति विमर्श	234
96	डॉ अमोल फालकर	दुधनकुमार की गजलों में अशापदी स्वर	236
97	डॉ अशोक द्रौपद रायकबाब	डॉ निरिंताजशरण अघवाल की गजलों में सामाजिक विमर्श	238
98	डॉ बबन सातपुरे	समकालीन हिंदी गजलों में धर्म विषयक चिंतन	240
99	डॉ डॉ वी कोल्हे	सामाजिक चेतना के गजलकार - दुधन कुमार	242
100	डा डॉ प्रीति सुरेद्रकुमार सोनी	जहीर कुरेशी की गजलों में व्यक्त सामाजिक चिंतन	243
101	डॉ. महेश मिश्र	उत्तर आई गजल इस दौर में कोटी के जीने से ..	246
102	डॉ पद्मान हवल ईमुरा	अदम मोडकी की कथन भविष्य	248
103	डॉ राजेशी लक्ष्मण तायरे	मराठी गजलों में विज्ञान विमर्श	250
104	डॉ संजय विराजी विदने	समकालीन गजलों में नारी विमर्श	252

## समकालीन हिंदी गजल : सामाजिक चेतना

प्र.सुपदा शिवाजी आर्ट

विद्यार्थी मुद्रा सारणी से हिंदी में विद्या के तौर पर गजल का लेखी से विकास हुआ है हिंदी गजल का स्वल्प विविधपूर्ण है और वह स्थानीय यक्षों के साथ-साथ राष्ट्रीय यक्षों को पूरी गंभीरता के साथ अभिव्यक्त कर रही है। हिंदी गजल का मूल स्वर यक्षार्थवादी है और मही उसकी अस्तंती साकद है। हिंदी गजल का यक्षार्थ है और यह उसकी अस्तंती साकद है। हिंदी गजल का यक्षार्थवाद अधिक स्पष्ट है। हिंदी गजल उर्ध्व गजल की स्थानी परंपरा को त्यागकर यक्षार्थवादी स्वर अपनाती है। उर्ध्व गजल की पहचान उसकी रूमानियत है, तो हिंदी गजल की पहचान उसकी सामाजिक, आर्थिक, राजनीतिक चित्तए है। यक्षार्थवादी धारा के साथ ही हिंदी गजल अपना अलग रास्ता तय कर सकती है। यह सतीष की बात है कि हिंदी में सतिस गजलकार अपनी गजली में सामाजिक, यक्षार्थवादी अभिव्यक्ति कर रहे हैं। समाज की सामाजिक, राजनीतिक यक्षार्थ से लेकर मनुष्य के सुख भावी तक की अभिव्यक्ति हिंदी गजल में हुई है। विद्वानों की आत्महत्या, उनकी दुर्दशा गजलदूरी की शिवाजी देशोजगारी, महंगाई आदी समस्याओं का चित्रण हिंदी गजल में हुआ है।

हिंदी गजल के क्षेत्र में गोपाल बाबू शर्मा ने महत्वपूर्ण कार्य किया है। डॉ गोपाल बाबू शर्मा की गजले सन ७० के बाद देश की हालत पर करारा व्यंग करती है, उनकी गजल आज के आदमी के आधार पर व्यंग करती है। आज का आदमी सदाचार के बदले दुःखभार में ध्वस्त है। नफरत को बढ़ावा दे रहा है। आज उसका संस्कृत खन हो गया है, फिर भी वह लापरवाह है। उसे कोई चिंता नहीं है।

“आचरण खो रहा आदमी/निर्वसन हो रहा आदमी  
घाय तो और गेले हुए /पुष्प को घों रहा है आदमी  
आज सब कुछ लुटा जा रहा/चैन से जी रहा आदमी।”

हिंदी गजल में आज के जीवन की सच्चाईयाँ अभिव्यक्त हुई हैं। महत्वपूर्ण बात है जीवन को देखने का नजरिया जो बाजारवादी व्यवस्था की असंतोषियाँ देखा है और उससे प्रतापित होनेवाले से हमदर्दी रखता है। मोर्दनुददीन 'शालीन' सवाल उठाते हैं -

कोरी तुम ली आपने किरदार बेचकर/कैसे में घर बनाजेंगा अखबार बेचकर

आज बाजारवादी व्यवस्था में श्रम की कीमत गिरती है, सौंदर्य की कीमत बढ़ती है। श्रम और सौंदर्य का संबंध पूरी तरह टूट जाता है। नौदरनाथ अफकाल की तरह मुजफ्फर हमपी ने श्रम की बेवरी के साथ-साथ सुजन और श्रम का रिस्ता अघी तरह पहचाना है -

मूल धिले थे, हाथ लगा था पत्थर को जब पहली बार/आखिर पत्थर पिरते पिरते हाथ हो गया पत्थर का...

अंदर से अघे होते थे अक्सर आगे तिरछे जोग /जैसे अफसाना भँडो का, जैसे शोर मुजफ्फर का...

यह आत्मविरासत रम की मल्यवज्जा से जूझा है, अर्ध की सजा से नहीं।

समाज में बढ़ती हुई खाई जीवन के हर पहलु को अपने हफेट में लेती जाती है। गरीब अपनी कीमत नहीं लगा सकता लेकिन उसे अनुकूलित करनेवाले सामन शिक्षा और धर्म काजार के हाथ में है। डॉ शरजंग गर्ग ने सही लिखा है -

बिकाऊ बिकाऊ, नहीं कुछ बिकाऊ/  
मदरसे और मंदिर भी बाजार निकलते।

जिस तरह यक्षों, नुजूर्नी महिलसार्ज के प्रति व्यवहार किसी समाज की मानवीयता की कसौटी है उसी तरह किसान की शिवाजी किरती अर्थव्यवस्था की कसौटी है। पश्चिमी भारत की हरित क्रांति का नतीजा देखने के बाद 1974 में उत्तर भारत के किसान की शिवाजी के बारे में सौधी आदमी ने लिखा था-

को तेव गिल घयी जिससे हुआ है कल्ल मेरा/किसी के हाथ का उस पर निर्भी नहीं मिलता

को मेरा गाँव है वो मेरे गाँव के चूल्हे/कि जिनमें भोले तो भोले चुज्ज नहीं मिलता।

आज वैजिवादी व्यवस्था ने किसान की परिस्थिती गंभीर हो गयी है। हर दिन किसानों की आत्महत्या की संख्या बढ़ती जा रही है। लाखों टन राकते हुए जनाज के किसानों की बढ़ती हुई आत्महत्या का संकर गजल में समझ आएगा किसान आज भी किसान जैसा है - इस किसान को प्रेमबंध के सहित्य ने दिखाया था, आज भी उसकी हालत नहीं बदली है, अहमद कमास पदवाजी ध्यंग की अंतर्धारा लिखे हुए अपनी बात कहते हैं और देश की पहचान सचनता और चक्रार्थी से दूर पडे किसान के जदिए करते हैं -

जुवा ररीद-नी, बेरा, लगान जैसा है/वो रास से पाँच तक हिंदोस्तान जैसा है

खुदा के फजल से शोना उभाल रही है जमीन/मगर किसान तो आज की किसान जैसा है।

राजनेता आज देश के नीलाम करने पर तुले हुए हैं। देश की महानता के यज्जाय उन्हें धन, पस प्रिय है। नेता शब्द के साथ ही शूते गादे कल्पना में चभर अते हैं। आखरी के लिए लोगों ने केवल हिंदुरतानी बनकर अपना सुन बढ़ाया और अजारी प्राप्त की लेकिन आज के नेता यह बात भूल गये हैं सब लोग धर्म को, जाति को राजनीति का पटिया बना रहे हैं। पहले विदेशी अत्याचार करते थे और अब अपने ही देश के नेतागण आज राजनीति एवं माली बनकर रह गये हैं। ईमानदार देशभक्ती ने जो स्वतंत्र भारत का सफन देखा था, वह धूर-धूर हो गया। देश की वास्तविक समस्याएँ उनको अहम, रचार्थ को आगे गौम रही जाती

MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Jr. No 41012

Vidyawarta®

Desember 2018  
Issue 29.1

0226

है। गरीबी और बेरोजगारी हटाने के लिए कुछ करने की जगह वे एक-दूसरे को गिराने और स्वयं साला में बने रहने के प्रयास में अपना और देश का समय धन व्यर्थ में खर्चते हैं।

“यश और प्रतिष्ठा संसद में भुलन है, / यश इतनी है कि काई पुल बना है।”

दुष्कृतकुमार राजनीति के इस रस्ते में देश की स्वतंत्रता के बह जाने की सम्भावना से चिंते हैं। शोषण, भ्रष्टाचार के नित नए ढांचकण्ठी से मेतामय पुँजीपतियों से देश भी तो या रहे हैं -

“रहसुमाओ की अदाओ पर फिदा है दुनिया/उस महकती हुई दुनिया को सगाते पारो”

आज की व्यवस्था भ्रष्ट हो गयी है। रात के अंधेरे में घुरे काम होने रहते हैं। भ्रष्टाचारी दुसरो की मेहनत की कमाई हड़क बावते हैं। दुसरो की बच्चे-बेटियों के साथ बुरा व्यवहार करत है। डॉ.उर्मिलेश ने इसका चित्रण किया है -

जाने कितने गौरवो की मेहनत वो छा गए / खुद ही वो फूलें-फले हैं यह सरासर झूठ है।

हर बच्चे को अपनी बेटी की तरह मानेये वो/ये जन्मी के फैसेले है यह सरासर झूठ है।

रच कहना ही नहीं आता उनको दोसरो/वे जन्म से तोतले है यह सरासर झूठ है।

संसार में आज की गजल वर्तमान के विषय लेकर अपना विकास कर रही है। अतीत खुरसो के काल में जहाँ गजल निषो मनोरंजना करती थी वह आज सच्चाये के धरातल पर आ चुकी है। इसका चित्रण कवि दुष्कृतकुमार, गोपाल बाबू शर्मा, मोईनुद्दीन शाहीन, अहमद कामल, परवाजी की गजल में दिखाई देती है। निष्कर्ष रूप में हिंदी गजल सामाजिक, राजनीतिक, समाजवादी सभरवाओ को लेकर अपना विकास कर रही है।

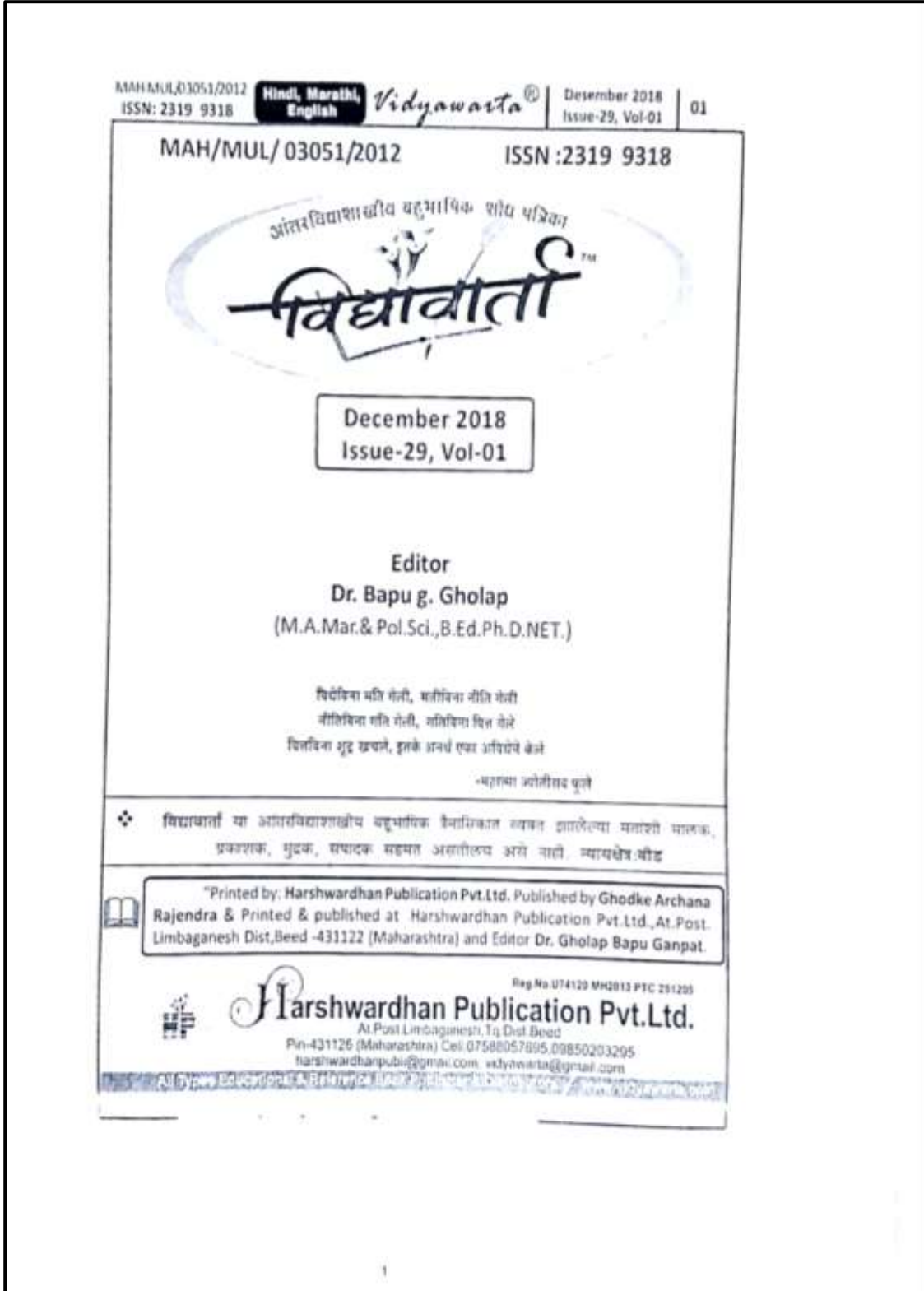
संदर्भ सूची :

1. सजोतसरी हिंदी गजल - सादिका अरसलम मयाय 'सहर'।
2. हिंदी गजल गजलकारी की नजर में - सरदार मुजावर।
3. साथ में पुप - दुष्कृत कुमार।

संशोधक हिंदी विभाग,  
न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर

Vidyawarta : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IIJIF)

## 5. Samkalin Hindi Gazal: Rajnitik Eav Samajik Bodh



79	प्र. सुनेल भायकवाड	दुधत कुमार की गजलों में विभिन्न साहित्यिक विधाएँ	200
80	प्र. डॉ. कल्पना एल पाटील	हिंदी गजलों में नारी विमर्श	201
81	डॉ.अमोल अचवरे	21 वीं सदी की हिन्दी गजलों में नारी विमर्श	204
82	प्र.डॉ.मोनुक रायद	गुमना कुमार के गजलों की राजनीतिक प्रसंगिकता	206
83	दशरामो अमोल भाधेद	दुधतकुमार की गजलों में सामाजिक एवं राजनीतिक चेतना	208
84	प्र.डॉ.मनीषा राय	समकालीन हिंदी गजल राजनीतिक विमर्श(दुधतकुमार के विराग सारंग में)	209
85	एच.डी.टी.गारे	दुधतकुमार की गजलों का राजनीतिक परिदृश्य	211
86	डॉ. वृष्णात पाटील	नए परिवेश की नई गजले	213
87	डॉ. प्रवीण देशमुख	21 वीं सदी की हिन्दी गजल : सामाजिक दशा व दिशा	215
88	प्र.प्रतीक्षा समपुरे	समकालीन हिंदी गजल में राजनीतिक एवं सामाजिक बोध	218
89	प्र.सलीमबी पाटील	21 वीं सदी की गजलों में युवती चेतना (भीड़ में सबको आलस एव फेड बनकर भी नहीं टूटा के संदर्भ में)	220
90	इगडे शिवल कथरु	दुधत कुमार की गजलों में सामाजिक विमर्श	223
91	प्र.सुमदा शिवाजी आई	समकालीन हिंदी गजल सामाजिक चेतना	225
92	प्र. गंगाधर बालन्ता उजमवार	दुधतकुमार की गजलों में सामाजिकता	227
93	डॉ.सुनील मुलतीधर पाटील	इज्जतगोली लदी की हिन्दी गजलों में राजनीतिक विमर्श डॉ.सुनील मुलतीधर पाटील	229
94	प्र. डॉ. लक्ष्मी सायडे	दुधतकुमार की गजलों में राजनीतिक चेतना	232
95	छाया गुलाबराज जाधव	21 वीं सदी के गजलकार मनोज खोमकर की गजल गज में विविध विमर्श	234
96	डॉ.अमोल फालकर	दुधतकुमार की गजलों में आजादी स्वर	236
97	डॉ. अशोक द्रोणद भायकवाड	डॉ. गिरिशखरण अग्रवाल की गजलों में सामाजिक विमर्श	238
98	डॉ.बसंत सातपुरे	समकालीन हिंदी गजलों में धर्म विषयक चिंतन	240
99	डॉ.डी.बी. कोल्हे	सामाजिक चेतना के गजलकार - दुधत कुमार	242
100	प्र. डॉ. प्रीति सुरेन्द्रकुमार खोनी	जहीर कुरेशी की गजलों में व्यक्त सामाजिक चिंतन	243
101	डॉ. राहुल मिश्र	उत्तर आई गजल द्वारा दीर्घ में कोठी को जीने से	246
102	डॉ. बछान हरान ईनुरा	अक्षय मोडकी की गजल भंगिमा	248
103	डॉ. राजश्री लक्ष्मण वाकरे	बराठी गजलों में विराग विमर्श	250
104	डॉ.राजय विराजी विदगे	समकालीन गजलों में नारी विमर्श	252

साम्प्रदायिक हिंदी गजल में राजनीतिक एवं सामाजिक बोध

प्र प्रतिभा तन्पुरे

गजल फारसी-उर्दू की एक लोकप्रिय कला शिल्प है। 'गजल' शब्द तो अरबी है, पर अरबी में गजले अधिक नहीं मिलती हैं। फारसी से यह शिल्प हिंदी तथा उर्दू में आया। इसका को गजल नहीं या गजला। गजलगी, गजलगी, गिरी और मलगी सभी गजले लिखी गयी हैं। गजल तो एक ऐसी कला शिल्प है, जिसमें गायक ने साफ़-साफ़ धरने की संपूर्ण क्षमता है। अपनी भावनाओं एवं विचारों को प्रभावपूर्ण ढंग से प्रस्तुत करने के लिए गजल का माध्यम ही बस सामान्य माध्यम रहा है।

'गजल' शब्द मुसलमानी भाषा का है जिसका अर्थ है - 'जोश से बर्ता करना'। गजल की शैली-शायरी और सतत परिष्कार इस प्रकार प्रस्तुत कर सकते हैं। कि मन् के भावों को रोहों के माध्यम से अभिव्यक्त करने की कला का नाम गजल है। हिंदी गजल की परंपरा जैसे ही बहुत ही पुरानी है। आदिमान के चर्चि अंधेर सुसारी हिंदी गजल के जनक माने जाते हैं। मुसल गजल शुरुआतिक भावों की अभिव्यक्ति को विधा रही है। पर समय के साथ-साथ उसमें कल्पित परिवर्तन भी आया है। आज की गजल में केवल मानुष भावों की अभिव्यक्ति नहीं होती, बल्कि जिन्दगी के कठने अनुभवों की भी सामान्य अभिव्यक्ति मंडी जाती, बल्कि जिन्दगी के कठने अनुभवों की भी सामान्य अभिव्यक्ति हो रही है। केकरी, भूख, भईगाई, धोखाधड़ी, अत्याय, भ्रष्टाचार, अमान्यव्यवस्था, अजनबीपन, डोंग, खून-खराबा, मानवियत, एकता, सद्बन्धन आदि तथाम विषयों की सामान्य दशाक की हिंदी गजल में अपनी निष्ठा की दायरे में लिया है।

हिंदी गजल में राजनीति एवं सामाजिक बोध की सुलभ अभिव्यक्ति के अलावा का श्रेय दुष्यंत कुमार को जाता है। दुष्यंत कुमार ने अपनी एक सार्वजनिक वक्ता को व्यक्त करने के लिए गजलों का ही साहाय्य लिया। उनकी गजलों में आम आदमी की ध्वजकने वाली जाती है। दुष्यंत कुमार की गजलों का मूल स्वर स्वयंसेवक रहा है। उनकी गजले तो सामाजिक संध्याशुभो का अर्द्धना बनकर सामने आती हैं। राजनीति, संविधान, गरीबी, सामाजिक तनाव, राष्ट्रभय आदि विविध विषयों को लेकर बड़ी पुरजा गजलों प्रस्तुत की हैं। उन्होंने गजल का सार्वजनिक अर्थ में परिवर्तन करके गजल को सामाजिक-राजनीतिक धरातल पर लाया।

कवि सामाज में आए बदलाव के प्रति जागृति पैदा करना चाहते हैं। परन्तु कवि ईमानदारी से कहते हैं - सामाज में उन्हें हंगामा खड़ा करना नहीं है। वे जोशिश कर रहे हैं कि, सामाज को सुशा, सुशा बदल जाए -

"सिर्फ हंगामा खड़ा करना मेरा मकसद नहीं, / पेरी कोशिशि यह है कि सुशा बदलनी चाहिए।"

दुष्यंत कुमार राजनीति के इस दले में देश की स्वातन्त्र्य के बर जाने की सम्भावना से विनित है। शोषण भ्रष्टाचार के निरत नए ध्वजकणों से नैतामय कुंजीसिधों से दार भी तो प रहे हैं -

"रघुनाथों की अर्धाओं पे भिदा है दुनिया, / इस बहकती हुई दुनिया को सँभालो यारो।"

हिंदी गजल में श्रेष्ठ में एक बहुत नुपया नाम है डॉ. सुंदर बेदी का। इन्होंने अपनी गजलों में माध्यम से सामाजिक यथार्थ को बारी की है।

भारत की सामाजिक परिस्थिती में विषयगत, गरीबी, बेकारी, भौंगाई दुर्भिक्ष, शोषण, बेईमानी, भ्रष्टाचार, राजनीति और धर्म के साथ पर दण, अधविश्वास ही उपरकर आते हैं। राष्ट्रीय और सामाजिक पलाय के विषय में हिंदी गजल का भण्डार भर पड़ा है। सामाजिक परिस्थितीयों की खराबी विभिन्न गजलकारों की गजलों में अलग-अलग ढंग में व्यक्त हुई है। सुंदर बेदी का श्रेष्ठ संक्षिप्त -

"सुदूर है मेरे घर में ये सुर्ज के धब्बे, / कभी यहाँ पे उजालों ने खुदबुखी की है।"

कवि जहीर कुतुबी गजलकार के रूप में हमारे सम्मुख आते हैं। कवि ने उनकी जीवन में जो अनुभूति आई, जो उन्होंने भोगा है उसका वास्तविक शिल्प गजल में प्रस्तुत है। कवि ने सामाजिक धरातल पर अपने विषयों को बारी की है। इन्होंने भी अपनी गजलों में सामान्य से सामाजिक एवं राजनीतिक विरूपताओं का परीक्षा किया है। उन्होंने राजनीति पर तीखे व्यंग किए हैं।

प्रजातंत्र पर व्यंग करते हुए वे लिखते हैं -

"राज की राजनीति की रम्या, / दिल कहीं, दल बदल रही है कहीं।"

डॉ. रंजिताम अशान्त ने जहाँ प्रेमाय पूर्ण गजले कही है यहाँ उन्होंने सामाजिक समस्याओं को लेकर भी गजले कही है। सामाजिक जीवन राजनीति और धर्म से प्रभावित होता है, यही कारण है कि राजज में बेरोजगारी, दहेज प्रथा, जनसंख्या की समस्या तथा की कमी सुविधाओं की कमी सुशुद्धाद चारों ओर व्याप्त है। डॉ. अशान्तजी का ये श्रेष्ठ देखिए -

"जो हम लड़ते रहे भाशा को लेकर, / कोई यस्मिन् न सुलसीदास होया।"

संदर्भ - विराट का हिंदी गजलों की विकास में विशेष योगदान रहा है। उनकी गजले भी सामाजिक आर्द्धना है। बंबई महानगर केरत है? इस पर उनकी लिखी हुई गजल के ये श्रेष्ठ प्रस्तुत है -

"जो दिख रहा है जैसा वैसा नहीं है यो, / बँहरे पे कई बँहरे भड़ती है चम्पू।"

इसी प्रकार रामकुमार कुमक, ओमप्रकाश शिर, डॉ. अनुपम नायडू, सबागी शंकर, उषा कुमार, ज्ञान प्रकाश विमल, कुमर संदि, डॉ. एनके सारस्वत, डॉ. गिरिराज शरण अण्जल, सुर्धमान गुप्त और आज के नये गजलकारों ने भी अपनी गजलों में विविध सामाजिक यथार्थ को बारी की है। वे गजले आम आदमी की जिन्दगी से आरंभ यथार्थताय करते हैं।

सारांश - यही बदलते समय के साथ-साथ हिंदी गजल का विकास भी बदल गया। दुष्यंत कुमार के आगमन के साथ हिंदी गजल की दुनिया में एक नये युग की शुरुआत होती है जिसे हम आम आदमी की हिंदी गजल का मूल कह सकते हैं। दुष्यंत के जन्मने से ही हिंदी गजलों में जनसामान्य की दीक्षाओं का राजनीति की खारिशी का और महानगर के अजनबीपन का व्यंगपूर्ण



MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Jr. No 41012

Vidyawarta®

December 2018  
Issue 29.1

0219

विकसित होने लगा था। तब से लेकर आज तक हिंदी गजलसामाजिक और राजनीतिक माहौल का दायमन ग्राम कर आगे बढ़ रही है। निष्कर्ष रूप में यह सचमुचे है कि हिंदी गजलों का भविष्य नितांत उज्ज्वल है। क्योंकि हिंदी गजलों भारतीय जनमानस की आकांक्षों-पिराणियों सुख-दुखों आस्था-अनास्थाओं राष्ट्रीय एकता, आपसी सद्भाव एवं मानवता को निरूपित कर रही है।

संदर्भ सूची

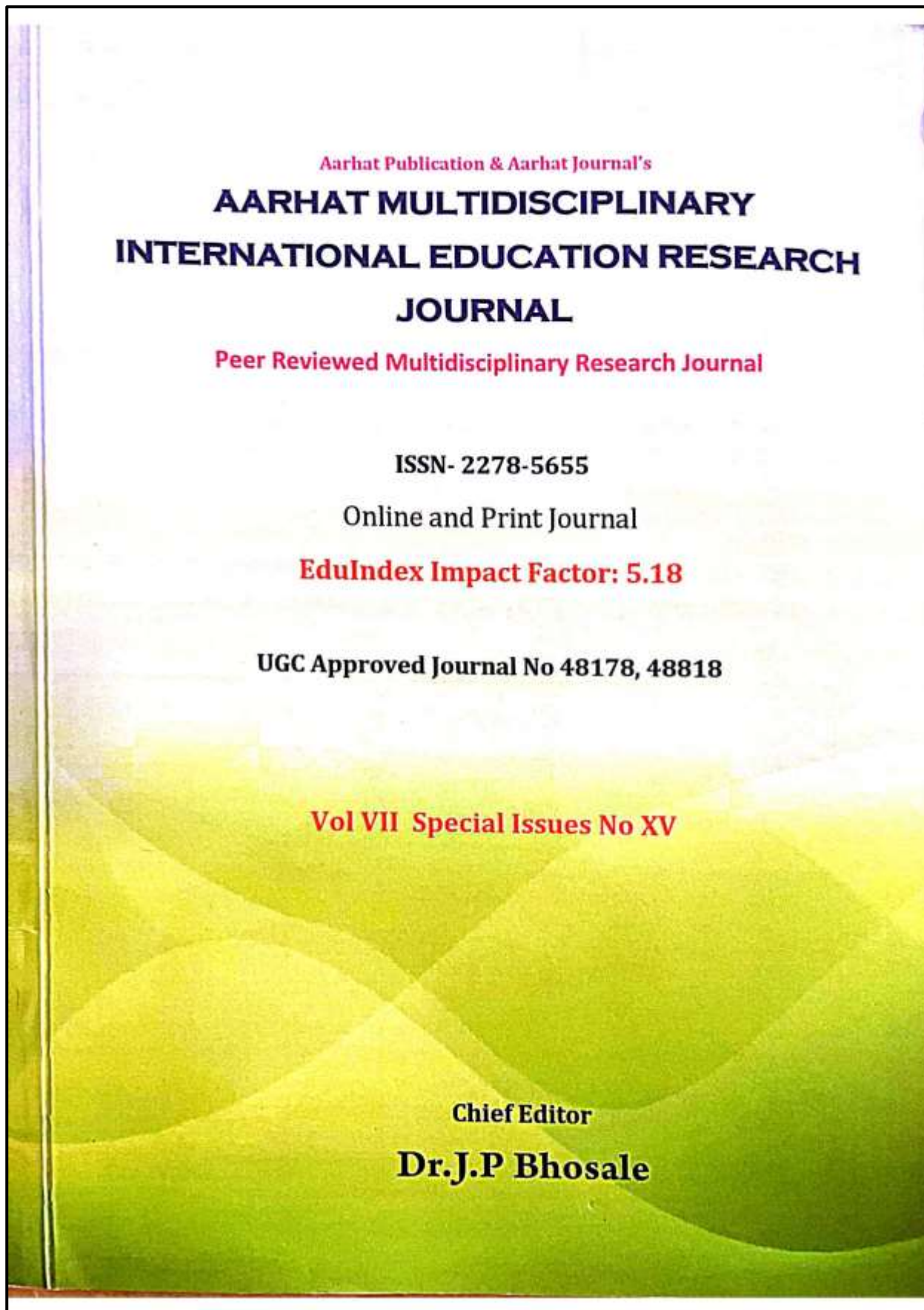
1. साद्वै में ध्रुप दुष्यंत कुमार पृ-15
2. साद्वै में ध्रुप दुष्यंत कुमार पृ-40
3. शांतिमाने कौंध के अंतर बेवैम पृ-9
4. धौदनी का दुःख जहीर सुरेशी पृ-7
5. नदीन भात हिंदी गजल डॉ.रोहिताराध अस्थाना पृ-36
6. शद्रसेन विराट
7. साद्वै में ध्रुप दुष्यंत कुमार पृ-15

सहा. अध्यक्ष हिंदी विभाग,

न्यू आर्ट्स, कौमरा जैन्ड सायन्स कॉलेज,  
पारनेर

Vidyawarta : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IIJIF)

**6. Environmental Pollution and Health Problems**



Aarhat Publication & Aarhat Journal's  
**AARHAT MULTIDISCIPLINARY  
INTERNATIONAL EDUCATION RESEARCH  
JOURNAL**

**Peer Reviewed Multidisciplinary Research Journal**

**ISSN- 2278-5655**

**Online and Print Journal**

**EduIndex Impact Factor: 5.18**

**UGC Approved Journal No 48178, 48818**

**Vol VII Special Issues No XV**

**Chief Editor**

**Dr.J.P.Bhosale**

## I N D E X

Sr. No.	Name of Research Paper & Researcher	Page No.
1	SURVY OF AQUATIC INSECT FAUNA FROM RURAL FRESH WATER RESERVIOR DHANORA DISTRICT BEED (M.S) INDIA <b>RAMESH N. ABDAR</b>	1-7
2	PHYSICOCHEMICAL CHARACTERIZATION OF STARCH FROM TWO MAIZE VARIETIES <b>R. B. BARMUKH</b>	8-13
3	HUMAN RESOURCE ACCOUNTING : WAY TO MEASURE THE EFFECTIVENESS OF PERSONNEL <b>DR. BHOSALE J. P.</b>	14-19
4	HIGHER EDUCATION IN THE NEW AGE OF GLOBALIZATION <b>DR. S. D. TAKALKAR</b>	20-26
5	AVAILABILITY AND MANAGEMENT OF WATER IN THE RIVERS OF RAIGAD DISTRICT <b>DR. SAMEER ARUN BUTALA</b>	27-32
6	RECENT TRENDS IN BANKING SECTOR IN INDIA <b>PROF. DATTATRYA DALVI</b>	33-36
7	LYTOCESTUS MULAANSIS N.SP. FROM FRESHWATER FISH CLARIAS BATRACHUS FROM MULA DAM AT BARAGAON NANDUR, TALUKA RAHURI, DISTRICT AHMEDNAGAR, M.S. <b>R. R. DANDAWATE</b>	37-43
8	IMPORTANCE OF SOIL AND WATER ANALYSIS IN RECENT AGRICULTURE – CASE STUDY OF SANGAMNER TAHSIL <b>SANGITA DANDWATE</b>	44-47
9	ENVIRONMENTAL POLLUTION AND HEALTH EDUCATION <b>S. M. GAIKWAD</b>	48-50

**ENVIRONMENTAL POLLUTION AND HEALTH EDUCATION****S. M. GAIKWAD**

Director of Physical Education & Sports,  
New Arts, Commerce & Science College, Parner,  
Tal. Parner, Dist. Ahmednagar – 414 302.

**ABSTRACT :** Environment means whatever surrounds the human beings, where the human interact with the environment constantly. These interactions affect quality of life. It is also known as external environment which includes the air, water, soil, noise, sun radiations, plants, deserts, rocks, buildings, industries etc. On the other hand, everyone has internal environment which consists of his body, his internal systems and their functions. The body maintains balance between the external and the internal environment, but sometimes the state of balance is disturbed due to the environment pollution and disease are caused. Environment is polluted when some foreign bodies enter in it and affects the life of humans. These foreign substances degrade the quality of water, air, noise and many other factors. To over-come the said factors humans should be physically fit, because healthy people constitute a healthy nation. It is necessary to explain the meaning of health as it is not merely absence of disease but much more.

**Key Words:** Environment, Health, Degrade, Polluted

**OBJECTIVES OF HEALTH EDUCATION**

Three main objectives are.

1. Informing the people
2. Motivating the people
3. Guiding into people

**WHY IS ENVIRONMENTAL HEALTH IMPORTANT**

The strength of a nation rest upon the health of its people and future of the health and the people, improve and present the health. A health is a fundamental human right. To be good man is like first require is success in life and to be a nation of healthy is the first condition is national prosperity. The natural question that arises is what health is? And on what it depends?

The dictionary meaning of health is "freedom from disease, sound body and mind etc. that condition in which functions of body and mind one duly discharged". Health is the ability of the body to sustain adaptive effort and is used to imply body power, vitality and ability to resist fatigue. Health is sometimes considered as the total outcome of the organic, neuromuscular interpretive and emotional development. Health is means greatest wealth, he who has health must cherish it with care, last he should lose it. To this end he must have adequate knowledge of how to live healthy. Health is not merely absence of disease. Health is state of complete physical, mental, and social wellbeing and not merely an absence of disease or infirmity". "Health is that state in which the individual is able to mobilize all his resources intellectual, emotional and physical, for optimum daily living". Recently this definition has been amplified and it has been added, "Attainment of a level of health that will enable every individual to lead a sociality and economically productive life"

**-World Health Organization**

#### **DIMENSIONS OF HEALTH**

Authorities are associated with the field of health have recognized dimensions of health are. Physical dimension, Mental dimension, Social dimension, Emotional dimension, Spiritual dimension, Vocational dimension, Educational dimension, Nutritional dimension, Environmental dimension, Curative & Preventive dimension.

#### **ENVIRONMENTAL HEALTH RISKS**

Here the term 'environmental health' refers to many different factors in a person's surroundings. Generally speaking, environmental health risks include problem with.

- **Air pollution** - smog, wood smoke and mould,
- **Water pollution** – gray water, lake water, fluoridation, and drought
- **Food quality** – contamination and nutrition.
- **Chemicals** – pesticides, farm chemicals, etc.
- **Metals** – exposures to lead
- **Diseases from animal and insects (vector born)** – dengue fever, hendra virus, Ross River fever and malaria
- **Infection disease** – viral infections like swine flu
- **Natural hazardous** – solar radiation and extreme weather events
- **Man Made structures** – exposure to asbestos or electromagnetic radiation sources like mobile phones

- **Occupational health** – safety issues relating to the workplace such as noise pollution and hazardous waste
- **Chemical change** – higher sea levels, increased soil salinity and increased temperatures.

#### REMEDIAL MEASURES

'Health education and Sports for All' should be compulsory. For Air pollution- containment, Replacement, Dilution, Legislation, International action, should be followed Save Ozone layer ; Save earth For water pollution- treatment of waste water ( Sewage & industrial waste water)population control, Educative manner. To control noise pollution- effectively prohibitory laws should be introduced. For eg- excessive noise can be recognized as a crime under section 268 of IPC, the provisions made under motor vehicles Act can be effectively implemented. Improvement in designing machines, banning pressure horns, improving road systems

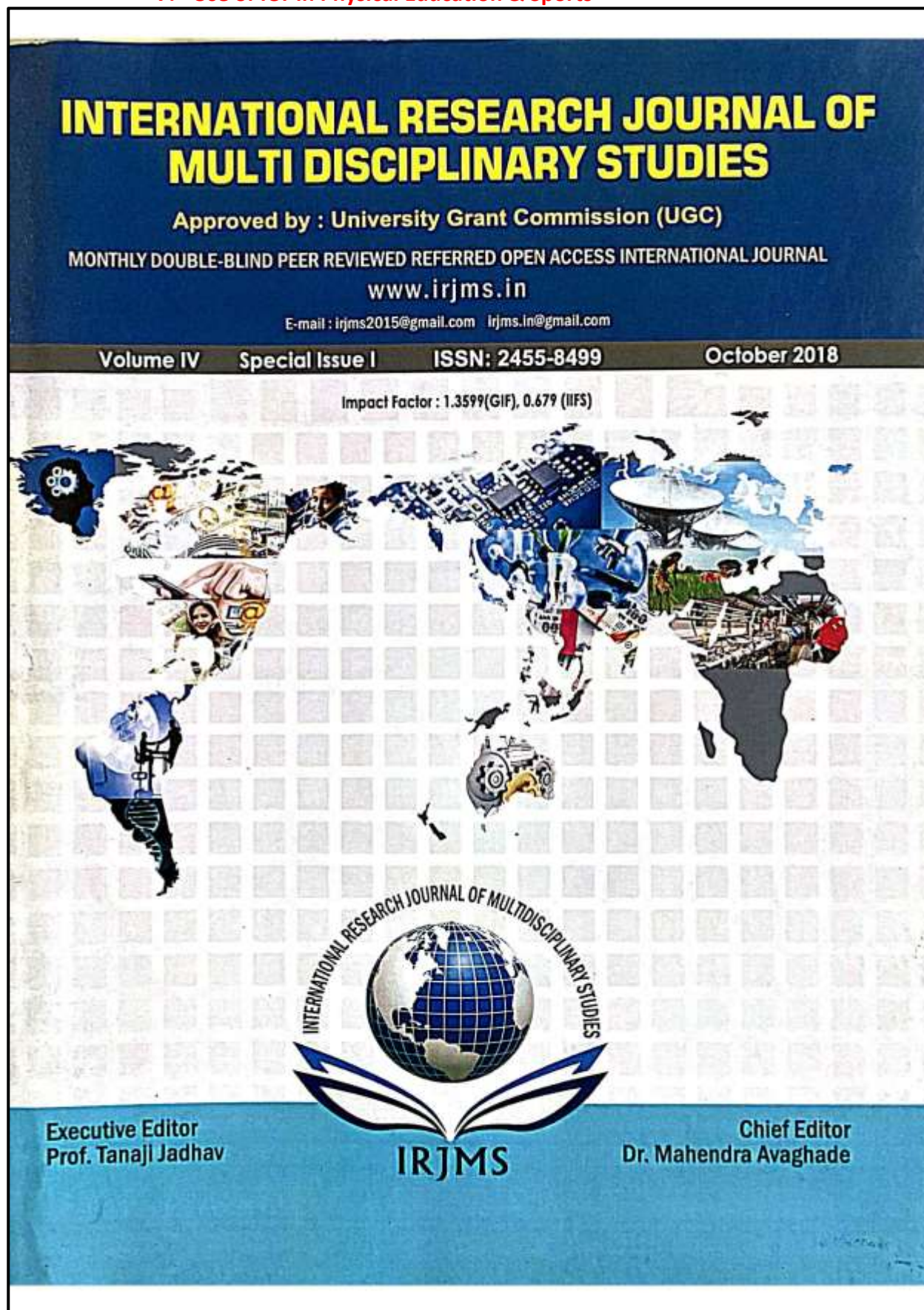
#### CONCLUSION

Health education provides the scientific facts of community hygiene that could be help in preventing and eradicating many diseases and remove ignorance. Health education programmes are basically of preventive and promotive nature. As prevention is better than cure, such programmes are very important in transmitting the knowledge. Making the people aware of various dreaded diseases, occurrence of which could be easily avoided. In this way, health education will play an important role in eliminating many problems that adversely affect young people, adults, and society in general.

#### REFERENCES

1. Dr. Ajmer Singh, Dr. Jagdish Bains, Dr. Jagtar Gill, Dr. R.S. Brar, Dr. Nirmalgit Rathee,- Essentials of Physical Education, Kalyani Publishers, B-I/ 292, Rajinder Nagar, Ludhiana-141 008
2. Sainai L.D., Sharma R.C.-Kalyani's Environmental Education-Kalyani Publishers, B-I/ 292, Rajinder Nagar, Ludhiana-141 008
3. [www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Enviromental\\_health](http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Enviromental_health)

7. Use of ICT in Physical Education & Sports







# **International Research Journal of Multidisciplinary Studies**

Chief Editor  
Dr. Mahendra R. Avaghade

Executive Editor  
Prof. Tanaji D. Jadhav

Published by  
**IRJMS**  
Sr. No. 397, Flat No. 7, 4 Sizan Society,  
Bhugaon, Tal. Mulshi, Dist. Pune 412115

**Printed by**  
**Anmol Graphics**  
Flat No.3, Ojas Apartment  
Sr.No.57/3B, NR, Morya Vihar, Kothrud,  
Pune 411038 Mob. 8888563815/9764991027

Copyrights: Editors @2018  
All Rights reserved

ISSN: 2454-8499 (Online)

Issue  
Available at [www.irjms.in](http://www.irjms.in)



## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

42	Effects of Cr <sup>3+</sup> on semiconducting properties of the Lithium ferrites <i>S.B.Patil</i>	190-196
43	DERIVATIZATION FINGER PRINTING ANALYSIS OF THE AMARANTHUS SPINOSUS LEAVES USING HPTLC METHODS. <i>Sable K. V<sup>1</sup>, Arsule C. S<sup>1</sup>, and Saswade R. R.<sup>2</sup></i>	197-200
44	Effect of human hair solution on growth and development of Zea maize as Bio fertilizers <i>Sandip Ingale<sup>1</sup>, Pradip J. Unde, Mangesh Doke, Avinash Anpat</i>	201-203
45	Use of ICT in Physical Education & Sports <i>Sanjay M. Gaikwad</i>	204-207
46	Effect of Temperature on Electrical Conductivity of Canada Balsam <i><sup>1</sup>K. Damberi Devi, A. <sup>2</sup>Joy Singh, <sup>3</sup>Sanjeev Girase</i>	208-213
47	Screening of drought tolerant wheat varieties using different indices <i>Sawant.K.S<sup>1</sup>, Dr.Deshmukh.R.N<sup>2</sup></i>	214-220
48	ADDITIONS OF CYANOPHYCEAE FROM THE SOILS OF SAI DAM LATUR MAHARASHTRA <i>Yadav S.G. and Awasthi R.S</i>	221-225
49	Studies on some traditional plant medicines by local tribes of kinwat forest <i>S.R. Shinde</i>	226-230
50	Wind Electricity and Rural Development: Case Study Mhekari Village, Ahmednagar <i>*Shoukat Z. Fakir, R.R. Bhalshing</i>	231-233
51	Evaluation of antioxidant potential of halophyte <i>Sesuvium portulacastrum</i> : A nutraceutical perspective. <i><sup>1</sup>. *S.B. Gagare, <sup>2</sup>P.S. Jadhav</i>	234-240
52	Study of Behavioral Aspects of Broiler Chicks Reared Under Light Sources in Different Poultry Farming. <i><sup>1</sup>S. T. Naphade, <sup>2</sup>S. G. Badhe, <sup>3</sup>S. R. Naphade</i>	241-244
53	Causes of formation of Pink Berry in Grapes ( <i>Vitis Vinefera</i> L.) using Physical Techniques <i><sup>1</sup>Dhakane S. F. <sup>2</sup>Bhise R. B.</i>	245-249
54	Prevalence of acute malnutrition/wasting and its associated factors among pre-school children in Rajshahi City, Bangladesh <i>Kumkum Yeasmin<sup>1</sup> and Tanzima Yeasmin<sup>2</sup></i>	250-259
55	Sustainability of Soil Health and Organic Farming <i><sup>1</sup>S.S.Thube, <sup>2</sup>S.R.Wagh</i>	260-266
56	Exotic Genus Bauhinia L. (Caesalpiniaceae) from Maharashtra <i>Vinod Raghoji Jogdand</i>	267-270

**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(HFS)

**Use of ICT in Physical Education & Sports****Sanjay M. Gaikwad**Department of Physical Education & Sports, New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar-414 302, SPPU,Pune(Maharashtra), INDIA

Email:gsanjay483@gmail.com

**Abstract**

The researcher wants to highlight the use of ICT in Physical Education because today we were living in the world in which everyone has to use new technologies, ICT is a reality in physical education system, the employment of ICT in physical education means implementing of ICT equipment & tools in physical education teaching, coaching, training and also as tool to support physical fitness of individuals. In last few years the usage of ICT tools by individuals regarding to maintain fitness indicators. The paper aims at analyzing the use ICT tools by physical education teachers as well as internet, e-mail, E-books, E-journals, cell phones, etc.

**Keywords**-ICT, Pedometers, Fitness Tracker, HRM.**Introduction**

This decade is mainly characterized by rapid rise in technology and innovative gazettes. So being in the digital era, technology has accounted tremendous changes in Physical Education and as well as in all sectors. In physical education sports activities plays an important role in maintaining one's health and improving one physically and physiologically. These changes range from the method of instructions is delivered to the attitudes on how training occurs to the amount of collaboration and knowledge sharing between not only the players but also between physical education teachers, coaches, managers, and administrators. ICT represents one of the most useful tools to enhance sports, among the individuals. The study focuses to use ICT tools by players, faculty members to improve performance.

**Objective of the Study**

1. To find out the most use of E- resources like E- books, E-Journals
2. To find out the usage of computer applications
3. To find out the usage of digital devices
4. To find out the use virtual simulation

**Utilization of ICT tools**

Specialized Software- the greatest value of Computers and LCD projectors reside in the ability to provide improved support to classroom, gymnasium instructions for better and deep understanding, and variety of software programmes for contentious improvement. Commercial and shareware programmes are available to track grading individual athletic performance, personal fitness programs, and health assessments. The development of individualized software is becoming more common. Computers allow us to continuously modify and update our schemes of work and training plans, and maintain the records sports participation at various levels, sports award, sports schemes and sports scholarships and other extracurricular achievements.

**Multimedia and CD- ROM**

Computers have integrated learning system with multimedia presentation. Traditional encyclopaedia and reference books have been replaced by CDs, Pen-drives, memory card etc.

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com)

Page No: 204



## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

contains pictures, sounds, videos, as well as standard texts also. In the bio-mechanics classroom students can observe the listen the mechanical analysis of movements in slow motions and play over those parts to rectify unwanted movements.

### Computer Assisted Instructions (CAI)

CAI provides student with an alternative to classroom settings and frees the instructor from rote processes that are better handled by the computer. Mohnsen (1995) identified a number of reasons for using CAI in physical education. Among them were suggestions that CAI provides students with "why" behind health related fitness, it provides unlimited practice, review and remediation's students stay actively involved and it meets a variety of the student needs. CAI if individually developed requires considerable time on the part of the instructor, but this is compensated by increasing learning time available in the classroom. Using CAI as instructor can develop or acquire a series of supportive and reforming software.

### WWW (World Wide Web) / Internet

The network of the Internet has caused an expansion of communication. The WWW is the main part of the internet supporting graphics, audio, video and hypertext links, as well as standard text, access to the internet combined with the development of commercial network service providers has allowed individuals, schools, Colleges and Universities to communicate with each other and share information through mechanism such as e-mail, what's app, Facebook, twitter etc.,

For Example- pioneer sports centres such LINPE, Gwalior, (Laxmibai National Institute of Physical Education), NSNIS, Patiala, (Netaji Subhas National Institute of Sports) Bangalore, Calcutta, Gandhinagar, SAI (Sports Authority of India) Sports Physiology Centres, Sports Psychology Centres, at Chicago, Sydney, University of Iowa etc, are on the WWW and provides excellent information as well as videos of training and coaching, videos of various human systems in operations regarding sports injuries. Players can be exposed to a video of a skill analysis to get over the difficulties. Provides a new dimensions of distance education even physical education, Sports fitness, Nutrition, and health. This technique has been used in many countries to link university professors, to college lecturers, coaches, trainers, physically disable students and other students who are all physically distant from each other.

So there are many good options are available to physical education teacher in regards to technology and easily accessible and easily incorporated into the curriculum.

### Some Technological Tools

**Pedometer-** this device is also known as Step Counter, which has mechanical sensors used to count the steps, and can easily be incorporated in physical activity, and it can be used by individuals easily to improve fitness. This devise is portable and can be worn under the belt and kept the whole day. Now days it can be said that the pedometer has become recognized acceptable tool for measuring physical activity. Players can wear a pedometer and receive immediate and continuous feedback regarding their activity level. By using the pedometers students will be able to see the progress towards set goals and consequently will be more motivation to the students.

**Heart Rate Monitors-** HRM device is completely based on the player's ability level and current level of fitness. The HRM makes learning more students centered. It also provides immediate feedback that can make student or player work harder for better performance. (Bian Partridge, King Andon Boyer, 2007) As fitness level increases student or player feels that their CVS (Cardiovascular System) is working effectively. The HRM will also provide

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com)

Page No: 205



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

real data that will allow player or student to see how different exercises and activities affect the HR9 Heart Rate) hence the HRM is a convenient apparatus that allows players to use up to date technology, charts, graphs of maximum heart can be made for each players or students and track increase or decrease in their heart rate.

**Digital Video Camera and Visual Analysis Software-** in sports motion analysis plays an important role, to see the performance or weakness of the player. Surely this system in sports enhance in many areas of physical education, using digital video camera we can collect the data and simplified it. The result can be seen on interactive multimedia, presentation to provide players or students with a better understanding the importance of skills and the techniques. The visual analysis system allows player to view captured movements and analyse them. This particular technology can helps coaches to control player's progress towards motor skills, goals and provides feedback for further performance.

For Example- using video camera a coach can record players performance, which is useful tool to help the player to improve their techniques as well as performance. In addition of motion analysis software player can rectify the unwanted motions.

**Simulation and Games-** games such as dance, recreational games, dance revolutions, Fx Cycles and Nintendo wii fit opportunities for students to be physically active and simultaneously enjoying themselves. These games can also combine to other technologies to enhance the experience. The players instructions from screen and mimic, the stretching and muscle training exercises. The wii- fit tracking features shows progress using the system. Therefore it can be a valuable physical education tool.

**Methodology-**

Methodology means a systematic investigation of an issue to collect important data. For the said topic survey method is used to collect the data.

**Methods and Tools for Data Collection-**

for the above topic survey have been based on quantitative observations. The method and tool for data collection is Survey questionnaire. The survey questionnaire was designed for the physical education teachers in respect to use of ICT in physical education.

**Piloting the Questionnaire**

A sample of 75 physical education teachers from Ahmednagar district were selected in view of piloting study. We took feedback from physical education teachers after completion of the questionnaire in order to reframe the difficult questions.

**Questionnaires Administration**

After having the concern of physical education teachers and they have confidently assured, then questionnaire were delivered during the Athletic Competition and at the end of competition questionnaire was collected.

**Reliability and Validity**

To ensure validity and reliability quantitative data has been used. Investigations were carried out from reliable sources to complete relevant data. The required minimum sample of physical education teachers were selected for validity and all other questionnaire were directly collected.

**Data Analysis and Interpretation-**

Information obtained through questionnaire was captured digitally using an application in SPSS software. The data was verified, and validated before proceeding to analysis. Obtained data was analyzed using SPSS where necessary Analysis comprised of categorical tables. Comparative analysis also made in respect to correlated variables and



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

basic classification criteria. According to recommended statistical procedures Results obtained were interpreted in relation to research findings in documentations.

**Table:1 Gender Wise use of ICT**

Sr. NO	Gender	Respondent	Percentage
1	Male PET	70	99.33
2	Female PET	05	06.67
		Total	100.00

Participants for survey study were seventy five from Ahmednagar District. From Table No.1 faculty gender wise 99.33% of the respondents were male and 06.67% of the respondents are female.

**Table No. 2 Usage of ICT tools in the physical Education**

Sr. No	ICT Tools	PET No.	Percentage
1	Computer	03	04.00
2	Internet	10	13.33
3	E-mail	11	14.66
4	Cell-Phone	58	68.00

**Result and Discussion-**

The particular topic on 'Use of ICT in Physical Education'. The ICT tools Computer, E- resources, E- Journals have been used by the physical education teachers. Usage of digital devices, storage devices like DVDs, pen drives, memory cards, mostly used by the faculties. ICT have become the vital part of human life. ICT is useful for physical education for fruitful results in features.

**References-**

- Journal of Health, Physical Education, Recreation- E-109/9 Shivajinagar, Bhopal-462016
- [http://www.researchgate.net/publication/305769131\\_Use\\_of\\_ICT\\_by\\_the\\_Physical\\_Education\\_Faculty\\_in\\_the\\_Universities\\_A\\_Study.php](http://www.researchgate.net/publication/305769131_Use_of_ICT_by_the_Physical_Education_Faculty_in_the_Universities_A_Study.php)
- [https://www.ukessays.com/education/benefits\\_of\\_ICT\\_in\\_physical\\_education\\_education\\_essay.php](https://www.ukessays.com/education/benefits_of_ICT_in_physical_education_education_essay.php)
- The Mother On Education- NCERT- I.G.I. Stadium, I.P. Estate, New Delhi- 110002
- [http://www.importance\\_of\\_physical\\_education.com](http://www.importance_of_physical_education.com)
- Using ICT in physical education. <http://curriculum.becta.org.uk/docserver.php>

## 8. Temporal Changes of Cropping Pattern in Ahmednagar District





'RESEARCH JOURNEY' International E-Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 108- Sustainable Development  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

## Temporal Changes of Cropping Pattern in Ahmednagar District

Dr. R. E. Najan

Head, Dept. of Geography  
New Arts, Commerce & Science College, Parner

### Abstract:

*Agriculture in any region is dominantly controlled by physical and human surroundings. The physical factors like relief, soil, climate, water supply which sets a extensive limit for the agriculture and human factors i.e. the economical condition of the farmer, requirement of crops in market, cost of crops in market, technological level of farmer, length of occupation etc. affects on agricultural pattern of region. These factors affect on farmers decision to acquire the particular crops in the agriculture.*

*In the present paper the spatial distribution of overall cropping pattern and their temporal changes have been outline and followed by the discussion of the area under different crops. The cropping pattern is the ratio of the area under different crops at the point of time.*

**Keywords:** Spatial Distribution, Land use, Cropping Pattern.

### Introduction:

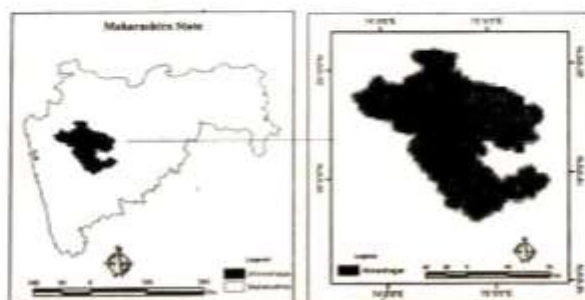
Agricultural land use and mainly the cropping pattern which reflects the development of the region, depend upon natural and societal environment. The cropping pattern in every region undergoes change due to variation in rainfall, irrigation facility, technological consciousness, agricultural inputs viz. capital, fertilizers, pesticides. The socio-economic factors also play an important role for determining cropping pattern in study region.

### Objectives:

The present paper based on the temporal changes of agricultural scenario in Ahmednagar district.

### Data base and Methodology:

The data regarding crops have been composed through socio- economic review and statistical abstract of Ahmednagar district and agricultural department Ahmednagar. The collected data converted into percentage to the gross cropped area. The crop percentage is arranged in to class categories. Graphs are prepared and finally displayed the spatial distribution. The study of temporal changes for the crops in the study has been computed for forty years period i.e. 1970-71 to 2010-11.







**Map of Study Area:**

**Cropping Pattern:**

Total Food Crops- The total food crops include the production of Wheat, Jowar, and Bajara Other Cereals, Pulses etc. and Total Non Food Crops – The non food crops included the production of different crops such as Sugarcane, Fruits ,Vegetables and Spices, Oil Seeds, Fibers and Fodder Crops.

Table - Area under Different Crops and its Changes -1970-71To 2010-11

Sr no	Major Crops	Year (Area in percentage under cultivation)					Decadal Change in Percentage			
		1970-71	1980-81	1990-91	2000-01	2010-11	1970-71-80-81	1980-81-90-91	1990-91-00-01	2000-01-10-11
1	Wheat	1.39	2.8	4.05	6.48	6.7	1.40	1.25	2.43	0.20
2	Jowar	73.30	59.48	53.46	45.52	50.85	-13.82	-6.02	-7.94	5.33
3	Bajara	7.60	14.63	23.08	18.99	12.76	7.03	8.45	-4.09	-6.23
4	Other Cereal	0.18	0.40	0.35	5.17	2.72	0.22	-0.05	4.82	-2.45
5	Pulses	2.40	8.27	3.30	8.00	10.6	5.87	-4.97	4.70	2.60
7	Sugarcane	0.60	1.60	2.33	2.83	1.22	1.00	0.73	0.50	-0.78
8	Fruits Veg.& Spice	0.50	0.86	1.37	2.00	2.10	0.36	0.51	0.63	0.10
9	Oil Seed	9.02	7.68	9.59	8.91	1.85	-1.34	1.91	-0.68	-7.06
10	Fiber	0.50	0.92	0.17	1.02	8	0.42	-0.75	0.85	10.06
11	Fodder	4.50	3.36	1.30	1.08	0.12	-1.14	-2.06	-0.22	-0.96
13	Total Cultivated Area	100	100	100	100	100	---	---	---	---

Sources-District Statistical Abstract, A. nagar- 1970-71) to 2001& District Agricultural Office, A.nagar- 2011.

The overall cropping pattern according to tahasil wise trends in 1970-71 to 2010-11 are under different food grain crops in study area, which have been shown in the Table No.4.1.Temporal variation is the cropping pattern as depending upon physical, socio-economical and technological situation. These are different from the regions overall characteristics. Therefore details analysis of various crops distribution based on the yearly average of 1970-71 and 2010-11. It is also describing the changes therein .These changes are found in the various tahasils, due to the combine effect of physical and non physical determinants. The change is agricultural pattern also depend upon the traditional behaviour of the people in a particular region.

**Temporal Changes in Cropping Pattern: 1970-71 to 2010-11:**

The following Table shows the overall cropping pattern of the study region. The total gross cropped area was 692758 hectares in 1970-71, which have 71.94 percent of the total geographical area of the study region. The gross cropped area was increased by 8.29 percent and reached up to 80.23 percent and it occupied 772631 hectares area in 2010-11. The Net Sown



Area was 673136 hectares. It covers 69.90 percent area in 1970-71. During the year 2010-11 Net Sown Area has increased by 0.49 percent and reached up to 70.39 percent of the total geographical area of the study region. The Net Sown Area had occupied 677324 hectares area.

Table – Change in Cropping Pattern

Sr. No	Crop	1970-71		2010-11		Change in %
		Area in Ha.	Area in %	Area in Ha.	Area in %	
1	Wheat	9646	1.39	51770	6.70	+5.31
2	Jowar	509085	73.48	392909	50.85	-22.63
3	Bajara	52622	7.60	98565	12.76	+5.16
4	Other Cereal	1019	0.15	20982	2.72	+2.57
5	Pulses	16333	2.36	81896	10.60	+8.24
6	Sugarcane	3643	0.53	9420	1.22	+0.69
7	Fruits, Vegetable and Spices	3352	0.48	16228	2.10	+1.62
8	Oil Seed	62690	9.05	14311	1.85	-7.20
9	Fiber	3134	0.45	85640	11.08	+10.63
10	Fodder Crop	31234	4.50	910	0.12	-4.38
11	Total Cropped Area	692758	71.94	772631	80.23	8.29

Sources-District Statistical Abstract, Ahmednagar- 1970-71 & Agricultural Office, Ahmednagar - 2011

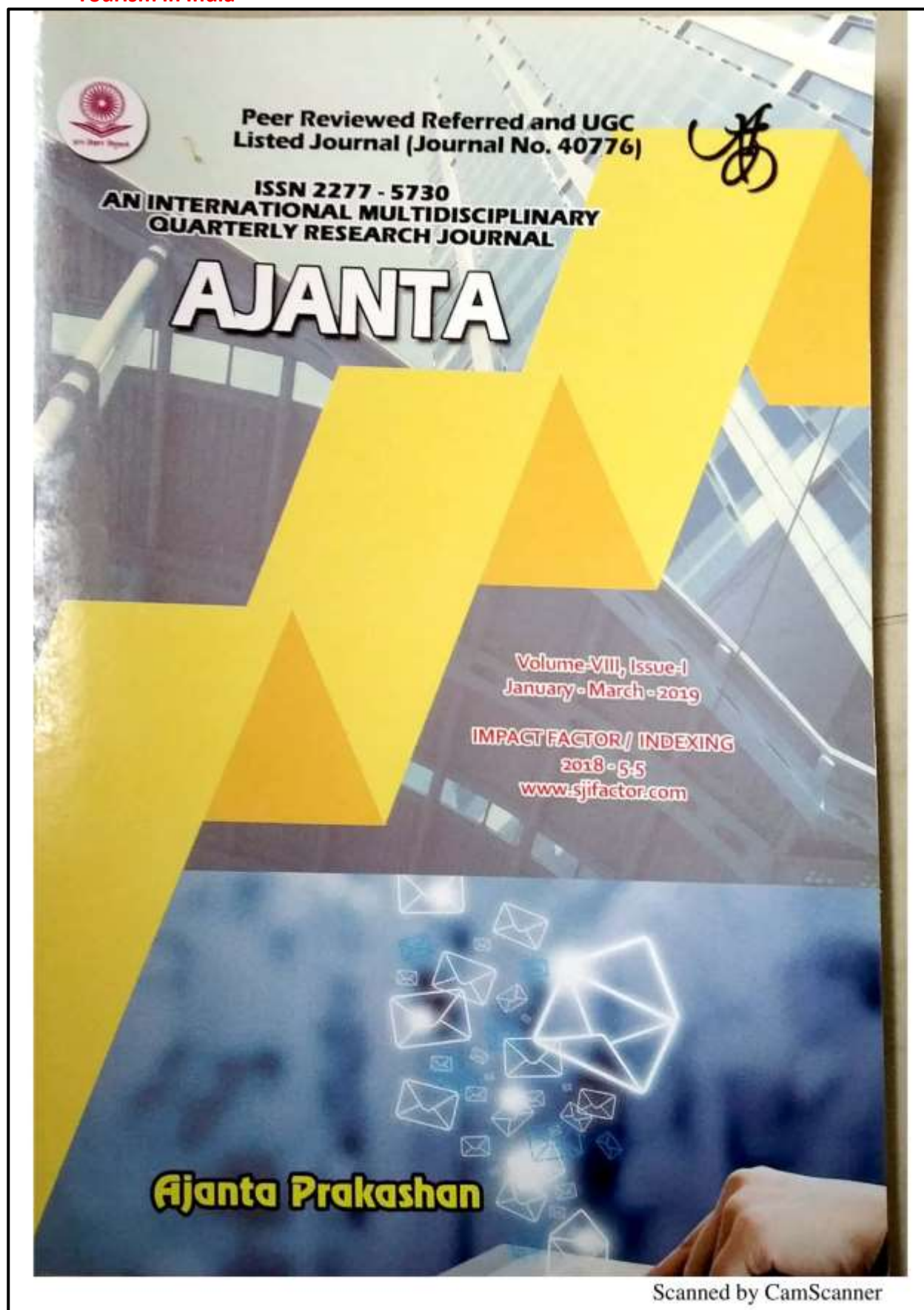
#### Conclusion:

The highest positive change has been observed in fiber crops where the area was 0.45 percent in 1970-71. It is increased by 10.63 percent and occupied area up to 11.08 percent in 2010-11. The highest negative change has indicated in Jowar crop where the area has declined by 22.63 percent in the study period. Above Table indicates the temporal change in the study area. Pulses (8.24 Percent), Wheat (5.31 percent), Bajara (5.16 percent), Other Cereal (2.57 percent), Fruits, Vegetable and Spices (1.62 percent) and Sugarcane (0.69 percent) these crops reveals increasing trend while Jowar ( 22.63percent), Oil Seed (7.20 percent) and Fodder Crops( 4.38 percent) reveals decreasing trend between the period of investigation.

#### References:

1. Socio-Economic Review and Statistical Abstract of Ahmednagar District, Ahmednagar, 1970-71
2. Socio-Economic Review and Statistical Abstract of Ahmednagar District, Ahmednagar, 1980-81
3. Socio-Economic Review and Statistical Abstract of Ahmednagar District, Ahmednagar, 1990-91
4. Socio-Economic Review and Statistical Abstract of Ahmednagar District, Ahmednagar, 2000-2001
5. District Agricultural Office, Ahmednagar, 2011

9. Present Tourism Scenario & New Technology Models for Development of Buddhist Tourism in India



VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## 6. Present Tourism Scenario & New Technology Models for Development of Buddhist Tourism in India

**Dr. G. K. Chavhan**

K. J. Somaiya College of Arts, Commerce & Science, Kopergaon.

**Dr. R. E. Najan**

New Arts, Commerce & Science College, Parner.

**Dr. P. N. Salve**

Maharaja Jivajirao Shinde Mahavidyalay, Shrigonda.

### Abstract

Buddhist pilgrimage is a significant perennial tourist activity in India, which brings in large volume of tourists as well as foreign exchange to our shores. Additionally, it is a culturally unifying factor, linking India to the rest of South and Southeast Asia. With the new 'Look East Policy' places the region in economic spotlight with cross-border trade and tourism exchanges anticipated to grow at a swift pace. In this backdrop, community involvement becomes a major component of perspective development strategies. With a high policy impetus on boosting 'inclusion', coupled with recent global experiences in community based tourism that have highlighted positive livelihood generation and educational impacts, implementation strategies are increasingly moving towards community led enterprises for sustainability of growth models. Present paper as a discussion on the Indian Tourism policy of Modi Government and suggests some technological tools for the development of Buddhist tourist places in India.

**Keywords:** *Inclusion, Collaborative Community, sustainable development.*

### Introduction

The concept of 'collaborative community' models aim to deliver sustainable socio-economic development by building the capacity of local communities to realize the potential value of their natural and cultural heritage to create tourism enterprise opportunities through a co-operative destination management organization model, which not only supplements income, but act as an incentive (or a motivation factor) to preserve local art and culture, and maintain traditional practices like architecture, cuisine and handicrafts etc.

The creation of co-operative models encompasses all the aspects of tourism under the ambit of a unified on-ground institution, which not only controls the structure and volume of

Peer Reviewed Refereed and UGC Listed Journal No. : 40776

54

Scanned by CamScanner

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)**

tourist activity, but also ensures that the entire destination is promoted holistically rather than by fragmented independent products or sites. It is imperative for the communities to have Direct Cash Flow in their day-to-day economy, and ensuring that the community retains the administrative aspects of the business is key to ensuring equitable growth. The figure below highlights some of the macro societal concerns that the model offers. The Buddhist Circuit is an important pilgrimage destination for the 450 million practicing Buddhists as well as travelers interested in history, culture or religion. The Circuit attracts tourists from 30 countries and 16 states of India<sup>2</sup>.

#### **Objectives**

- To understand the Ministry of Tourism recently launched the Strategy for Integrated Tourism Development of the Buddhist Circuit in Uttar Pradesh and Bihar.
- To suggest the technology tools for development of Buddhist tourist places in India.

#### **Investing in the Buddhist Circuit**

While International Finance Corporation, a wing of World Bank, will provide INR 180 lakh, Tourism Ministry would contribute INR 225 lakh and the contribution of Bihar and UP is INR 22.50 lakh each for the project. Local communities will be involved and creation of around 10,000 jobs is estimated. The strategy aims at infrastructure development, skill development, increased market access, involvement of communities and enhancing the visitors experience in the Buddhist circuit.

The new Government is aggressively leveraging Buddhist Tourism as a part of its foreign policy. The 'Look East' policy targeted at seamlessly connecting South East and ASEAN countries to the Indian hinterland through the critical North East Region (NER) Union finance minister Arun Jaitley's recent decision to focus only on Sarnath - Bodh Gaya section of the Buddhist Circuit has been described as "a masterstroke" by travel and tour operators, who are anticipating a 15% rise in the number of tourists to the circuit (Source: Times News Network)

Recently, Indo-Japan partnership between the culturally rich cities of Varanasi and Kyoto was accepted and adopted by both the governments. Kyoto is expected to play a vital role in Varanasi's journey to be transformed into a Smart Heritage City. The partnership is expected to focus on urban development in addition to tourism, arts, culture, heritage preservation and education.

*Peer Reviewed Refereed and UGC Listed Journal No. : 40776*

55

Scanned by CamScanner

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)**

The Department of Tourism and Culture, Government of Chhattisgarh, plans to develop the 'Buddhist Tourism Circuit' in Sirpur in association with the Centre. The Government is also making efforts to get 'World Heritage Site' recognition for Sirpur, which is of great religious importance for Buddhism, Shaivism and Vaishnavism.

#### **Technology Tools to Leverage Buddhist Tourism:**

Originally associated with backend reservation and customer management systems, technology has increasingly come to the fore and is now an indispensable part of the consumer, not only enabling service delivery, but also offering product experiences through innovative marketing and sales channels.

We briefly discuss below the concept of a 'Buddhist Travel Card', a prepaid travel card that can greatly improve the tourist experience, as well as boost the destination image.

- Creation of a cashless eco system – Easy management of Cash
- Revenues - Increased revenues through stoppage of leakages
- Avoidance of the fake currency - The prepaid card ensures that tourists are NOT inconvenienced with fake currency
- Loyalty - Opportunity to better manage the tourist's loyalty
- Tourism Intelligence - Cashless payments help gauge key consumer behavior patterns like heritage sites most frequented by international tourists of a particular country
- Multipurpose Utility Card - Can be used for air rail local transport (like fleet cabs), thereby lowering the chances of the tourist being charged exorbitantly
- Souvenir: The card can be an attractive travel souvenir

The Buddhist sites in the State can be enveloped by an integrated Information, Information and communications (ICT) technology infrastructure, using a common technology platform, which would benefit the sites by offering the tourists the following services and amenities, apart from solving currency hassles.

**Entryat Monuments-** The card can be used as an entry ticket to various sites within the Buddhist circuit.

**Virtual Guides-** Many popular monuments across the country are being upgraded with virtual audio-visual guides that offer information about the monument at strategic locations. The card can be used as an access tool for such devices

*Peer Reviewed Refereed and UGC Listed Journal No.: 40776*

56

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

**AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)**

---


**Discounts and Offers-** The card holders can be offered discounts at select Government or private handicraft emporiums/hotels and restaurants, thereby catering to the 'incentivization' element for both the stakeholder and the tourist.

**Travel Apps-** Interactive travel applications across popular devices like smart phones, laptops, iPads can be bundled along with the card offering information like interactive maps, travel tips (Must See/Must do-s), emergency / helpline information, not only enrich the tourist experience but also create a safe tourist environment as well.

#### **References**

1. Dr. M. Selvam, (1989), Tourism Industry in India: A study of its Growth and its Developmental Need, Himalaya Publishing House.
2. Wikipedia
3. [www.edgeofindia.com](http://www.edgeofindia.com)
4. Ministry of Tourism (Govt. of India)

## 10. Com. Datta Deshmuykh yanche Shetkari v kamgar Chalvalitil Yogadan

	<p><b>'RESEARCH JOURNEY'</b> <i>International Multidisciplinary E- Research Journal</i>          Special Issue 79 : Political History of Peasant-Workers Movements in Maharashtra          Impact Factor - (SJIF) - <u>6.261</u>          UGC Approved Journal</p>	<p>ISSN :          2348-7143          December-2018</p>
Impact Factor – 6.261		ISSN – 2348-7143
INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S		
<b>RESEARCH JOURNEY</b>		
Multidisciplinary International E-research Journal		
PEER REFREED & INDEXED JOURNAL		
December-2018		Special Issue – LXXIX
<div style="border: 1px solid black; padding: 5px; display: inline-block;">             Political History of Peasant- Workers Movements in Maharashtra           </div>		
<p>Guest Editor :          Dr. M.N. Gulve          Principal          Shri Sant Gajanan Mahavidyalaya, Kharda,          Tal. Jamkhed, Dist. Ahmednagar [M.S.] INDIA</p> <p>Executive Editor of the issue          Mr. Nakul Khawale (Kharda)          Mr. Dhananjay Jawalekar (Kharda)</p> <p>Chief Editor -          Dr. Dhanraj T. Dhangar (Yeola)</p>		
<b>SWATIDHAN INTERNATIONAL PUBLICATIONS</b>		
For Details Visit To : <a href="http://www.researchjourney.net">www.researchjourney.net</a>		
© All rights reserved with the authors & publisher		Price : Rs. 800/-
1	Website – <a href="http://www.researchjourney.net">www.researchjourney.net</a>	Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>



'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal  
 Special Issue 79 : Political History of Peasant-Workers Movements in Maharashtra  
 UGC Approved Journal

ISSN :  
 2348-7143  
 December-2018



### Editorial Board

#### Chief Editor -

Dr. Dhanraj T. Dhangar,  
 Assist. Prof. (Marathi)  
 MGV'S Arts & Commerce College,  
 Yeola, Dist - Nashik [M.S.] INDIA

#### Executive Editors :

Prof. Tejesh Beldar, Nashikroad (English)  
 Dr. Gajanan Wankhede, Kinwat (Hindi)  
 Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
 Dr. Rajay Pawar, Goa (Konkani)

#### Co-Editors -

- ❖ Mr. Tufail Ahmed Shaikh- King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Haresh - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU. Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirsath - Nanasahab Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindhkhedha [M.S.]

#### Advisory Board -

- ❖ Dr. Marianna kosic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tatkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

#### Review Committee -

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J. Somaiyya College, Kopergaon
- ❖ Dr. S. B. Bhambar, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayyed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Kategaonkar - M.V.P.S.'s G.M.D. Arts, B.W, Commerce & Science College, Sinnar.

#### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258



## INDEX

No.	Title of the Paper	Author's Name	Page No.
1	A Study of Women's Movement in Maharashtra	Miss. Manisha Kurane	05
2	Working Class Feminism and Peasant Movements	Ms. Shivnanda Holkar & Prof. Kishor Kale	13
3	Peasant Movement in Maharashtra	Dr. G. S. Patil	17
4	Impact of Marxian View on Godavari Parulekar as A Maharashtra Agrian Leaders	Dr. Devarshi Mukund Arvindrao	21
5	A Study of Dr. B. R. Ambedkar Contribution to Peasant & Workers Politics in Colonial Maharashtra	Baliram J. Paikrao	24
6	शेतकरी चळवळ: एक ऐतिहासिक अभ्यास	डॉ. प्रशांत साबळे	29
7	महाराष्ट्रातील कामगार लढ्याचा प्रारंभ	प्रा. रामभाऊ काशीय	33
8	स्वातंत्र्योत्तर महाराष्ट्रातील शेतकरी चळवळ व सद्यस्थिती	प्रा. राजकुमार चाटे	37
9	डॉ. बाबासाहेब आंबेडकर स्थापित स्वतंत्र मजूर पक्ष आणि कामगार उद्वार	आबासाहेब कसबे	40
10	का. श्रीपाद अमृत डांगे व कामगार चळवळ	अंगद पाटील	44
11	महाराष्ट्रातील शेतकरी चळवळीचा राजकीय इतिहास	प्रा. आर. ई. भारूडकर	48
12	शेतकरी चळवळीचा उदय, विकास, भवितव्य व आव्हाने	डॉ. नामानंद साठे	51
13	का. दत्ता देशमुख यांचे शेतकरी व कामगार चळवळीतील योगदान	प्रा. वीरेंद्र धनशेट्टी व प्रा. जिजाभाऊ घुले	54
14	महाराष्ट्रातील शेतकरी चळवळीचा राजकीय इतिहास	डॉ. जे. एस. ढवळे	58
15	महाराष्ट्रातील शेतकरी चळवळीचा आडावा	प्रा. अविनाश फलके	60
16	डॉ. बाबासाहेब आंबेडकरांनी शेतकऱ्यांसाठी केलेले ऐतिहासिक कार्य	अनिल जामकर	64
17	कामगार चळवळ व आव्हाने	डॉ. आनंदकुमार करडे	67
18	शेतकरी संघटनेतील महिलांचा सहभाग - एक अभ्यास	प्रा. तानाजी जाधव	70
19	धरणे, विकास आणि धरणग्रस्तांच्या पुनर्वसनाची समस्या	प्रा. कृष्णा पाटील	75
20	शेतकरी चळवळ व शेतकरी संघटना	डॉ. मधुकर साठे	79
21	सोलापूर जिऱ्यातील शेतकरी चळवळी आंदोलने	महेश घाडगे	83
22	विदर्भ व पश्चिम महाराष्ट्रातील शेतकरी आंदोलनांचा तालनिक अभ्यास	डॉ. डी. एस. सावंत	88
23	कामगार चळवळीचा राजकीय इतिहास	प्रा. आर. बाय. बाघमारे	97
24	महाराष्ट्राच्या शेतकरी चळवळीतील महत्त्वाचे नेतृत्व खा. राजू शेड्डी	डॉ. खंडेराव खळदकर	100
25	छ. शाहू काळातील शेतकी प्रदर्शनाचा इतिहास	डॉ. विकास सरनाईक	109
26	ब्रिटीशकालीन जमिनमहसूल व्यवस्था सावकारी व जमिनदारी व्यवस्थेला उपकारक	गणेश भामे	113
27	राष्ट्रसंत तुकडोजी महाराज यांचे शेतकरी चळवळीतील कार्य	डॉ. सुनिता कुरुडे	116
28	शेतकरी आत्महत्या: राजकारणाच्या साठमारीतील दुर्लक्षित घटक	डॉ. नितीन गायकवाड	121
29	खानदेशातील शेतकऱ्यांचे उठाव (स. १८१८ ते स. १९४१)	डॉ. जे. डी. गोपाळ	124
30	मुंबईतील कामगार चळवळ	सागरकुमार जाधव	129
31	महाराष्ट्रातील शेतकरी चळवळीचा राजकीय इतिहास	श्री. प्रवीण साळुंके व डॉ. चांगदेव बंडगर	136

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal

Special Issue 79 : Political History of Peasant-Workers Movements in Maharashtra  
UGC Approved Journal

Impact Factor - (SJIF) - 6.261

ISSN :

2348-7143

December-2018

32	अहमदनगर जिऱ्हातील समाजवादी व डाव्या चळवळीतील नेतृत्वाचे शेतकरी व कामगार चळवळीतील योगदान	डॉ.संजय गायकवाड व प्रा.जिजाभाऊ धुले	141
33	शेतकरी-कामगार चळवळीतील स्त्रियांचा सहभाग	प्रा.महेश कुलकर्णी	145
34	भारतातील शेतकरी संघटना व शेतकऱ्यांच्या समस्या	प्रा.विजय गावंडे	148
35	भारतीय किसान संघ	दत्तात्रय जाधव	152
36	डॉ. आंबेडकरांनी कामगार चळवळीसंबंधी भूमिका : एक अवलोकन	प्रा.शेषनारायण वडवे	158
37	महाराष्ट्रातील शेतकरी चळवळीचा राजकीय इतिहास	दिपक भगुरे	161
38	१९ व्या शतकातील कामगारांची स्थिती सुधारण्यासाठी ब्रिटीश सरकारने केलेले कायदे	डॉ.जगदीश भेलोंडे	164
39	शरद जोशी यांच्या शेती विषयक लढ्यांचा (कापूस, कांदा,ऊस,भाव विषयी लढ्यांचा) आढावा	डॉ.जे.एम.बोचरे	168
40	शेतकरी चळवळ आणि शरद जोशी यांचे ग्रामीण शेतकरी महिला सवलीकरणातील योगदान	डॉ.बाबासाहेब देशमुख	171
41	महाराष्ट्रातील कामगार चळवळीच्या इतिहासातील डॉ.बाबासाहेब आंबेडकरांचे योगदान	डॉ.सुनिता गित्ते	174
42	स्वातंत्र्यपूर्व काळातील महाराष्ट्रातील कामगार चळवळ	डॉ.गणपत गट्टी	176
43	शेतकऱ्यांचा संघटीत संघर्ष : मुळशी सत्याग्रह	प्रा.धनंजय जवळेकर	179
44	महाराष्ट्रातील कामगार विद्रोह:ऐतिहासिक परिपेक्ष(१८७५-९९)	प्रा.दिलीप गिऱ्हे	183
45	महाराष्ट्रातील शेतकरी चळवळीची वाटचाल व तिच्या पुढील आव्हाने	प्रा.नकुल खवले	187
46	महिला किसान अधिकार मंच वा चळवळीचा चिकित्सक अभ्यास:विशेष संदर्भ मराठवाडा आणि बिदर	डॉ.आर.आर.वेनवाड	191
47	स्वातंत्र्यपूर्व काळातील शेतकरी संघटन व जागृती	डॉ.उत्तम राठोड	195
48	ऐतिहासिक कामगार चळवळ	कु.सानिया पठाण	199
49	महाराष्ट्रातील शेतकरी संघटनांची आंदोलने	शेख महेमूद शेख हल्लिम	208
50	लोकनेते गोपीनाथराव मुंडे यांचे ऊसतोड कामगारांचे प्रश्नासंबंधी विचार	डॉ.बी.के.शेष	214
51	शेतकरी आंदोलनात महिलांचा सहभाग	डॉ.जे.एम.बोचरे श्री के.डी. पल्लेवार	218
52	डॉ.बाबासाहेब आंबेडकरांनी कामगारांसाठी केलेले कार्य	हनुमान वांकर	221
53	आधुनिक महाराष्ट्रातील कामगार चळवळ	डॉ. एन.डी.नाईक व डॉ. राधाकृष्ण जोशी	223
54	शेतकरी संघटना	डॉ. दिगंबर सोनवणे	226
55	महाराष्ट्रातील १८७५ चा शेतकरी विद्रोह	प्रा. गणेश वाघ	229
56	भारतातील कामगार चळवळ : एक दुष्टीक्षेप	डॉ. जे. के. भालेराव	231
57	कष्टकऱ्यांचे कैवारी डॉ. बाबासाहेब आंबेडकर	प्रा. समाधान लोंडे	234
58	महाराष्ट्रातील शेतकरी चळवळ : काल आणि आज	डॉ. त्रिंबक राजदेव	238
59	कर्मवीर दादामाहेब गायकवाड आणि मराठवाड्यातील भूमिहीनांचा सत्याग्रह	डॉ. विष्णू बाघमारे	244
60	जायकवाडीच्या पाण्यासाठी मराठवाड्यातील चळवळी	प्रा. शिवानंद जाधव	247

*Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.*

- Chief & Executive Editor

4

Website - [www.researchjourney.net](http://www.researchjourney.net)Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)



कों. दत्ता देशमुख यांचे शेतकरी व कामगार चळवळीतील योगदान

प्रा. विरेंद्र धनशेट्टी

(राज्यशास्त्र विभाग प्रमुख)

न्यु ऑर्ट कॉमर्स अँड सायन्स कॉलेज पारनेर

ता. पारनेर जि. अहमदनगर

प्रा. जिजाभाऊ धुले

(राज्यशास्त्र विभाग)

श्री डॉ.के.ए.व. महाविद्यालय टाकळी डॉ.के.ए.व. ता. पारनेर

प्रास्ताविक :

महाराष्ट्राच्या सामाजिक, राजकीय, शैक्षणिक, सांस्कृतिक, सहकारी चळवळीतील महत्त्वाचा जिल्हा म्हणून नगर जिल्हाकडे पाहिले जाते. किंबहुना महाराष्ट्राच्या राजकारणाला दिशा देण्याचे मोलाचे काम नगर जिल्हातील चळवळींनी केले आहे. हा जिल्हा पुरोगामी विचारांच्या चळवळीचा जिल्हा म्हणून राज्यात ओळखला जातो. याच दैदीप्यमान ऐतिहासिक वलयामुळे राज्याचे समाजकारण, राजकारण सातत्याने जिल्हाभोवती फिरत असते. जिल्हाच्या डाव्या चळवळीतील अग्रगणी नेतृत्व म्हणजे कों. दत्ता देशमुख. संगमनेर तालुक्यातील जवळेकडलंग सारखा दुष्काळी भागातील एका गरीब शेतकरी कुटुंबात झाला. हमाली करून मोठ्या भावाने त्यांना शिकवले, पुढे स्वातंत्र्य लढ्यात भाग घेतल्याने त्यांना कारावास झाला. कारावासाच्या काळात अभ्यास करून ते सिव्हील इंजीनीअर झाले. पैसा आणि प्रतिष्ठा कमवण्याचा राजमार्ग सोडून तसेच राज्याची सर्वोच्च राजकीय सत्ता स्वतःकडून घालत येत असताना एखादया तपसव्याच्या निःस्पृह वृत्तीप्रमाणे त्याकडे पाठ फिरवून गरीब शेतकरी, ग्रामीण आणि शहरी कष्टकरी वर्गांना संघटीत करून त्यांच्या न्याय्य हक्कांसाठी आयुष्यभर प्रयत्नांची परीक्षा करणारे असामान्य व्यक्तीमत्त्व म्हणजे कों. दत्ता देशमुख.

कों. दत्ता देशमुखांनी जिल्हा लोकल बोर्ड, कोतवाल, बांधकाम विभागाचे कामगार, रस्ते बांधकाम कामगार, विडी कामगार, औदयोगिक कामगार, मेल कामगार, ऊस तोडणी कामगार, शेतमजूर या तळाच्या कष्टकरांच्या संघटना बांधण्यासाठी 'लाल निशाण' पक्षाच्या कार्यकर्त्यां समावेत महाराष्ट्रभर भ्रमंती केली. या सर्व कष्टकरांसाठी न्यायोचित लढे दिले. त्यांचा राजकीय प्रवास काँग्रेस, शेकाप, काकिप, लाल निशाण गट, लाल निशाण पक्ष असा राहिला. या संबंध राजकीय प्रवासात त्यांची मुळ वैचारिक बैठक बदलली नाही त्यामुळे त्यांचा प्रवास क्विच संधीसाधुपणाचा वाटला नाही. त्यांना महाराष्ट्राचे मुख्यमंत्री पद देवू केलेले असतानाही त्यांनी विनम्रपणे नकार दिला. काँग्रेसकडून सर्वोच्च पद देण्यास तयार होऊनही कों. देशमुख यांनी एकले नाही त्यामुळे १९६२ च्या निवडणुकीत त्यांचा पराभव करण्यासाठी सर्वोतोपरी प्रयत्न करण्यात आले. पराभवानंतर त्यांनी कृषी क्षेत्रात नवनवीन प्रयोग करून शेतकऱ्यांसमोर अदर्श ठेवत कृषी क्षेत्राला एक दिशा आणि दृष्टी दिली. महाराष्ट्रातील दुष्काळ दूर व्हावा यासाठी त्यांनी अभ्यासपूर्वक मांडणी करून महाराष्ट्रापुढे आदर्श ठेवला.

शेतकरी व कामगारांसाठीची आंदोलने :

१९४१ मध्ये कों. भास्करराव जाधव यांच्या नेतृत्वाखाली नवजीवन संघटनेची स्थापना झाली. १९३५ च्या कायद्यातील मर्यादीत मतदानाच्या पायावर निवडणुका झाल्या. १९४६ मध्ये कों. दत्ता देशमुख व कों.

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal

Special Issue 79 : Political History of Peasant-Workers Movements in Maharashtra  
Impact Factor - (SJIF) - 6.261  
UGC Approved JournalISSN :  
2348-7143  
December-2018

बापूसाहेब भापकर हे अहमदनगर जिल्ह्यामध्ये काँग्रेसचे आमदार म्हणून निवडून आले. पुण्याचा भागातील उच्च शेतीमुळे जमीनीचा प्रश्न तीव्र बनला होता. बापूसाहेब दत्ता देशमुख यांनी शेतकऱ्यांची मोठी चळवळ उभी केली. काँग्रेस पक्षात असतानाही पक्ष विरोधी भूमिका घेतल्याने तत्कालीन युवमंत्रि मंगारजी देसाई यांना राग आला व काँ. देशमुख यांना नुकसान टाकण्यात आले. तत्काल अखत्यारी त्यांना विधानसभेत हजर राहता आले नाही व त्यामुळे त्यांची आमदारकी रद्द झाली. १९४३ मध्ये शेतकरी कामगार पक्षाची स्थापना करण्यात आली. १९४७ मध्ये नवजीवन संघटना शेतकरी कामगार पक्षात विलीन झाली. त्याच वेळी काँ. दत्ता देशमुख काँग्रेसमधून शेकाप मध्ये आले. २३ मे १९५० रोजी दाभाडी जि. नाशिक येथे भरलेल्या अधिवेशनात कम्युनिस्ट तत्त्वज्ञान व मार्क्स लेनिनवादी क्रांतीकारो विचार व व्यावहार सुत्रे स्वीकारली गेली. यात दत्ता देशमुख यांचे मोठे योगदान होते. पुढे शेकाप मध्ये फुट पडली व काँ. दत्ता देशमुख यांच्या नावाने शेकापचा नगर विद्या विभाग ओढखला जाऊ लागला. १९५२ च्या सार्वत्रिक निवडणुकीनंतर अहमदनगर जिल्ह्यातील कष्टकरी समुदायाला जागृत करण्यासाठी संघटित करण्याचा प्रयत्न दत्ता देशमुख यांच्या ताल निशाण गटांनी केले. त्याचबरोबर १९५२-५३ च्या दुष्काळी कामगारील कामगारांची संघटना उभारली. हे सर्व कामगार संतमजूर होते. संघटना उभी राहिल्यानंतर त्यांना वेळेवर मदती मिळते की नाही, झपाट्यात होतय का याची पहाणी काँ. देशमुख हे करत असत. अहमदनगर जिल्ह्याच्या वागायत भागात भूमीहीन शेतमजुरांच्या चळवळीला राज्यव्यापी पाटिचा उभा करण्यासाठी भूमीहीन, शेतमजूर, शेतकरी संघटनांच्या स्थापना करून दत्ता देशमुख यांच्या नेतृत्वाखाली कम्युनिस्ट पक्ष व लाल निशाण पक्ष यांच्या पुढाकाराने ८ मार्च १९७० रोजी श्रीरामपूर येथे पहिले अधिवेशन घेण्यात आले. या अधिवेशनास ८ ते १० हजार अदिवासी शेतमजूर उपस्थित होते. तर १९७१-७२ च्या दुष्काळाच्या पार्श्वभूमीवर 'लाल बावटा' हातात घेऊन रस्ता रोकणे आंदोलन करण्यात आले. ६ मे १९७३ ला १५ लाख दुष्काळी कामगारील शेतकरी व कष्टकरी शेतकऱ्यांचा ऐतिहासिक संघ झाला. या ऐतिहासिक आंदोलनातून रोजगार हमी योजना पुढे आली व या कायद्याने कामगारांच्या हक्क मिळवून दिले. हा संघ घडून आणण्यात काँ. दत्ता देशमुख यांचे मोठे योगदान होते.

#### दैनिक श्रमिक विचार :

२६ जानेवारी १९७८ रोजी महाराष्ट्रातील ५३ कामगार संघटनांनी स्थापन केलेल्या महाराष्ट्र राज्य कर्मचारी प्रांतीय श्रमिक परिषदेने श्रमिक चळवळीचा पुन्हाकार करणारे चर्चा देशातील पहिले दैनिक 'श्रमिक विचार' सुरू करण्याचा ऐतिहासिक निर्णय झाला. अहमदनगर जिल्ह्यातील ताल निशाण पक्ष घड्याने काँ. दत्ता देशमुख यांचा हे दैनिक सुरू करण्यात मोठा पुढाकार होता. भांडवली पध्दतीच्या जाहीरतीच्या उपलब्धाचा काहीच आधार नसलेले हे दैनिक ८ वर्षे पुण्यातून चालवले गेले.

#### विडी कामगारांसाठीचा लढा:

स्वातंत्र्यपूर्व काळापासून महाराष्ट्रातील अनेक जिल्हात विडी उद्योग चालत असे. अहमदनगर जिल्ह्यातही संगमनेर अकोले तालुक्यात विडी उद्योगाला सुरुवात झाली. काँ. दत्ता देशमुख यांनी लाल निशाण पक्षाच्या माध्यमातून संघटित आणि असंघटित क्षेत्रातील कामगारांचे संघटन करून त्यांच्या न्याय्य हक्कांसाठी चळवळी केल्या. अहमदनगर जिल्ह्याच्या उत्तरेकडील दुष्काळी व डोंगराळ भागातील असंघटित क्षेत्रातील विडी कामगारांचे संघटन करून त्यांच्या न्याय्य हक्कांसाठी लढा दिला. त्यासाठी संग. मंथे, आंदोलने, निदर्शने,



पेरावा, सत्याग्रह, जेलभरो, सभा, परिपदा, मेळावे, इ. साधनांचा लोकशाही मार्गाने आवलंब करून कामगार कल्याणाचे अनेक कायदे मंजूर करून घेतले.

**विडी कामगार समिती :**

१९६३ मध्ये किमान वेतन समिती नेमाची म्हणून विडी कामगारांनी राज्यव्यापी संप केला. या संपानंतर शासनाने किमान वेतन समिती नेमली. या वेतन वाढ समितीवर विडी कामगार प्रतिनिधी म्हणून काँ. दत्ता देशमुख यांना घेतले. या समितीने किमान वेतन आणि बोनसचा हक्क मान्य केला व १ एप्रिल १९६४ रोजी शासनाने नोटीफिकेशन काढून ती लागू केली. १९७३ मध्ये मुख्यमंत्री शंकरराव चव्हाण संगमनेरला आले असताना त्यांच्या समोर दत्ता देशमुख यांनी विडी कामगारांच्या तक्रारी मांडल्या. पुढे कामगारांची किमान वेतन बोनसचा प्रश्न, भविष्यनिर्वाहनिधी आणि पेन्शन हे चार प्रश्न घेऊन २३ जून १९७४ मध्ये संगमनेर, अकोला, सिन्नर विडी कामगार समित्तेचे स्थापना केली. पुढे भविष्यनिर्वाहनिधी, किमान वेतन निश्चिती यासाठी त्यांनी आंदोलन केले. त्यामुळे महाराष्ट्र सरकारने भविष्यनिर्वाहनिधी कायदा केला. १९७६ मध्ये केंद्र सरकारने कामगार कल्याण निधी कायदा बनवला यामुळे धरकुल, मोफत दवाखाना व औषध उपचार, कुटुंबनियोजनासाठी प्रोत्साहनपर आर्थिक मदत, महिलांना प्रसूती लाभ योजना मिळाल्या. तर २० सप्टेंबर १९९० मध्ये किमान वेतन व महागाई भत्ता लागू करण्यात आला. हे कायदे करून घेण्यात काँ. दत्ता देशमुख यांची भूमिका महत्त्वपूर्ण ठरली.

**सक्तीच्या लेव्ही विरोधी आंदोलन :**

दुष्काळी परिस्थिती आणि लेव्हीच्या सक्तीमुळे लोकांना अन्नधान्याचा तुटवडा होता, कम्युनिस्ट आणि शेतकरी कामगार पक्षांनी सरकारचे गोंदामातील धान्य गाळ्यात घेऊन गोरगरीबांना वाटले. एरंडगाव येथे धान्य वाटप चालू असताना पोलीसांनी गोंदोबाव केला त्यान ९ जण ठार झाले. अकोले येथील सरकारी कार्यालयावर काँ. दत्ता देशमुख यांच्या नेतृत्वाखाली ४-५ हजार लोकांचा मोर्चा नेला काँ. देशमुख यांना अटक करून स्थानबध्द करण्यात आले होते.

**महाराष्ट्र राज्य वीज कामगार चळवळीतील योगदान :**

वीज उद्योगाच्या वाढत्या विस्ताराबरोबरच कामगारांची संख्या वाढत गेली. कामगारांना अनेक आडचणी आणि समस्यांना सामोरे जावे लागत होते. त्यांच्या समस्या सोडवण्यासाठी नोकरसंघ स्थापन करण्यात आला. काँ. दत्ता देशमुख नोकरसंघाचे अध्यक्ष झाल्यानंतर त्यांनी कामगारांचे कायमस्वरूपी भरती व्हावी, कामगारांचे कामाचे तास १६ पेन्शन ८ ताम करणे, आंबेर टाईमचा भत्ता देण्यात यावा यासाठी लढा उभारला. या लढ्यामुळे १०५ रोजदारीवर काम करणाऱ्या कामगारांना कायम केले गेले. तसेच कामाचे तास सोळा वरून आठ ताम करण्यात आले. १९५८ मध्ये काँ. देशमुख यांनी राज्य विधानसभेमध्ये भाषण करून राज्य स्टेट इलेक्ट्रीस्टी बोर्डाचे अध्यक्ष हशम प्रेमजी यांच्या कार्यकाळातील भ्रष्टाचार, वशेलेबाजीची चौकशीची मागणी केली. सरकारने ती मान्य करत चौकशी समिती नेमली व हशम प्रेमजी यांना पदावरून बडर्तफ करण्यात आले. त्यामुळे वीज कामगारांवर दत्ता देशमुख यांचा प्रभाव पडला.

**१९६७ चा वीज कामगारांचा संप :**

काँ. दत्ता देशमुख नोकरसंघाचे अध्यक्ष झाल्यानंतर 'नोकरसंघ' व 'विद्युत कर्मचारी' संघ यांनी कामगारांचे प्रश्न सोडवण्यासाठी स्थापन केलेल्या स्टेट इलेक्ट्रिसिटी बोर्ड वर्कर्स फेडरेशनचे अध्यक्ष झाले.

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal

Special Issue 79 : Political History of Peasant-Workers Movements in Maharashtra  
UGC Approved JournalISSN :  
2348-7143  
December-2018

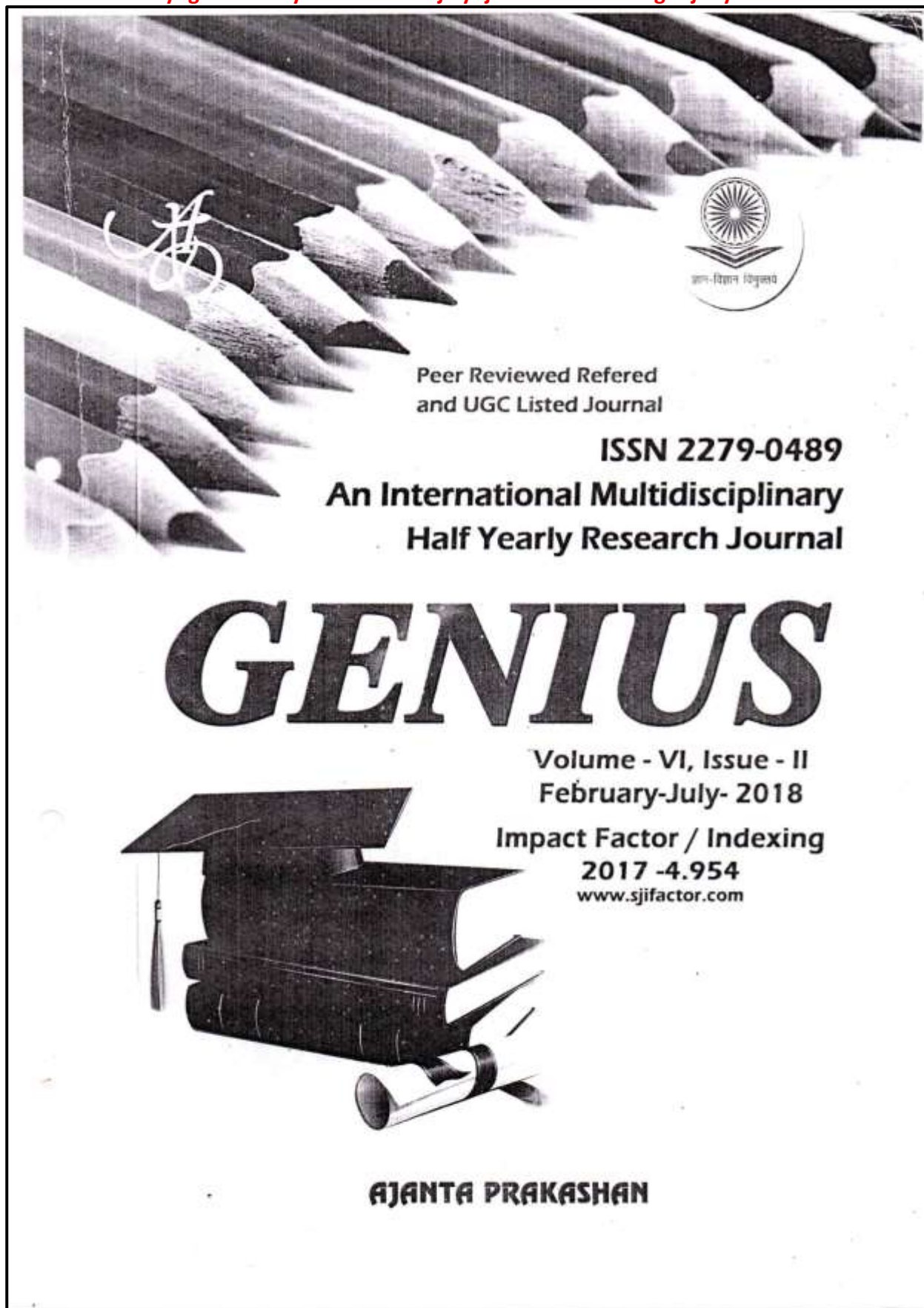
त्यांच्या नेतृत्वाखालील संघटनेने वेतन श्रेणी व महागाई भत्ते यात सुधारणा करण्याची मागणी केली. ती मागणी मान्य न झाल्याने ६ फेब्रुवारी १९६७ रोजी संप केल्या. संपाचाचार्त कॉंग्रेस सरकारने ताडत भूमिका घेतली हा संप ४३ दिवस चालला. पुढे संप एफनफॉर्मा मागे घेऊन तत्कालीन कामगार मंत्री नरेंद्र निहडके यांना कळवण्यात आले. त्यांनी संपावरील कामगारांना सन्मानाने कामावर घेतले जाईल असे अशवासन मुख्यमंत्र्यांच्या वतीने दिले. मात्र पुढे वीज मंडळाने अशवासन पाळले नाही व संपात सहभागी असलेल्या कामगारांची खाते निहाय चौकशी सुरू केली. कामगारांवरील पोलीस केसेस मागे घेतले नाही, कामगारांच्या बदल्या केल्या, महाराष्ट्र स्टेट इलेक्ट्रिसिटी बोर्ड वर्कर्स फेडरेशनची मान्यता काढून घेण्यात आली. त्याविरोधात फेडरेशनने कामगारांच्या केसेस कामगार न्यायालयापासून सर्वोच्च न्यायापर्यंत लढवून कामगारांना कामावर घेण्यास भाग पाडले यात काँ. दत्ता देशमुख यांनी मोलाचे योगदान दिले.

सांयशरूपाने असे दिसून येते की, काँ. दत्ता देशमुखांनी जिल्हा लोकल वॉर्ड, क्रीडाकाल, बांधकाम विभागाचे कामगार, रस्ते बांधकाम कामगार, विद्युत कामगार, औद्योगिक कामगार, मेल कामगार, उग्र तोडणी कामगार, वीज कामगार, शेतमजूर या तळाच्या कष्टकरांच्या संघटना निर्माण केल्या. त्यासाठी कम्युनिस्ट पक्ष, शेतकरी कामगार पक्ष, कामगार किसान पक्ष, तालूक निर्माण गट, तालूक निर्माण पक्ष यांच्या माध्यमातून संप, मोर्चे, आंदोलने, निदर्शने, धरंदळ, सत्याग्रह, जेलभरणे, सधा, परिषदा, मंडळाचे इत्यादी लोकशाही मार्गाने न्याय्य हक्कांसाठी लढा दिला. अहमदनगर जिल्हाच्या राजकीय, आर्थिक व सामाजिक चळवळीत काँ. दत्ता देशमुख यांचे महत्त्वपूर्ण योगदान राहिले आहे. विद्युत कामगार व वीज कामगार यांच्यासाठी दिलेला लढा हा अमुल्य असा आहे. सर्वसामान्यांचे हित लक्षात घेत आर्थिक आणि सामाजिक आधारावर विकास घडून आणण्यात या नेतृत्वाने मोलाचे योगदान दिले आहे.

## संदर्भ सुची :-

- १ जाधव भास्करराव, १९९५, डाव्या चळवळीचा बालेकिल्ला अहमदनगर जिल्हा
- २ जाधव भास्करराव, १९९७, 'मुक्तीवेग' शोध प्रबंध
- ३ भोळे भा. ल., १९८८, महाराष्ट्रातील डाव्या चळवळ, पन्नालाल मुंगगा आणि किराणें चेंडकीहाळ (संघ.) आजचा महाराष्ट्र, श्री विद्या प्रकाशन, पुणे.
- ४ शेवाळे वि.म., सुरेश परचुरे आणि दत्ता काळेकरे, २०१४, संघर्ष काँ. दत्ता देशमुख शेतकरी प्रभुत्व एस.एस.डी.ची वर्कर्स फेडरेशन, कोल्हापूर.
- ५ शेवाळे वि. म., माधव चव्हाण आणि मुलच देवमुख (संघ.), १९९९, 'काँ. दत्ता देशमुख' झाले न्यायी गौड, काँ. दत्ता देशमुख, पुणेगामी विद्यमान कोल्हापूर
- ६ गडाख यशवंतराव (प्रकाशक), १९९५, काँ. वकीलराव रणे यांचे गौड शेतकरी विरोधात.
- ७ चव्हाण शंकर बाळजी, २००४, अहमदनगर जिल्ह्यातील कामगार चळवळ एक राजकीय विश्लेषण, पीएच.डी प्रबंध, डॉ. बाबासाहेब अविडकर मराठवाडा विद्यापीठ, औरंगाबाद.
- ८ बोडे बाळ, २०१६, अहमदनगर जिल्हाच्या सामाजिक, आर्थिक आणि राजकीय विकासात राजकीय नेतृत्वाच्या योगदानाचा अभ्यास: १९९३ ते २०१०, पीएच. डी प्रबंध, दिळक महाराष्ट्र विद्यापीठ पुणे.
- ९ kamble bal. 1996, Political Socialization of Politically Marginalized Group: A study of Beedi Workers in Ahmednager District. Unpublished ph.D Thesis. SPPU. Pune
- १० भोसले महेश, दि. २१ मार्च २०१८, जिल्हा चळवळीचा बालेकिल्ला, शैल प्रभात, १४ वा वर्षापर्यंत दिन विरोधात मधील लेख, जैनचैतन्य कल्पसर्जनिदलगाव
- ११ जाधव भास्करराव, दि. २५ ऑगस्ट १९९६, तालूक निर्माण गट, दैनिक लोकमत दहावा वर्षापर्यंत दिन विरोधात मधील लेख
- १२ दैनिक लोकमत, १९९०, नगर पंचशाळासाठी विरोधात मरण गेट

11. Jilha udyogkendrachya sudharit karja yojnanchi ahmednagar jilhyatil bhumika





GENIUS - VOL. - VI ISSUE - II-ISSN 2279-0489 (I.F.-4.954)

FEBRUARY-JULY-2018

## MARATHI

१	डॉ. सी. एन. कोकाटे प्रा. दिपक पंडरीनाथ सोनटक्के	जिल्हा उद्योग केंद्राच्या सुधारित कर्ज योजनेची अहमदनगर जिल्ह्यातील भूमिका	१-४
२	वि. एस. संबेटवाड	पंडित जवाहरलाल नेहरूंचे समाजवादी विचार	५-६
३	अर्चना रामरतन रायवोले	संगीतातील अष्टपैलु व्यक्तींमध्ये श्री संत गुलाबराय महाराज	७-११
४	श्री. जिवाजी हरी चौगुले	अर्धनारी मठेश्वर मंदिर स्थापत्य वेळापूर	१२-१५
५	डॉ. घ. ना. पांचाळ	मौलाना अब्दुल कलाम आझाद यांचे चाचन आणि लेखन	१६-१८
६	मिलिंद पंजाब तावडे	महाराष्ट्रामध्ये मनरेगांतर्गत अनुसूचित जातीच्या रोजगाराची स्थिती	१९-२१
७	सी. काळे सुप्रिया हेमंतकुमार	कोल्हाटी जमात उगम व वाटचाल	२२-२६
८	प्रा. रामटेके पुरुषोत्तम वारलू	पर्यटन आणि पर्यावरण विशेष संदर्भ: खुलताबाद, बेरुळ, दौलताबाद	२७-३०

'जिनिअस' या सहामयि प्रसिध्द झालेली मते मुख्य संपादक, संपादक मंडळ व सल्लागार मंडळास  
द्वारे उपलब्ध असे नाही. या नियतकालिकात प्रसिध्द करण्यात आलेली लेखकांची मते ही त्यांची वैयक्तिक मते आहेत. तसेच  
शोध निबंधांची जबाबदारी स्वतः लेखकावर राहिल.  
३. मालक, मुद्रक, प्रकाशक विनय शंकरराव हाताले यांनी अजिंठा कॉम्प्युटर अँड प्रिंटर्स, जयसिंगपूर, विद्यापीठ  
गेट, औरंगाबाद येथे मुद्रित व प्रकाशित केले.

१

## जिल्हा उद्योग केंद्राच्या सुधारित कर्ज योजनेची अहमदनगर जिल्ह्यातील भूमिका

डॉ. सी. एन. कोकाटे

अर्थशास्त्र विभाग, डॉ. बाबासाहेब आंबेडकर विद्यापीठ, औरंगाबाद.

प्रा. दिपक पंढरीनाथ सोनटक्के

अर्थशास्त्र विभाग प्रमुख, न्यु, आर्ट्स, कॉमर्स अँड सायन्य कॉलेज, पारनेर.

### प्रस्तावना :

आज माहिती तंत्रज्ञानाच्या काळात पारंपारिक शिक्षण कालबाह्य होत असल्यामुळे व भारताच्या लोकसंख्येत भरमसाठ वाढ झाल्यामुळे बेरोजगारीची समस्या निर्माण झाली आहे. रोजगार व स्वयंरोजगार केंद्रांमध्ये रोजगारासाठी नाच नोंदविलेल्यांची संख्या ही मोठ्या प्रमाणात आहे. परंतु त्या प्रमाणात देशात रोजगार उपलब्ध नाही. त्यामुळे या काळात स्वयंरोजगार शिवाय पर्याय उपलब्ध नसलेला दिसून येतो.

स्वातंत्र्यपूर्व काळात देशामध्ये औद्योगिक विकास पुरेसा झालेला नव्हता. भारताला स्वातंत्र्य मिळाल्यानंतर पंडित जवाहरलाल नेहरूंच्या नेतृत्वाखाली नियोजन आयोगाची स्थापना करण्यात आली व पंचवार्षिक योजनेच्या माध्यमातून देशाच्या विकासाला सुरुवात झाली. राज्याच्या निमशहरी व ग्रामीण क्षेत्रातील अतिलहान व सूक्ष्म उद्योग उपक्रमांना उद्योग उभारणीसाठी वित्तीय सहाय्य उपलब्ध करून त्यांचा विकास साधण्याचा व त्याद्वारे ग्रामीण व निमशहरी क्षेत्रात रोजगार व स्वयंरोजगार संधी निर्माण करण्यासाठी शासनाने प्रयत्न केलेले आहेत. शासनाने २३ डिसेंबर १९७७ रोजी जाहिर केलेल्या नवीन औद्योगिक धोरणात जिल्हा उद्योग केंद्र योजनेला मंजुरी दिली. या धोरणांनुष्ये लघु, अतिलहान, कुटीर उद्योग आणि स्वयंरोजगारास प्रोत्साहन देणाऱ्या व औद्योगिकीकरणाचा विस्तार करण्यासाठी या योजनेअंतर्गत मोठ्या प्रमाणात प्रयत्न केलेले आहेत.

लघु उद्योगाचा केंद्र विद्दू म्हणून जिल्हा उद्योग केंद्राकडे पाहिले जाते. यामध्ये कुटीरद्योग, स्वयंरोजगार आणि ग्रामीण भागातील कच्चा मालाच्या सहाय्याने चालू शकणारे लघु उद्योग तसेच अशा उद्योगामुळे अर्थव्यवस्थेला गती प्राप्त होईल. या सर्वांनाच प्रोत्साहन दिले जाते.

### अहमदनगर जिल्हाची ओळख :

मलिक अहमद वाने इ.स. १४९४ मध्ये वसलेले व निजामशाहीचे राजधानीचे शहर म्हणून अहमदनगर शहर म्हणून ओळखले जाऊ लागते पूर्ण जिल्हाचे मुख्यालय अहमदनगर शहर असल्याने जिल्ह्याला अहमदनगर हे नाव देण्यात आले. महत्त्वपूर्ण जिल्हा असून तो महाराष्ट्राच्या मध्यभागी वसलेला आहे. अहमदनगर जिल्हाचे क्षेत्रफळ १७४१०.९९ चौ.कि.मी. असून क्षेत्रफळ दृष्टीने हा जिल्हा महाराष्ट्र राज्यात प्रथम क्रमांकावर आहे. अहमदनगर जिल्हात १४ तालुके असून २०११ च्या जनगणनेनुसार जिल्हाची लोकसंख्या ४५,४,३१५९ एवढी आहे.

GENIUS - VOL. - VI ISSUE - II-ISSN 2279-0489 (I.F.-4.954)

FEBRUARY-JULY-2018

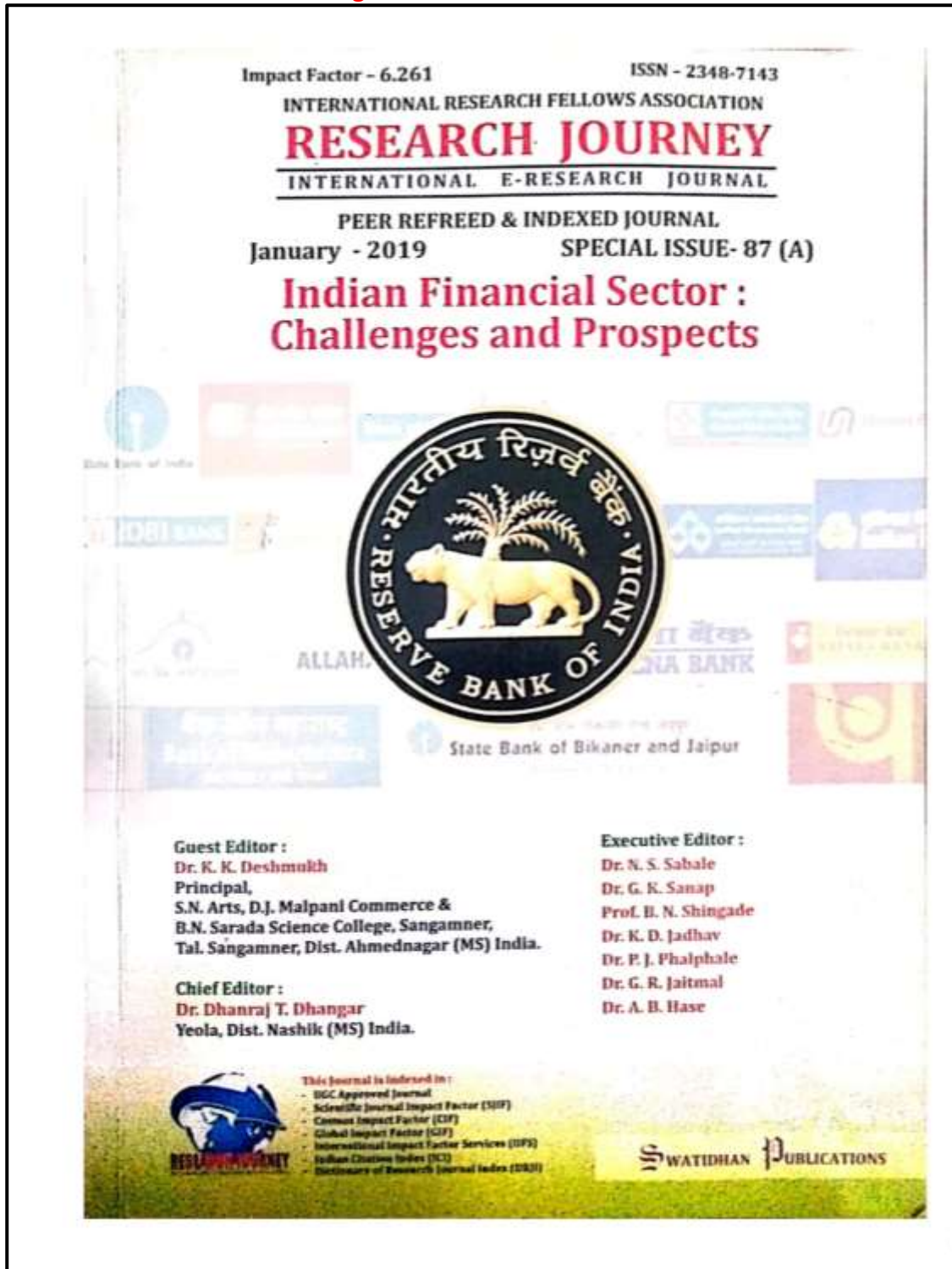
**निष्कर्ष :**


१. या तीन ही वर्षांत अहमदनगर तालुक्यात सर्वांत जास्त लाभार्थी आहेत.
२. जिल्हा उद्योग केंद्राद्वारे राबवििलेल्या या योजनेत दिली जाणारी रक्कम कमी प्रमाणात आहे.
३. जिल्हा उद्योग केंद्राच्या सुधारीत बीज भांडवल या योजनेमुळे स्वयंपरोजगार काही प्रमाणात व्हा असेना निर्माण झालेला दिसून येतो.

**संदर्भ :**

१. उद्योगक दिवाळी अंक २००१ क्र. ७८
२. महाराष्ट्र शासनाने परिपत्रक दि. ६ मार्च १९७८
३. जिल्हा सामाजिक आर्थिक समालोचन अहमदनगर, २०१३ पृ.क्र ६
४. उद्योगक ऑगस्ट २०१५ पृष्ठ.क्र ४८
५. D.I.C औद्योगिक विकास टिपणी, २०१० अहमदनगर

12. New Banking Product



	<b>'RESEARCH JOURNEY' International E- Research Journal</b> Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013) Special Issue 87(A)- Indian Financial Sector : Challenges & Prospects UGC Approved Journal	E-ISSN : 2348-7143 January-2019
	<b>Impact Factor - 6.261</b>	<b>E-ISSN - 2348-7143</b>
INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S <b>RESEARCH JOURNEY</b> International E-Research Journal		
PEER REFREED & INDEXED JOURNAL January-2019    Special Issue - 87 (A)		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>Indian Financial Sector : Challenges and Prospects</b> </div>		
<b>Guest Editor:</b> Dr. K. K. Deshmukh Principal S. N. Arts, D. J. Malpani Commerce & B.N. Sarda Science College, Sangamner [M.S.] INDIA		
<b>Executive Editor of the issue:</b> Dr. N. S. Sabale Dr. G. K. Sanap Dr. B. N. Shingade Dr. K. D. Jadhav Dr. P. J. Phalphale Dr. G. R. Jaitmal Dr. A. B. Hase		
<b>Chief Editor : Dr. Dhanraj Dhangar (Yeola)</b>		
<b>SWATIDHAN INTERNATIONAL PUBLICATIONS</b> For Details Visit To : <a href="http://www.researchjourney.net">www.researchjourney.net</a>		
© All rights reserved with the authors & publisher		Price : Rs. 800/-
Website - <a href="http://www.researchjourney.net">www.researchjourney.net</a>		Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>



**'RESEARCH JOURNEY'** International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 87(A)- Indian Financial Sector : Challenges & Prospects  
UGC Approved Journal

E-ISSN :  
2348-7143  
January-2019

### INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Challenges and Opportunities in Indian Finance Sector	Dr. Girishkumar Rana	05
2	Co-operatives and Agricultural Credit : Issues and Challenges	Dr. Avinash Raikar	11
3	Demonetization – Impact on Small Traders and Road Side Vendors	K. Naveen Kumar	13
4	Growth of Loans and Advances of Selected Urban Co-operative Credit Societies in Goa : A Study	Mr. Amrut Naik	20
5	Recent Trends in Banking Sector	Dr. Suhas Avhad	25
6	Impact of Merger Activity on Financial Performance: A Case Study of State Bank of India	Manisha Shinde & Dr. Arun Gaikwad	28
7	Challenges and Opportunities of Indian Banking	Dr. Atul Salunke	36
8	A Study of Internet Banking Service of SBI	Mr. Nitin Gaikwad & Dr Vilas Eppar	40
9	New Banking Product	Dr. R.G. Rasal & Dr. Ashok Ghorpale	45
10	Non-Performing Assets Challenges & Future	Dr. G.K. Sanap & Dr. Sandeep Irole	47
11	An Overview of Mutual Fund Houses in India	Dr. Manohar Sanap & Ms. Shephalika Gokhale	49
12	The Truth about Consolidation of National Banks in India	Dr. R.K. Datir & Dnyanesh Mahatekar	53
13	Eligibility Criteria for Car and two-Wheeler Loan	Dr. Pratap Phalphale	56
14	Indian Banking Sector : Challenges and Prospects	Dr. Parag Kadam	59
15	A Study of CSR of Nationalized Banks with Special Reference to Bank of Maharashtra	Miss. Priyanka Nalkar	64
16	Global Financial Crisis & India : Problems and Recommendations	Sachin Palande	70
17	A Study of Impact of Demonetization on Rural and Urban Area with Special Reference to Pune District	Dr. Kishor Nawale	76
18	Digital Lending : The Future of MSME Credit	Dr. Manohar Sanap & CA. Prashant V. Munot	81
19	The Study of Sanjay Gandhi Niradhar Anudan Yojana: Administrative and Implementation Perspective with Special Reference to Pune District	Dr. Manohar Sanap & Ms. Anuja Gawade	94
20	Indian Banking Sector: Challenges and Prospect	Dr. Pratap Phalphale	103
21	Digital Payment System – A Boon or Bane	Dr. Bhausaheb Pawar	108
22	Digitization of Banking Business : Opportunities and Challenges	Dr. Avinash Chintamani	113
23	Impact of the RBI's Monetary Policy on Indian Economy	Dr. Vishal Pawase	118
24	Demonetization- Impact on Indian Economy	Shrikant Fulsundar	120
25	Corporate Social Responsibility of Banking Institutes	Pof. Pratibha Pagar, Dr. Prakash Yadav	125
26	Indian Banking Sector Challenges and Prospects	Prof. Ramdas Aher	131
27	Issues of India's Public Sector Banks	Dr. Mahesh Deshmukh	135
28	Nationalization of Banks of India	Prof. Ananda Sarange	140
29	Role of Tourism in Rural Development	Mr. Namdev Devkate	142

Website – [www.researchjourney.net](http://www.researchjourney.net) Email - [researchjourney2011@gmail.com](mailto:researchjourney2011@gmail.com)



**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 87(A)- Indian Financial Sector : Challenges & Prospects  
 UGC Approved Journal

E-ISSN :  
 2348-7143  
 January-2019

### **New Banking Product**

**Dr. R.G. Rasal**  
 Vice Principal & HoD,  
 Department of Economics,  
 PVP College, Loni, Tal. Rahata, Dist. Ahmednagar

**Dr. Ashok Ghorpade**  
 Asst. Professor,  
 Dept. of Economics  
 New Arts, Commerce & Science College, Parner.  
 E-mail- ashok123ghorpade@gmail.com

#### **Introduction:**

The concept Bank is defined by different angles by different experts. Banking in India was defined under Section 5(A) as "any company which transacts banking, business" and the purpose of banking business defined under Section 5(B),"accepting deposits of money from public for the purpose of lending or investing, repayable on demand through cheque/draft or otherwise". In the process of doing the above-mentioned primary functions, they are also permitted to do other types of business referred to as Utility Services for their customers (Banking Regulation Act, 1949).

Economic Development of any nation is depending on the development of banking sector. Today in India the banking sector is stronger and capable of to handling the pressures of competition. In India number of banks has accepted the new technology and they are doing their business with the help of such technological development.

From 1969, tremendous changes have been taken place in the banking industry. With traditional products and services bank has introduced the new services to their customer. There has been considerable innovation and diversification in the business of major commercial banks. Some of them have engaged in the areas of consumer credit, credit cards, merchant banking, leasing, mutual funds etc.

**Objective:** Above study has undertaken for the purpose of to study the recent trends in banking sector.

#### **Research Methodology:**

Secondary information is used in present study which is collected from following secondary sources.

1. Books
2. Journals
3. Periodicals
4. Websites

**Data Analysis:** Following are the recent technological developments in banking sector

#### **1. ATM:**

ATM means Automatic Teller Machine. It is one of the important technological development in banking sector. We can withdraw or deposit the money without visiting to the branch with the help of such machine. We can withdraw or deposit the money any time.



'RESEARCH JOURNEY' International E-Research Journal

Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 87(A)- Indian Financial Sector : Challenges & Prospects

UGC Approved Journal

E-ISSN:

2348-7111

January-2014

Automatic Teller Machine enables the customers to withdraw their money 24 hours a day 7 days a week.

#### 2. Electronic Payment System:

This system is come into existence in United States. Electronic Payment is a financial exchange that takes place online between buyers and sellers. We can avoid handling cash in transaction with the help of such system.

#### 3. Real Time Gross Settlement:

This system is started in India from 2004. Above system is operated by Reserve Bank of India. Real Time Gross Settlement (RTGS) is an electronic form of funds transfer where the transmission takes place on a real time basis. In India, transfer of funds with RTGS is done for high value transactions, the minimum amount being Rs 2 lakh. The beneficiary account receive the funds transferred, on a real time basis.

#### 4. NEFT (National Electronic Fund Transfer):

National Electronic Funds Transfer (NEFT) is a nation-wide payment system facilitating one-to-one funds transfer. With the help of such scheme individuals can electronically transfer funds from any bank to any individual having an account with any other bank branch in the country participating in the Scheme.

#### 5. Tele Banking:

Tele banking means operate individual account with the help of telephone.

#### 6. Core Banking:

Core Banking means a centralized system established by a bank which allows its customers to conduct their business irrespective of the bank's branch. Under this scheme branches of banks are interlinked with each other.

#### 7. Credit Card:

Credit card is a card on which a specific credit is sanctioned by the bank to the customer. Customer can purchase or make the payment without keeping balance on their account.

#### Conclusion:

The banking sector in India has become tougher in term of development and economic growth the number of customers in the financial sector. In the next generation will play a vital role in further strengthening the banking sector. Nowadays, the new technology is sure that the future of banking will introduce more offers and services to the customers with the best banking product and innovations. Banking sector also increased the accessibility of a common person to bank for his productivity and requirements. The Indian banking sector has improved the technology and new Technology. The innovative banking technology changing reforms have changed the face of Indian banking and financial sector. The banking system has improve the manifold in terms of product and services, technology, banking system, trading facility etc. it is the evidence that the banking system has grown in India to compare with other country. Future, the banks comprehends their customer and bank will be meeting their requirements. Indian Banking Sector provide better services with other developed bank.

#### References:

1. [www.wikipedia.com](http://www.wikipedia.com)
2. [www.rbi.com](http://www.rbi.com)
3. [www.google.com](http://www.google.com)
4. Times of India news paper
5. [www.abhinavjournal.com](http://www.abhinavjournal.com)
6. [www.moneycontrol.com](http://www.moneycontrol.com)



**13. Phase changes under heat treatment during synthesis of Alpha-Al<sub>2</sub>O<sub>3</sub> by Sol Gel method***Dhawale Vijaya Pandurang et al., IJSRR 2019, 8(2), 550-555*

Research article

Available online [www.ijssr.org](http://www.ijssr.org)

ISSN: 2279-0543

***International Journal of Scientific Research and Reviews*****Phase Changes Under Heat Treatment During Synthesis of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> Nanoparticles by Sol Gel Method****Dhawale Vijaya Pandurang<sup>1\*</sup>, Mohite Kakasaheb Chandrakant<sup>2</sup>, and Kulkarni Satish Damodar<sup>3</sup>**<sup>1</sup> New Arts Commerce and Science College, Parner, Ahmednagar- 414 302, M.S. INDIA  
E-mail: [vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com)<sup>2</sup> C.T. Bora College Shirur, Dist. Pune- 412 210, M.S. INDIA  
E-mail: [kcmohite@gmail.com](mailto:kcmohite@gmail.com)<sup>3</sup> New Arts Commerce and Science College, Ahmednagar- 414 001, M.S. INDIA  
E-mail: [satishdkulkarni@gmail.com](mailto:satishdkulkarni@gmail.com)**ABSTRACT**

In the present study,  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles synthesized using alcoholic solution of AlCl<sub>3</sub>, 25% NH<sub>3</sub> and Polyvinyl alcohol (PVA). PVA act as a capping agent. All these chemicals were inexpensive raw materials. Stable crystalline phase of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles occurred at a temperature 1100°C. During heat treatment, stable  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> can be obtained through the series of phase transformations from boehmite,  $\gamma$ ,  $\delta$ ,  $\theta$  to  $\alpha$ - phase of Al<sub>2</sub>O<sub>3</sub>. Crystalline nanoparticle formation of the dried sol was investigated using x-ray diffractometry (XRD). XRD shows crystal size increases from 25 nm to 32 nm when calcination temperatures increases from 500°C to 1100°C. It was shown that crystal size increases during the heat treatment. The morphology of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles was studied using Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), along with energy- dispersive X-ray analysis (EDAX). TGA and DTA shows, 77% weight loss and phase transformations. Synthesized  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles were applied in waste water treatment as an adsorbent.

**KEYWORDS:** Sol-gel method, phase change, heat treatment, calcination.**\*Corresponding Author:****Dhawale V. P.**

Associate Professor

Post Graduate Department of Physics,

New Arts Commerce and Science College,

Parner, Ahmednagar, 414 302- India

E-mail: [vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com)

Mob. No. +91 9822725739

## 1. INTRODUCTION

Alumina ( $\text{Al}_2\text{O}_3$ ) is the most important ceramic materials used for fabrication of catalyst, catalyst supports, adsorbent materials, coatings and for industrial applications.<sup>1</sup> In the present work an alumina nanopowder is synthesized by sol-gel method using low cost aluminum chloride ( $\text{AlCl}_3$ ), ammonia ( $\text{NH}_3$ ) and polyvinyl alcohol (PVA). Sol-gel method is most convenient method to produce ceramic nanoparticles. It consist of formation of sol from alkoxides or organometallic precursors. In this, suspended particles polymerized at low temperatures and thus generated wet gel is then dried and heat treated.<sup>2</sup> However long gelation time is the drawback of sol-gel route.<sup>3</sup>  $\text{Al}_2\text{O}_3$  exists near about fifteen distinct crystallographic phases and it can undergo a variety of transitions until the most stable corundum structure  $\alpha\text{-Al}_2\text{O}_3$  -forms at high temperatures.<sup>4</sup> During the thermal treatment, stable  $\alpha\text{-Al}_2\text{O}_3$  phase can be obtained through the following series of phase transformations before conversion to  $\alpha\text{-Al}_2\text{O}_3$ .



The aim of the present paper is to study phase changes through TGA, DTA and XRD obtained at different temperatures.

## 2. EXPERIMENTAL SECTION

$\alpha\text{-Al}_2\text{O}_3$  nanoparticles were synthesized by using aluminum chloride as a precursor, 25% ammonia and polyvinyl alcohol (PVA). Alcoholic solution 0.5 M  $\text{AlCl}_3$  was prepared, 25%  $\text{NH}_3$  was added drop by drop till resulting solution turned to a white sol, PVA was added until it becomes a transparent sticky gel. The gel was allowed to mature for 24 hours at room temperatures and heat treated at  $100^\circ\text{C}$  for 24 hours. The dried gel was divided into 4 parts and were heat treated at  $500^\circ\text{C}$ ,  $700^\circ\text{C}$ ,  $900^\circ\text{C}$  and  $1100^\circ\text{C}$  for 4 hours respectively.

## 3. RESULTS AND DISCUSSION

### 3.1. SEM/TEM and EDAX of $\text{Al}_2\text{O}_3$ nanoparticles

SEM image of the  $\text{Al}_2\text{O}_3$  NPs gives the distribution pattern and size of the nanoparticles (Fig. 1A,B). The TEM micrograph shows slight agglomeration with spherical morphology and their average particle size were 77.7 nm (Fig. 1C,D). The SAED pattern of  $\text{Al}_2\text{O}_3$  NPs shows that the rings are composed of dots suggesting the crystalline nature of these particles (Fig. 2E). The quantitative analysis of the  $\text{Al}_2\text{O}_3$  nanoparticle was done using EDAX spectroscopy measurement and it shows Al and O as the major components of aluminium oxide nanoparticles in the heads as shown in figure 2(F).

*Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555*

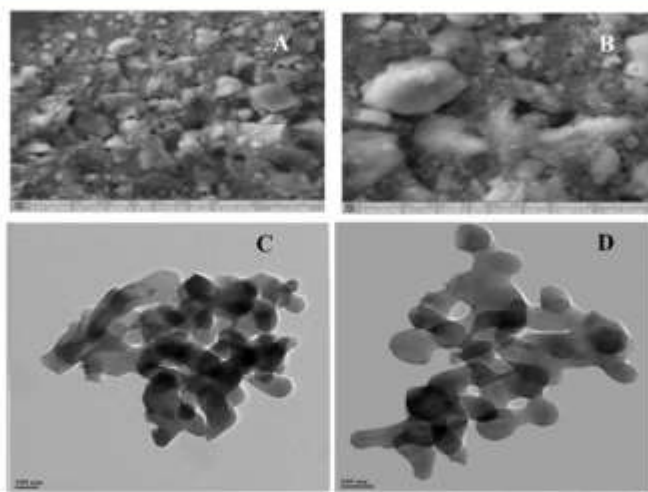


Figure 1. Scanning electron micrographs (SEM) (A, B) and Transmission electron micrographs (TEM) of  $\text{Al}_2\text{O}_3$  nanoparticles (C, D).

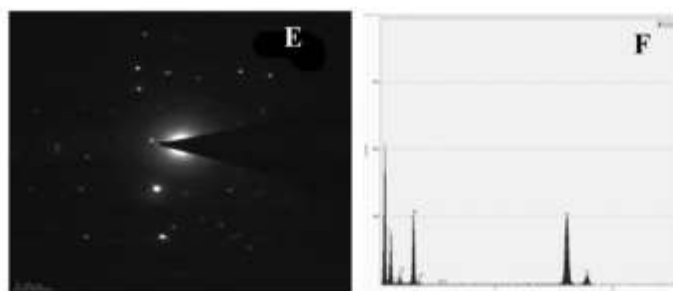
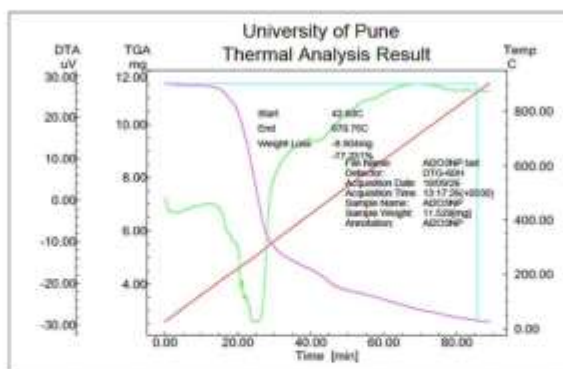


Figure 2. Selected area electron diffraction pattern (E) and EDAX of  $\text{Al}_2\text{O}_3$  nanoparticles (F).

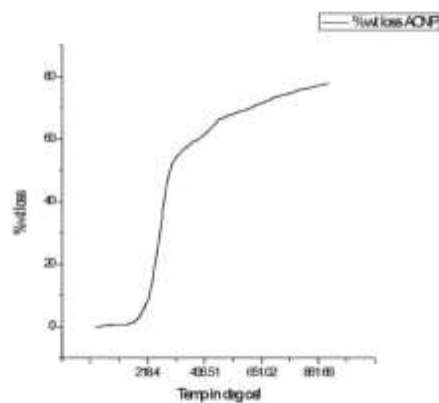
### 3.2. Thermal analysis

The % weight loss with temperature of TGA curve shows that nanoparticle formation temperature is  $762^\circ\text{C}$  and transition temperature  $800^\circ\text{C}$  with one step weight loss of 77%. The DTA curve shows endothermic reaction attributed to moisture loss and to hydroxyl loss from the decomposition of hydrated aluminum chloride and aluminum hydroxide (Graph 1a,b). The endothermic effects at about  $800^\circ\text{C}$  and  $900^\circ\text{C}$  may be due to the transformations of polymorphous enantiotropy  $\gamma\text{-Al}_2\text{O}_3$  in  $\alpha\text{-Al}_2\text{O}_3$ . Transformation temperature  $\gamma\text{-Al}_2\text{O}_3$  to  $\alpha\text{-Al}_2\text{O}_3$  is less than  $1000^\circ\text{C}$  shows small crystallite size and degree of crystallinity characteristic of the nanopowder.<sup>2</sup>

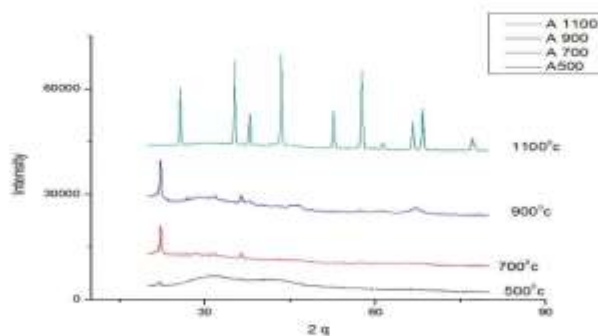
Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555



Graph 1(a). Thermal analysis (DTA and TGA) of  $\alpha$ -  $\text{Al}_2\text{O}_3$  nanoparticles obtained by Sol-gel method, calcined at  $1100^\circ\text{C}$  temperature for 4h

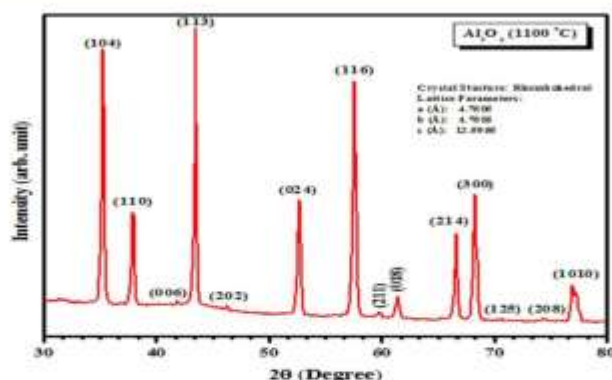


Graph 1(b). The % weight loss of  $\alpha$ -  $\text{Al}_2\text{O}_3$  nanoparticles



Graph 2. XRD Patterns of dry gel calcined for 4 h at different temperatures

Dhawale Vijaya Pandurang et al., JSRR 2019, 8(2), 550-555



Graph 3. X-ray Diffraction pattern of  $\alpha$ - $\text{Al}_2\text{O}_3$  nanoparticles

### 3.3. XRD analysis

Graph 2 shows the comparable XRD patterns of powders prepared by different calcination temperatures from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ . X-ray diffraction images for the powders obtained from precursors  $\text{AlCl}_3$  and dried at 24 hours after maturation of 24 hours, heat treated for four hours from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$  separately. It shows that thermal treatment leads to its decomposition with the formation of a mixture of  $\gamma$ - $\text{Al}_2\text{O}_3$  phase (JCPDS - 47-1308) and  $\alpha$ - $\text{Al}_2\text{O}_3$  phase (JCPDS file-71-1678).<sup>6</sup>

XRD at temperatures  $500^\circ\text{C}$  and  $700^\circ\text{C}$ , shows there are 4-5 broad peaks in the pattern for the sample sol-gel sample which are difficult to index according to the JCPDS data indicating that the powder is possibly amorphous. Powder at this temperature shows the existence of organic materials and confirms XRD pattern, where these compounds have prevented particles from forming crystal structure. However, the diffraction peaks are a little sharper and attributed to  $\gamma$ - $\text{Al}_2\text{O}_3$  for the sol-gel sample.<sup>7</sup> All diffraction peaks exhibit high degree of broadness due to formation of nanocrystals. The characteristic peaks of  $\gamma$ - $\text{Al}_2\text{O}_3$  is improved for the sol-gel sample with increasing calcination temperature upto  $1000^\circ\text{C}$ .<sup>8</sup> The diffraction peaks of  $\delta$  and  $\gamma$  are very close to each other, in fact overlapping in some positions. It can indicate that  $\gamma$ - $\text{Al}_2\text{O}_3$  co-exists with  $\delta$ - $\text{Al}_2\text{O}_3$ .<sup>9</sup> Increasing temperature of heat treatment upto  $1100^\circ\text{C}$  for four hours results in the formation of only  $\alpha$ - $\text{Al}_2\text{O}_3$  (JCPDS file-71-1683) (Graph 3). At  $1100^\circ\text{C}$  single phase  $\alpha$ - $\text{Al}_2\text{O}_3$  is completely formed. The diffraction pattern is extremely sharp indicating the existence of highly crystalline material which is shown by the curve at temperature  $1100^\circ\text{C}$ . Average crystal size calculated from Debye scherrer formula was found to be increasing from 25 nm to 32 nm of dried gel when calcination temperature increases from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ .

#### 4. CONCLUSION

The sol-gel synthesis of  $\alpha$ - $\text{Al}_2\text{O}_3$  was relatively simple and easy method. The resulting  $\alpha$ - $\text{Al}_2\text{O}_3$  powder were characterized by X-ray diffraction, differential thermal analysis and thermo gravimetric analysis (DTA, TGA). Applying heat treatment at temperatures up to  $1100^\circ\text{C}$  for 4 hours  $\alpha$ - $\text{Al}_2\text{O}_3$  powder was obtained at nanometric scale having rhombohedral structure. Its crystal size ranges from 25 nm to 32 nm after calcinations of dried gel from  $500^\circ\text{C}$  to  $1100^\circ\text{C}$ .  $\alpha$ - $\text{Al}_2\text{O}_3$  nanopowder have superior properties as compared to the powder obtained in larger particle size and it can be used as a effective adsorbent in waste water treatment.

#### ACKNOWLEDGEMENT

Smt. Dhawale V.P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under Faculty Development Program.

#### REFERENCES

1. Mirjalili F, Abdullah LC, Mohamad Het al. Proceess for nano-alpha-alumina powder. ISRN Nanotechnology, 2011; 2011: 1-5.
2. Rogojan R, Andronesu E, Ghitulica Cet al. Synthesis and characterization of alumina nanopowder obtained by sol-gel method. UPB Sci. Bull Series B., 2011; 73: 67-76.
3. Gocmez H and Ozcan O. Low temperature synthesis of nanocrystalline  $\alpha$ - $\text{Al}_2\text{O}_3$  by a tartaric acid gel method. Mater Sci. Eng. A., 2008; 475:20-33.
4. NaoufalBahlawane and Tadahikon Watanabe. New sol-gel Route for the preparation of pure  $\alpha$ - alumina at  $950^\circ\text{C}$ . J. Am. Ceram. Soc., 2000; 83(9): 23- 26.
5. Arami H, Mazloumi M, Khalifehzadeh K et al. Bundles of self-assembled boehmitenano strips from a surfactant free hydrothermal route. Journal of Alloys and Compounds, 2008; 461(1-2): 551-554.
6. Hongyu Liu, Guiling Ning, Zhihong Gan et al. A simple procedure to prepare spherical  $\alpha$ -alumina powders. Materials Research Bulletin, 2009; 44(4): 785-788.
7. Rajaeiyan A and Bagheri-Mohagheghi MM. Comparison of sol-gel and co-precipitation methods on the structural properties and phase transformation of c and a- $\text{Al}_2\text{O}_3$  nanoparticles, Adv. Manuf. 2013; 1:176-182. DOI 10.1007/s40436-013-0018-1.
8. Banerjee S and Sujatha P. Effect of citrate to nitrate ratio on the decomposition characteristics and phase formation of alumina. J. Therm Anal Calorim., 2007; 90:699-706.
9. Zhan X, Honkanen M, and Leva E. Transition alumina nanoparticles and nanorods from boehmitenano flakes. J. Crystal Growth, 2008; 310:3674-3679.

## 14. Synthesis and Characterization of SiO<sub>2</sub> Nanoparticles



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

### Synthesis and Characterization of SiO<sub>2</sub> Nanoparticles

S. L. Kadam<sup>1</sup>, Jaypal Inaniyan<sup>2</sup>

<sup>1</sup> Post Graduate Department of Physics, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar-414 302, SPPU, Pune (Maharashtra), INDIA.

Email:mr.sukadeo@rediffmail.com

<sup>2</sup> Shri B. R. Mirdha Govt. Colleges, Nagaur, Maharshi Dyanand Saraswati University, Ajmer (Rajasthan), India. Email: Jaypalinaniyan1996@gmail.com

#### Abstract

More attention has been focused on silica nanoparticles by scientific community due to its advanced applications in various fields. The optical properties of silica nanoparticles can be attained with respect to surface defect related to large surface/volume ratio according to the applications. In this paper, silica nanoparticles were synthesized by well known Stober Method. The infrared spectra of silica nanoparticles of various sizes are similar. TEM measurements has also confirmed that the particles are monodisperse, spherical in nature and having a size of around 130 nm. The SAED pattern shows that the particles are amorphous in nature. The compositional ratio of silicon and oxygen is analyzed by EDX and found that the particles are composed only of Si and Oxygen.

**Keywords:** SiO<sub>2</sub> Nanoparticles, Stober Method, FTIR, Amorphous.

#### Introduction

As the requirements for precise micro components have increased dramatically for the last few years, finishing techniques to improve the surfaces of microstructures have attracted more attention[1]. For example the surface quality of micro lenses critically affects the performance of an optical system. To produce glass, ceramics and semiconductors with surfaces of superior quality, abrasive polishing is commonly required as a finishing step[2]. SiO<sub>2</sub> nanoparticles have particular physical, chemical and optical properties that have led its wide use in many fields. They are used in various industrial applications such as catalysis [3,4], prosthetic materials[5], dielectric materials[6], drug delivery[7], humidity sensors[8] and inorganic carriers for enzyme immobilization[9]. Many experimental studies also use silica nanoparticles as colloidal suspensions in the form of hydrosols and aerosols. However for many of the applications it is desirable to have the suspended phase consisting of homogeneous particles of uniform shape and size. Such mono-disperse particulate suspensions offer many experimental and theoretical advantages.

Stober et al[10] first in 1968 discovered a pioneer method for synthesizing spherical silica nanoparticles by using ammonium hydroxide as a catalyst. We synthesized silica nanoparticles of various sizes by slight modification of Stober's original method. The synthesized nanoparticles were characterized by using infrared spectroscopy and transmission electron microscopy. These nanoparticles which are amorphous in nature will be used as template for size controlled synthesis of various other nanoparticles for Li-ion battery.

#### Experimental

##### Materials

Silica nanoparticles were synthesized by using tetraethylorthosilicate (TEOS ≥ 99% GC) (Sigma Aldrich), ammonia solution (NH<sub>4</sub>OH) 30% (S D fine-chem. Limited) and absolute ethanol (Changshu Yangquan, China). All chemical were analytical grade. Milli-Q water (18.2 mega ohm) was used for all experiments.

##### Preparation of SiO<sub>2</sub> Nanoparticles

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com)

Page No: 132



The SiO<sub>2</sub> nanoparticles were prepared by the following procedure. Silica (SiO<sub>2</sub>) nanosphere of various sizes was synthesized by the well known Stober Method [6] with slight modification. The size of silica nanoparticles were controlled by varying the amount of catalyst like ammonium hydroxide. In a typically reaction 50ml of ethanol was mixed with various amount of ammonium hydroxide (NH<sub>4</sub>OH=1,1.99,2.5,2.99,5.97 and 8.96 ml) in a 100ml round bottom flask and the reaction mixture stirred for 5 min at room temperature, followed by the addition of deionised water (18ml) and tetraethylorthosilicate (TEOS, 3.13ml). The reaction mixture was then stirred for 1.5 hour at room temperature. The white colour precipitate of silica nanoparticles thus synthesized was washed 4-5 times with absolute ethanol and dried in air at 105°C for 24 hours. The synthesized SiO<sub>2</sub> nanoparticles here onwards will be represented as SiO<sub>2</sub>-x ml NH<sub>4</sub>OH nanoparticles (according to the volume of ammonia added).

#### Results and Discussion

**Infrared spectroscopy-** Figure 1 shows the infrared spectra of silica nanoparticles of various sizes. The infrared spectra of silica nanoparticles of various sizes are similar. The band at 3432 cm<sup>-1</sup> is assigned to the O-H stretch due to the presence of Si-OH group or the bonded water [11]

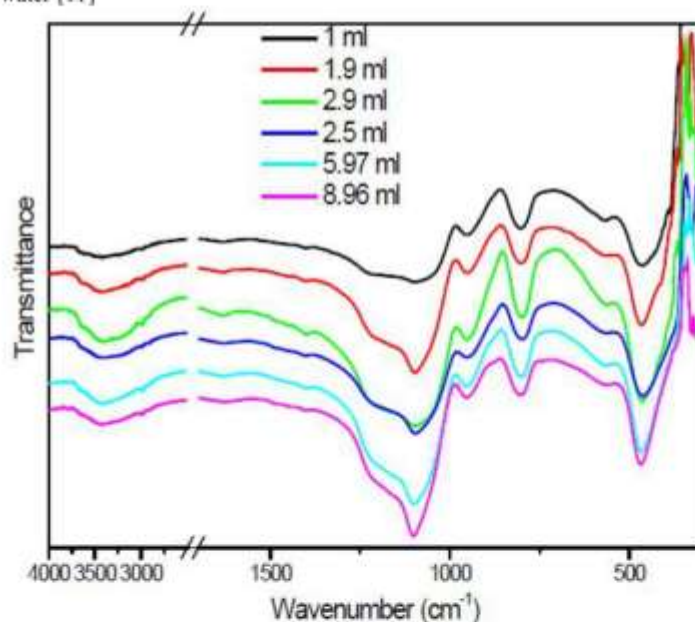


Fig.1 Infrared spectra of silica nanoparticles of various sizes.

on the surface of the silica particles. Infrared band at 1633 cm<sup>-1</sup> is due to the bending mode of H<sub>2</sub>O molecules. The very intense and quite broad band at 1100 cm<sup>-1</sup> with a shoulder at 1195 cm<sup>-1</sup> is assigned to the TO and LO modes of Si-O-Si asymmetric stretching vibration [11].





The band at  $955\text{ cm}^{-1}$  can be assigned to silanol group. The bands at  $803\text{ cm}^{-1}$  and  $468\text{ cm}^{-1}$  are assigned to the Si-O-Si symmetric stretch and O-Si-O bending vibrations respectively.

**Transmission electron microscopy (TEM)** –The synthesized  $\text{SiO}_2$  nanoparticles were characterized by TEM. A representative analysis is shown here for  $\text{SiO}_2$  -2.5 ml  $\text{NH}_4\text{OH}$  nanoparticles. The bright field TEM image of  $\text{SiO}_2$  -2.5 ml  $\text{NH}_4\text{OH}$  nanoparticles is shown in Fig.2. It is clear from the figure that the particles are monodisperse, spherical in nature and having a size of around 130 nm. The selected area energy dispersion (SAED) pattern as shown in figure 2c clearly shows that the particles are amorphous in nature. The energy dispersive X-ray (EDX) analysis as shown in figure 3 clearly shows that the particles are composed only of Si and oxygen.

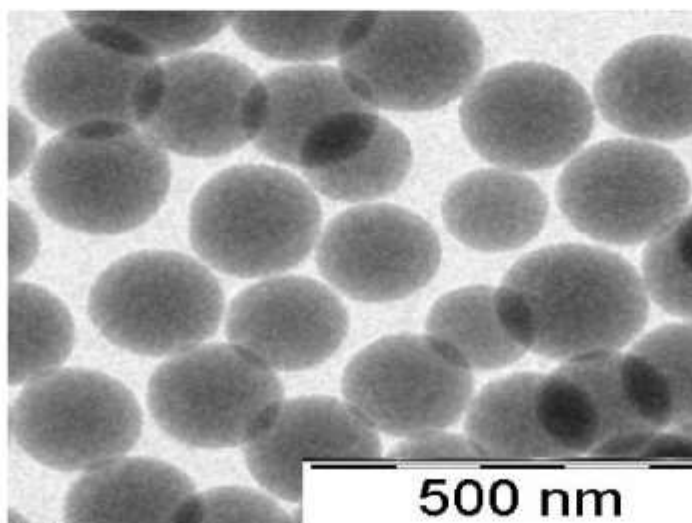


Fig 2a

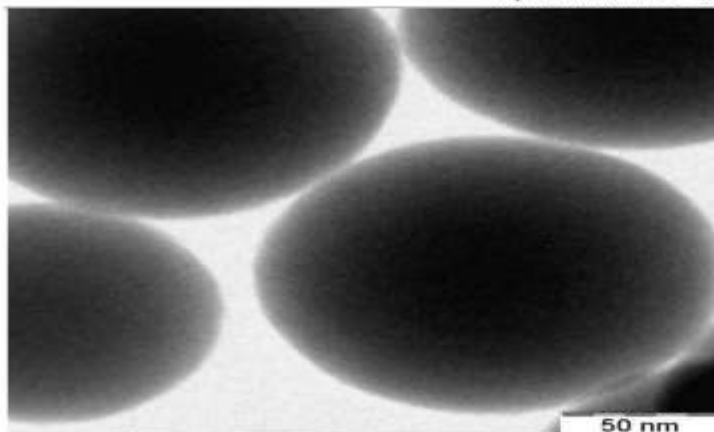
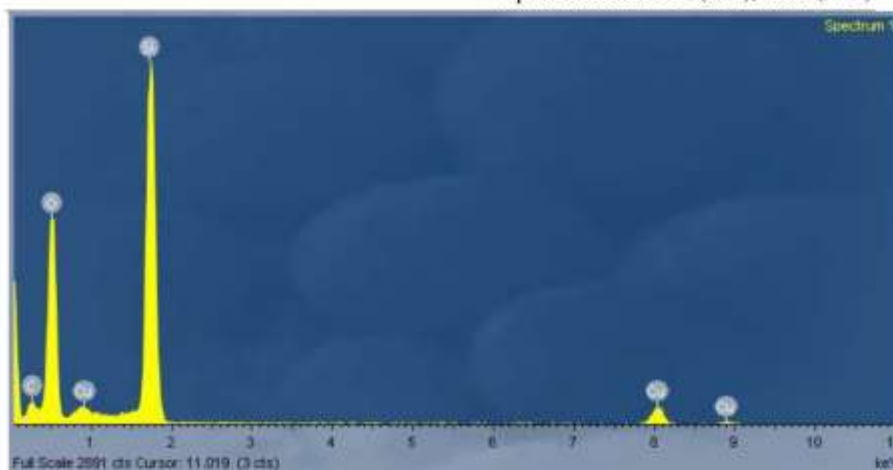


Fig 2b



Fig 2c

**Figure-2.**Bright field TEM image at low (a) and (b) high magnification and (c) SAED pattern of SiO<sub>2</sub>-2.5 ml NH<sub>4</sub>OH particle.



**Figure-3.** Energy dispersive X-ray analysis of SiO<sub>2</sub>-2.5 ml NH<sub>4</sub>OH particles


**Conclusion** Silica nanoparticles of various sizes were synthesized by well known Stober method with slight modification by changing the amount of catalyst like ammonium hydroxide. The nanoparticles were well characterized using FTIR and TEM. The nanoparticles are monodisperse and amorphous in nature.

**Acknowledgment** Author would like to thank Dr. Aninda Bhattacharya, Scientist, I. I. Sc. Bangalore under whose supervision this work is carried out.

#### References

1. Kao, M. J., Hsu, F. C. and Peng, D. X. (2014). *Advances in Materials Science and Engineering*, article ID 691967, pp. 1-8.
2. Ahn, Y., Yoon, J. Y., Baek, C. W. and Kim, Y. K., (2004). *Wear*, vol.257, no.7-8, pp. 785-789.
3. Li, J., Wu, D. and Sun, Y. (2009), *Catal. Today*, pp.148.
4. Anisur, R. M., Shin, J., Choi, H. H., Yeo, K. M., Kang, E. J. and Lee, I. S. (2010). *J. Mater Chem.*, 20, pp. 10615.
5. Gomez-Vega, J. M., Iyoshi, M., Kim, K. Y., Hozumi, A., Sugimura, H. and Takai, O. (2001). *Thin Solid Films*, pp. 695.
6. Jain, A., Rogojevic, S., Ponoth, S., Agarwal, N., Matthew, I. Gill, W. N., Persans, P., Tomozawa, M., Plawsky, J. L. and Simonyi, E. (2001). *Thin Solid Films*, 398, pp.513.
7. Anglin, E. J., Cheng, L., Freeman, W. R. and Sailor, M. J., (2008). *Adv Drug Deliv Rev*, 60, pp. 266.
8. Herbert, G., (1994). *J. Eur. Ceramic Soc.*, 14, pp. 205.
9. He, F., Zhuo, R. X., Liu, L. J., Jin, D. B., Feng, J. and Wang, X. L. (2001). *Reactive Functional Poly*, 47, pp. 153.
10. Stober, W., Flink, A. and Bohn, E. (1968). *Colloid Interface sci.*, 26, pp. 62.
11. Music, S., Filipovic-Vincekovic, N. and sekovanic, L. (2010). *Brazilian Journal of Chemical Engineering*, 28, pp. 89.

15. Soil Analysis and its correlation with VAM. International Research Journal of Multidisciplinary Studies. Iv(I): 173-176

 INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

**Soil analysis and its correlation with vam**

**Rangnath Aher**  
P.G. Department of Botany, New Arts, Commerce and Science College, Parner ,  
Dist- Ahmednagar, Maharashtra, India.

**Abstract**  
*Present investigation deals with correlation of soil analysis with vesicular mycorrhizal fungi. It is observed that a correlation can be established between the number of spores, percentage infections, and physical and chemical parameters of soil.*

**Introduction**  
The term mycorrhizae refers to a plant root associated with symbiotic fungus, a whole being considered as a functionally distinct organ involved in mineral nutrient uptake from soil. The AM Fungi are more abundant in rhizosphere of plants (Mosse, et al., 1981) and mostly present in 'A' horizon upto a depth of 45 to 30 cm of soil. They decrease with increasing depth (Redhead, 1977). Soil physico-chemical characters viz. Soil moisture, soil temperature, pH, soil texture, nutrient level after the occurrence, distribution and effectiveness of VA mycorrhizae. Present investigation deals with correlation of soil analysis with vesicular mycorrhizal fungi.

**Materials and Methods**  
Soil samples (rhizosphere and non-rhizosphere soil) were analysed for the following parameters.  
(A) Physical parameters: This includes estimation of moisture content  
(B) Chemical parameters like pH was checked by an Elico pH meter and also by pH paper. Organic carbon of soil, was estimated using Walkley and Black (1934). Calcium carbonate of soil estimated by Rapid titration method. For estimation of nitrogen in soil Kjeldahl's method [Bal's modification, Jackson, (1967)] was followed. The estimation of available phosphorus was done using Trivedi and Goel's method (1984). The estimation of potassium was done with the help of flame photometer (Jackson, 1973).

**Spore isolation and VAM infection**  
Isolation of VAM spores from soil was done by using wet sieving and decanting method (Gerdemann and Nicolson, 1963) and estimation of VAM Spores (Adholeya and Gaur, 1994).

**Results and Discussion**  
**I) Soil analysis** Physical and chemical analysis of rhizosphere and non-rhizosphere soil from all 5 localities were done.  
**Moisture (Table-1)**  
Maximum moisture content was observed in Parner (18 and 16) in rhizosphere and non-rhizosphere soil and minimum (5%) in Wadzire. In all localities except Wadzire the rhizosphere soil had more moisture. This was because the root system of plants helped in retaining more moisture and is one of the ecological factors responsible for the occurrence of more VAM spores compared to non-rhizosphere soil.  
**pH (Table-2)**  
The range of pH was between 6 and 7. The number of VAM spores were more. This indicated that soil with neutral pH favor's the proliferation of VAM spores. In all 5 localities not much of a variation was observed in the pH of rhizosphere and non-rhizosphere soil.

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com) Page No: 173

152019 Welcome To Review of Research Journal International Monthly Scholary 14

Home Just Accepted Current Issue Archive Reviewed Articles Received Articles Journals Indexing Contact Us

**Our Journal is Attited In**

- Welcome to RoR
- Peer Review
- Editorial
- Board of Editors
- Publication Ethics
- AGB and Ethics
- Plagiarism Policy
- Qualis Capes / BRAZIL as B3**
- Track your Article
- Count Your API
- Post Publication
- Submit Article

Since Oct 2011

**International Online Multidisciplinary Journal**

**Review of Research**

ISSN No. : 2249-894X

Open Access

Monthly Publish

Save Tree. Save Paper. Save World

**ISSN No : 2249-894X**

**Review of Research**

**Editor in Chief**  
Dr. Ashok Yakkaldevi  
Mrs. Kamani Parvati  
Eкатерина Патраску

**Our New Projects**


- **Call for Book Chapters- LBP-DRJI Indexed new!**
- **Call for Book Reviews and Reviewers new!**

**Capes / BRAZIL as B3**

Review of Research Journal is a Online International multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be **double-blind peer reviewed** referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the

robp.world 1/2

## 16. Germination studies in four cultivars of gram under PEG-6000 induced water stress.


**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**  
 Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
 Impact Factor: 1.3599(GIF), 0.679(IIFS)

---

**Germination Studies in Four Cultivars of Gram under PEG-6000 Induced Water Stress**

**Dr. Ravindra N. Deshmukh**  
 Department of Botany and Research Centre  
 New Arts, Commerce and Science College, Parner,  
 Dist- Ahmednagar. 414 302, E mail: sorghumws@gmail.com

---

**Abstract**  
*Gram is the third important pulse crop in the world. In Maharashtra due to erratic rainfall, the productivity of chickpea is severely affected by drought besides several biotic constrain. Gram is inseparable ingredients of vegetarian diets and one of the cheapest sources of dieting protein. In present investigation all the cultivars with increase in PEG-6000 induced water stress seed germination was drastically reduced from -2 to -8 bars. The overall results regarding seed germination and physiological changes under PEG 6000 induced water stress indicated that the gram cultivar virat showed comparatively better performance than the other cultivars like Digvijay, Vijay and Vishal. water stress induced by PEG-6000 at seed germination stage revealed that the cultivars Virat showed maximum accumulation of carbohydrate which was followed by Vijay, Digvijay and Vishal. The cultivar Virat showed better performance for protein content Vijay, and Vishal.*

**Key Words:** Gram, PEG-6000, Water Stress, Germination, Protein, Carbohydrate.

---

**Introduction**  
 Chickpea (*Cicerarietinum*) belong to family leguminoceae it is the third important pulse crop in the world only. Among the chickpea growing countries, India ranks first in both areas and production. In Maharashtra due to erratic rainfall, the productivity of chickpea is severely affected by drought besides several biotic constrain (Sharma and Ortiz, 2000). Although drought management has been an option to obtain the realizable yield. It is increasingly felt that the genetic improvement of drought tolerance is more rewarding (Udaykumaret.al. 1998). Pulse breeders try to develop drought tolerant cultivars of chickpea either by traditional breeding methods or biotechnological approaches in order to minimize the losses occurring due to drought. Gram is inseparable ingredients of vegetarian diets and one of the cheapest sources of dieting protein in India. India contributes 67% of the global chickpea production. The major constraints of low productivity are abiotic stresses like moisture, temperature, nutrients, salinity etc. Among them water and high temperature stress particularly at terminal stage of crop growth is the most important abiotic stress for chickpea productivity. Market price of chickpea is about four times higher than the wheat and also maintains the fertility of soil by fixing atmospheric N<sub>2</sub> through roots and nodules.

**Materials and Methods**  
 In the present investigation, impact of water stress on seed germination was induced by PEG-6000 on four cultivars of gram. The influence of water stress on biochemical and germinating parameters was investigated in detail. The germinating experiment was conducted at the Department of Botany, New Arts, Commerce and Science College Parner, Dist- A. Nagar,  
 The authentic seeds of four released cultivars of gram (Vijay, Digvijay, Virat and Vishal) were procured from Senior Pulse Breeder, Mahatma Phule Agricultural University, Rahuri, Dist- Ahmednagar.

**Seed germination study under PEG-6000 induced water stress:-**  
 The healthy and uniform seeds of released cultivars of gram Vijay, Digvijay, Virat and Vishal were washed thoroughly in water, surface sterilized with 0.1% HgCl<sub>2</sub> and washed with distilled water for 3-4 times. These seeds were kept for germination on germination paper in sterilized petri plates, containing different concentrations of PEG-6000 solutions such as 0 bar (distilled water), -2 bar, -4

---

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com) Page No: 84



bar, -6 bar and -8. The method described by Sairam and Kumari (1998) was followed to prepare the different solutions of PEG-6000. Five ml of PEG-6000 solution of respective concentration was added in each petri plate. The control was maintained with distilled water. All the sets were arranged in triplicate under uniform laboratory conditions. Observations on following different parameters were recorded on sixth day.

- 1) **Germination percentage:**-(Prado *et al.*, 2000),
- 2) **Length of plumule and radicle:**-On 6<sup>th</sup> day of sowing, 5 seedlings from each replication and treatment were randomly selected for measuring the root and plumule length.
- 3) **Fresh and dry weight:**-On 6<sup>th</sup> day five seedlings were randomly selected for recording fresh weight. These seedlings were kept in an oven at 60 °C, till constant dry weight was obtained. The total dry weight of seedlings from control and each treatment was recorded.
- 4) **Estimation of total carbohydrate:-**  
Carbohydrate was estimated using anthrone reagent as per the method described by Sadasivam and Manickam (1997).
- 5) **Estimation of proteins:-**  
Proteins were estimated by using Lowry *et al.* (1951) method.

#### Results and Discussion:

The results obtained under different water stress treatments during seed germination under PEG-6000 induced water stress. The germinating as well as parameters was recorded and these are discussed in detail by using recent reference.

#### 1 Effect of PEG induced water stress on seed germination and seedling growth:-

The effect of PEG 6000 induced water stress on seed germination in cultivars of gram recorded in Table 1, Table 2, Table 3 and Table 4 and shown in photo plate: 1A, B and 2 A, B revealed that in all the cultivars with increase in PEG induced water stress seed germination was drastically reduced from -2 to -8 bar. The maximum seed germination percentage recorded in Virat at -4 bar water stress (70%), which was followed by Vijay and Digvijay (60%) and Vishal (35%). The seed germination in cultivar Vijay showed 40% and in other cultivar it showed high decrease was completely inhibited in all the cultivars at -6 bar. At highest water stress the gram cultivar Virat had showed better performance regarding seed germination as compared to others.

The root length in all the cultivars decreased from -2 to -6 bar PEG induced water stress. The maximum root length was recorded at -2 bar in Digvijay (5.4 cm), which was followed by Vishal (4.6 cm), Virat (3.7 cm) and Vijay (3.5 cm). The maximum root length at -4 bar PEG induced water stress was recorded in cultivar Digvijay (4.3 cm) which was followed by Virat (3.5 cm) and very high reduction in root length was recorded in Vishal (2.8cm) and Vijay (1.3cm) respectively.

The shoot length was also decreased with increase in water stress. The maximum plumule length at -4 bar PEG induced water stress was recorded in cultivar Viart (0.1 cm) only.

The fresh weight and dry weight decreased with increase in water stress was noted in all the cultivars of gram. The overall results regarding seed germination and physiological changes under PEG 6000 induced water stress indicated that the gram cultivar virat showed comparatively better performance than the other cultivars like Digvijay, Vijay and Vishal. Meena *et al.* (2003) reported that in sorghum and wheat seedlings under PEG-6000 induced water stress the root and shoot length, root: shoot ratio was reduced with increased level of water stress. Water absorption is prerequisite to initiate a series of metabolic changes in emergence of embryo, hence increase in moisture tension is known to delay and affect the seed germination. Gill *et al.* (2002) studied the effect of osmotic stress on seed germination and growth in sorghum cultivar CSH-9. According to them under stress condition germination was decreased significantly.



when the seeds were treated by using mannitol. Singh *et al.* (1996) and Prado *et al.* (2000) explained that the reduction in seed germination under water stress condition was due to enforced dormancy in the seeds. They further considered it as an adaptive strategy for seeds to prevent germination under stressful environment, ensuring proper establishment of seedlings. Similarly under osmotic stress a significant reduction in water potential and tissue water content in the germinating seeds may be responsible for inhibition of seed germination under stress. Sajjanet *et al.* (2004) reported that seed germination, seedling length and vigour index was reduced with increased levels of water stress in sorghum cultivars.

Munjial and Dahiya (2004) had screened forty barley genotypes for drought tolerance under PEG-induced water stress and reported that the drought tolerant cultivars showed higher percentage of seed germination, coleoptile length, root and shoot length. Similar was the trend recorded in present investigation for the drought tolerant ability in three wheat genotypes when exposed to PEG induced water stress during seed germination.

### 2 Effect of water stress on carbohydrate content:-

The minimum degradation of carbohydrates under water stress situation is an indication of drought tolerance. The results presented in table 1, 2, 3 and 4 water stress induced by PEG-6000 at seed germination stage revealed that the cultivars Virat showed maximum accumulation of carbohydrate at control stage (341 mg/g DW) which was followed by Vijay (268 mg/g DW), Digvijay (187 mg/g DW) and Vishal (178 mg/g DW).

At -2 to -8 water stress cultivar Virat showed better performance than the other cultivar for carbohydrate content. More reduction in carbohydrate indicate drought susceptibility. The cultivar Vishal showed very poor performance regarding the carbohydrate content, which was followed by Vijay and Digvijay.

Burmanet *et al.* (2005) reported significant decrease in starch content under different intensities of water stress in clusterbean. The levels of degradation of starch in the present investigation might be used as biochemical marker to evaluate the drought tolerant potential of promising cultivars of sorghum.

Deshmukh (2000), Deshmukh *et al.* (2000), Deshmukh *et al.* (2001) and Deshmukh *et al.* (2004) reported decrease in starch content in six different cultivars of sorghum under PEG induced water stress. They further claimed that the level of starch degradation was depending on genotypes and degree of water stress. The response of all the six cultivars to water stress was different.

Deshmukh *et al.* (2001), Venkateshwaranet *et al.* (1989) explained that increased starch hydrolysis during water stress might be responsible for reduction or degradation of starch content. According to them higher the starch degradation more sensitive must be the cultivar towards drought stress.

Yadav *et al.* (2005) studied the influence of water deficit at vegetative, anthesis and grain filling noted that degradation of starch in to sugars for the osmotic adjustment may alleviate some of the detrimental effects of water stress and it may be one of the important criterion of yield stability and drought tolerance in sorghum.

### 3 Effect of water stress on protein content:-

The abiotic stresses like water has a great impact on protein synthesis and its degradation hence the alterations in protein content in response to drought stress may act as one of the most important parameter for assessing the drought tolerance of crop plants.

The table 1, 2, 3 and 4 indicate the impact of PEG-6000 induced water stress on protein content at seed germination stage. The results were analysed at 6<sup>th</sup> day. The cultivar Virat showed better performance for protein content because it showed very less in reduction protein content. Initially it showed maximum amount of protein (562 mg/g DW) which was followed Vijay (442 mg/g DW), Digvijay (389 mg/g DW) and Vishal 9245 mg/g DW). Regarding protein content Vishal cultivar





showed very poor performance like carbohydrate content and which was followed by Vijay and Digvijay.

Sharma *et al.* (1990), Sarkaret *et al.* (1989) and Quartacci and Navari-Izzo (1992) also reported reduction in protein content in groundnut, pea and sunflower seedlings under PEG induced water stress respectively. Similarly Burman *et al.* (2005) noted significant decrease in soluble protein contents in clusterbean at pre-flowering stage. Deshmukh (2000), Deshmukh and Dhumal (2000), Deshmukh *et al.* (2001), Deshmukh *et al.* (2003) and Deshmukh *et al.* (2004) reported that PEG induced water stress was responsible for reducing the protein content in different cultivars of sorghum. They claimed that the decline in protein content was due to enhanced protein hydrolysis and or impaired protein synthesis under water stress condition. It was supported by Ranieriet *et al.* (1989). The increased level of some amino acids like proline and glycine betaine was ascribed to break down the protein content. According to Prakashet *et al.* (1988), Davidson and Chanvalier (1992) the reduction in protein content under water stress might be due to the reduced availability of amino acids required for protein synthesis.

#### References

1. Burman U, B. K. Garg and S. Kathju. (2005). Effect of different intensities of water stress and phosphorus application on clusterbean. National Seminar on Plant Physiology, NAU, Navsari. III-O2. 53.
2. Davidson D. J. and M. Chanvalier. (1992). Storage and remobilization of water soluble carbohydrates in stem of spring wheat. *Crop Sci.* 32: 435-447.
3. Deshmukh R. N. (2000). Biochemical changes in *Sorghum bicolor* (L.) Moench, under water stress. M. Phil. Thesis, Dept of Botany, Uni. Of Pune. (MS).
4. Deshmukh R. N. and K. N. Dhumal. (2000). Effect of PEG-6000 induced water stress on physiological attributes of drought tolerance in sorghum. National seminar on Plant Physiol. Lucknow, India. 3. 47: 69.
5. Deshmukh R. N., K. N. Dhumal and R. K. Aher. (2003). Effect of water stress on protein and proline contents in sorghum cultivars. 2<sup>nd</sup> Inter. Cong. Plant Physiol. New Delhi, India. S4-P108: 212.
6. Deshmukh R. N., S. L. Khapke and K. N. Dhumal. (2004). Biochemical changes in *Sorghum bicolor* (L.) Moench under PEG-6000 induced water stress. National seminar on Plant Physiol. Pune, India. 338: 189.
7. Deshmukh R. N., S. L. Laware and K. N. Dhumal. (2001). Metabolic alterations in *Sorghum bicolor* under water-stress. *J. Maha. Agric. Uni.* 26(1). 50-53.
8. Gill P. K., A. D. Sharma., P. Singh and S. S. Bhullar. (2002). Osmotic stress induced changes in germination, growth and soluble sugar content of *Sorghum bicolor* (L.) Moench seeds. *Bulg. J. Plant Physiol.* 28 (3-4). 12-25.
9. Lowry O. H. N. J. Rosenbrough, A. L. Farr, and R. J. Randall. (1951). Protein measurement with Folin Phenol reagent. *J. Biol. Chem.* 193: 265-275.
10. Meena R. K., T. R. Meena, R. Ganesh, A. Joshi, K. B. Shukla and P. N. Mathur. (2003). Effect of polyethylene glycol induced water stress on grain water uptake and growth of seedlings in cultivars of wheat and jowar. National Seminar on Plant Physiology held at Tirupati. S1-P5: 60.
11. Munjal R. and B. N. Dahiya. (2004). Screening of barley genotypes for drought tolerance. National Seminar on Plant Physiol. Pune, India. 354-198.
12. Prado F. E., C. Boero., M. Gallardo., and J. A. Gonzalez. (2000). Effect of NaCl on germination, growth and soluble sugar content in *Chenopodium quinoa* wild seeds. *Bot. Bull. Acad. Sin.* 41: 27-34.



## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

13. Prakash, L., M. Dutt and G. Prathapasenan. (1988). NaCl alters contents of nucleic acids, protein polyaminase and the activity of agmatine, deciminase during germination and seedling growth of rice (*Oryza sativa* L.) *J. Pl. Physiol.* 5(6), 769-776.
14. Quartacci M. F. and F. Navari-Izzo. (1992). Water stress and free radical mediated changes in sunflower seedlings. *J. Plant physio.* 139 (5), 621-625.
15. Ranieri, A., R. Bernardi, P. Lonese, and G. F. Soladati. (1989). Changes in free amino acid content and protein pattern of maize seedlings under water stress. *Environ Expt. Bot.* 29(3), 351-357.
16. Sadosivam S. and A. Manikam (1997). *Biochemical Methods*, 2<sup>nd</sup> edition, New age international Publishers: 107-108.
17. Sairam R. K. and S. Kumari. (1998). Measurements of water potential, relative water content and membrane stability. A short course on "Physiological analysis of yield in crop plants". ICAR, IARI, New Delhi, 131-137.
18. Sajjan A. S., K. N. Pawar, M. S. Dhanaieppagol and B. D. Birodar. (2004). Influence of water stress treatments on seed quality of sorghum genotypes. *Crop Res. Hissar.* 27(1), 46-49.
19. Sarkar R. K., J. P. Saini and S. D. Dube, (1989). Studies on moisture stress and associated biochemical changes in pea seedling. *Progressive Horticulture* 21 (1-2): 9-14.
20. Sharma K., G. Singh, R. Sharma. (1990). Biochemical changes in groundnut seedlings grown under polyethylene glycol induced water stress. *Environ. Ecol.* 8(3), 854-856.
21. Singh K. P. (2000). Effect of osmotic water stress on germination of wheat. *Ann. Plant Physio.* 14(1), 98-100.
22. Singh R. D., V. K. Yadav and Neelam Yadav. (1996). Effect of reducing sugars and proline on water-relation components in gram (*Cicer arictinum*) under water stress. *Indian J. Agric. Sci.* 66 (2), 119-123.
23. Udaykumar M. and T. G. Prasad. (2003). <sup>13</sup>C Isotope discrimination in plants- a potential technique to determine water-use efficiency. A training program on Application of stable isotopes to study physiological processes for crop improvement, Dec. 2003. Dept. Crop Physiol. UAS, Bangalore. 42-45.
24. Venkateswaran, B., M. Maheswari, and N. Saharan (1989). Physiological basis for the inhibition of nitrogenase activity in water stressed cowpea (*Vigna unguiculata* L. WALP). *Curr. Sci.* 58 (15), 864-865.
25. Yadav S. K., N. Jyothi, M. Maheswari, M. Vanaja and B. Venkateswarlu. (2005). Influence of water deficit at vegetative, anthesis and grain filling stages on water relation and grain yield in sorghum. *Indian J. Plant Physiol.* 10(1), 20-24.

## 17. Screening of drought tolerant wheat varieties using different indices



## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

## Screening of drought tolerant wheat varieties using different indices

Sawant.K.S<sup>1</sup>, Dr.Deshmukh.R.N<sup>2</sup>

1. Research Student, 2. Research Guide, Department of Botany and Research Centre, New Arts Commerce and Science College, Parner, Dist.-Ahmednagar (414302) Maharashtra (India)  
Email id- kalpanasawant2009@gmail.com

**Abstract**

Moisture stress is a major constraint in productivity across the wheat growing zones of India. Climate change and uneven rainfall further aggravate the situation under moisture stress environments. Wheat genotypes capable of giving increased yield under a broad range of optimal and sub-optimal water availability are considered desirable. This study was undertaken to evaluate various selection indices of moisture stress and their applicability in identifying drought tolerant wheat genotypes which can adapt to various moisture stressed environments. Seven wheat varieties (Motiya, Vijay, NI-5439, Kenphad-39, Gulab, N-59, B-288-18) were tested for moisture stress tolerance. Present investigation was carried under four water regimes i.e. 100% Field Capacity (FC), 75% FC, 50% FC and 25% FC. Results of the investigation showed highly significant difference among wheat varieties. All the studied phenotypic traits were decreased significantly under increasing water stress conditions. The superior varieties Vijay and B-288-18 which indicated maximum mean productivity (MP), geometric mean productivity (GMP) and stress tolerance index (STI) whereas stress susceptibility index (SSI) and tolerance (TOL) was observed at its lowest. These traits are recognized as beneficial drought tolerance indicators for selecting a stress tolerant variety. Similarly, total grain yield per plant, biological yield per plant and harvest index was also higher in the same wheat varieties, which put these as good candidates for selection criteria in wheat breeding program for drought resistance.

**Key words:** Genotypes, Grain yield, Moisture stress indices, Wheat

**Introduction**

Water scarcity in arid and semi-arid regions is a major concern for agricultural authorities around the world (Sharafi et al., 2011). Water stress is heterogeneous, both in time and space and highly unpredictable in nature. Undulated topography leads to uneven distribution of rainfall or irrigation water which leads to within field spatial variability owing to excess water at lower elevations and in-adequate availability of water at higher elevations (Naresh et al., 2004). The ability of wheat varieties to perform fairly well under variable water stress is an important trait for production stability under water stress conditions (Pirayvatlou, 2001). Several drought stress indices, such as stress tolerance (TOL) (Rosielle and Hamblin 1989), mean productivity (MP) (McCaig and Clarke, 1982), geometric mean productivity (GMP) (Ramirez and Kelly, 1998), stress susceptibility index (SSI) (Fischer and Maurer, 1978), stress tolerance index (STI) (Fernandez, G.C.J. 1992), have been suggested to identify varieties with better stress tolerance. Significant and positive correlation of Y<sub>pi</sub> (yield under irrigated conditions) with MP, GMP and STI have been reported. These indices are efficient in identifying high yielding cultivars under moisture stress conditions (Talebi et al., 2009) and are identified as reliable criteria to select varieties for terminal drought stress condition. Huang (2000) established mathematical relationship between stress tolerance (TOL) and stress indices (MP, SSI, GMP and STI) under various water stress regimes. It has been suggested that a larger value of TOL and SSI show relatively more sensitivity to stress, therefore, a smaller values of TOL and SSI should be favoured while selecting stress tolerant



**Stress Tolerance Index (STI):** The higher STI values caused higher stress tolerance and yield potential (Rajmani, 1994 and Rosielle and Hamblin, 1989). The highest values of STI was obtained for genotypes Vijay (2.664394), B-288-18 (2.255276), Motiya (1.206177), Kenphad 39 (0.816524), NI-5439 (0.453427), Gulab (0.387931), and N-59 (0.355832) and so were selected by this index (Fig2). Generally, STI and GMP help in identification of genotype which yields well under both stress and non stress condition.

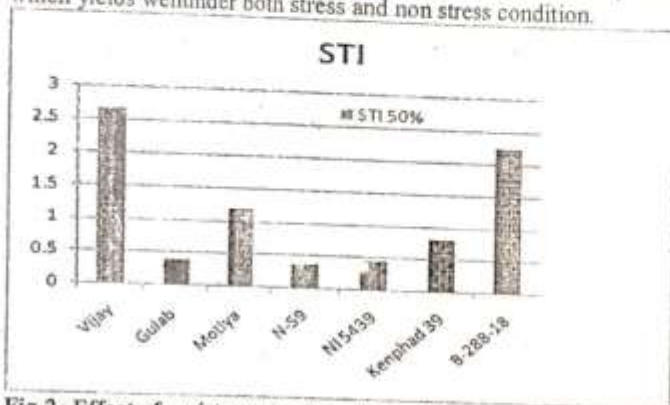


Fig.2- Effect of moisture stress on Stress Tolerance Index of wheat cultivars

**Stress Susceptibility Index (SSI):** The smaller SSI caused the greater stress tolerance (Zangi, 1998). Stress tolerance (TOL) and SSI are positively correlated ( $r=0.95$ ,  $p<0.001$ ). The genotypes NI- 5439 had the smallest SSI index (-2.21533) followed by Vijay (-2.05223), B-288-18 (-1.87654), Gulab(3.70005), Kenphad 39 (5.221777) and N-59 (8.707276) (Fig 3). so these were theselected genotypes by this index. This observation corroborated the finding of other workers who explained that varieties with an SSI of less than 1 unit are drought resistant (Ramirez & Kelly, 1998). The stress susceptibility index helps in identifying the genotype, which has less reduction in grain yield under stress conditions compared to normal condition.

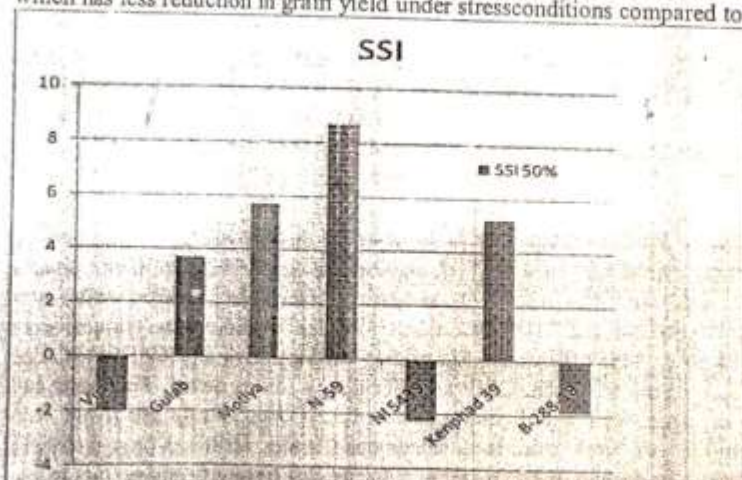


Fig.3- Effect of moisture stress on Stress Susceptibility Index of wheat cultivars



**Mean Productivity (MP):** Mean Productivity favours higher yield potential and lower stress tolerance (Zangi, 1998). Therefore, selection based on MP may not be providing genotypes with increased yield in stress conditions. Value for Vijay was the highest (4.960163) and significantly more than all other varieties followed by variety B-288-18 (4.561285) Motiya (3.505834), Kenphad-39 (2.851844), N-59 (2.210213), NI5439 (2.047188) and Gulab (1.919414)(Fig 4). Hence, these were the best genotypes based on this index. MP is based on the arithmetic means and therefore, it may have an upward bias due to a relatively larger difference between  $Y_{pi}$  and  $Y_{si}$  (Zangi, 2005).

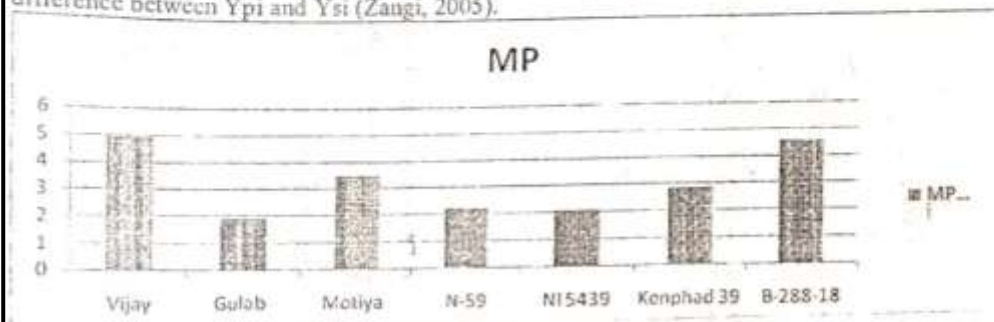


Fig.4 - Effect of moisture stress on Mean Productivity of wheat cultivars

**Geometric Mean Productivity (GMP):**

The geometric mean (GMP) is less sensitive to extreme values (Rajmani,1994). GMP values recorded were highest in variety Vijay (4.944543), B-288-18 (4.549113) whereas Motiya (3.326845) also showed significantly higher GMP compared to all other varieties i.e. Kenphad-39 (2.737231), NI5439 (2.039768), Gulab (1.886705) and N-59 (2.210213)(Fig 5). Though, the indices are mathematical expression of same variables, yet their relations with the yield are different under non stress and stress environment (Amini et al., 2012).

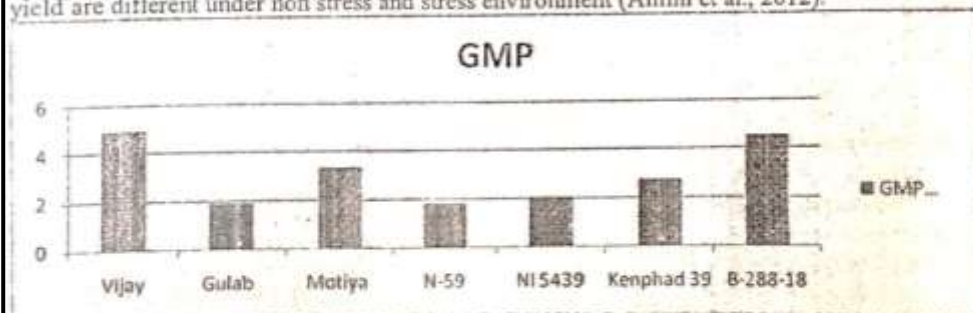


Fig.4 - Effect of moisture stress on Geometric Mean Productivity of wheat cultivars

**Conclusion**

On the basis of this study, it can be concluded that along with SI, the use of stress indices follows the order of STI, SSI, MP and GMP for selection of drought tolerant genotypes under stress conditions and they may be used to screen wheat varieties tolerant to moisture stress conditions. Conclusions of this study corroborate earlier findings of Shen et al., 2011. It is further concluded that among the tested genotypes, Vijay and B-288-18 are the



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

superior wheat genotypes with higher stress resistance and comparatively better yield potential under both irrigated and stress conditions.

References

1. Amini, A.R., Ali, S. and Mohamad, H.S. 2012. Assess the usefulness of various indices and yield potential in identifying of barley adapted to water stress. *International Journal of Agriculture and Crop Sciences*, 47:364-367
2. Anonymous. 2013. *Progress Report of the All India Coordinated Wheat & Barley Improvement Project 2012-13 Vol. 1* pp. 252
3. Azizi, C.S., Mostafaei, H., Imanparast, L. and Eivazian, M.R. 2009. Evaluation of drought tolerance in lentil advanced varieties in Ardabil region, Iran. *Journal of Food, Agriculture and Environment*, 7(3&4): 283-288
4. Defan, D., Miroslav, Z., Desimier, K., Stephen, R. K., and Gordana, S.M. 2008. Genotype x environment interaction for wheat yield in different drought stress conditions and agronomic traits suitable for selection. *Australian Journal of Agricultural Research*, 59: 536-545
5. Fernandez, G.C.J. 1992. Effective selection criteria for assessing plant stress tolerance. In: Kuo C.G. (Ed.), *Proceedings of the International Symposium on Adaptation of Vegetables and Other Food Crops in Temperature and Water Stress*, Publication, Tainan, Taiwan.
6. Fischer, R.A. and Maurer, R. 1978. Drought resistance in spring wheat cultivars. *Australian Journal of Agricultural Research*, 29:897-912
7. Huang, B. 2000. Role of root morphological and physiological characteristics in drought resistance of plants. In: Wilkinson, R. E. (ed.), *Plant-Environment Interactions*. Marcel Dekker Inc., New York, pp. 39-64
8. McCaig, T.N. and Clarke, J. M. 1982. Seasonal changes in nonstructural carbohydrate levels of wheat and oats grown in semiarid environment. *Crop Sciences*, 22: 963-970
9. Naresh, R.K., Rathore, R.S., Yadav, R.B., Singh, S.P., Misra, A.K., Kumar, V., Kumar, N., and Gupta Raj, K. 2014. Effect of precision land levelling and permanent raised bed planting on soil properties, input use efficiency, productivity and profitability under maize (Zea mays)-wheat (Triticum aestivum) cropping system. *African Journal of Agricultural Research*, 9(36): 2781-2789
10. Narkhede P. L. (1989). Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolites of rabi sorghum and soil factors controlling conservation of moisture. Ph. D. Thesis, M. P. K. V. Rahuri
11. Pirayvatlou, A.S. 2001. Relations among yield potential, drought tolerance and stability of yield in bread wheat cultivars under water deficit conditions. *Proceedings of the 10<sup>th</sup> Australian Agronomy Conference*, Hobart, January 29, 2001
12. Rajmani, A. 1994. Screening *Gossypium hirsutum* genotypes for drought tolerance. *Madras Agricultural Journal*, 81: 465-468
13. Ramirez, P. and Kelly, J. D. 1998. Traits related to drought resistance in common bean. *Euphytica*, 99: 127-136
14. Rosielle, A.A. and Hamblin, J. 1981. Theoretical aspects of selection for yield in stress and non-stress environments. *Crop Science*, 21: 943-946



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

15. Sio-Se Mardeh, A., A. Ahmadi, K. Poustini and V. Mohammadi. 2006. Evaluation of drought resistance indices under various environmental conditions. *Field Crop Research*, 98:222-229.
16. Sharafi, S., Ghosseini, G.K., Mohammadi, S., Lak, S. and Sorkhy, B. 2011. Evaluation of drought tolerance and yield potential in winter barley (*Hordeum vulgare*) varieties. *Journal of Food Agriculture and Environment*, 9: 419-422
17. Shen, Z., Ren, J., Wang, Z. and Cui, W. 2011. Effects of initial water content and irrigation frequency on soil-water dynamics under subsurface drip irrigation. *Journal of Food, Agriculture and Environment*, 9: 666-671
18. Talebi, R., Fayuz, F. and Naji, A.M. 2009. Effective selection criteria for assessing drought stress tolerance in durum wheat (*Triticum durum*). *General and Applied Plant Physiology*, 35: 64-74
19. Zangi, M.R. 1998. Drought resistance evaluation in cotton and path analysis of its effective characters. M.Sc. Thesis, Tarbiat Modares University, Iran
20. Zangi, M.R. 2005. Correlation Between Drought Resistance Indices and Cotton Yield in  
in
21. Stress and Non Stress Conditions. *Asian Journal of Plant Sciences*, 4: 106-108

**Acknowledgement**

Authors are thankful to the Principal, New Arts Commerce and Science College, Parner, for giving facilities and support and Savitribai Phule Pune University, Pune for providing the financial support for this work

## 18. Diversity of AM (Arbuscular Mycorrhizal) fungi in rhizospheric soil of wheat fields of Parner tehsil. )

I J R B A T, Vol. VI (Special Issue 2), Feb 2018 : 187-191

e-ISSN 2347 – 517X



INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)

www.ijrbat.in

### DIVERSITY OF AM (ARBUSCULAR MYCORRHIZAL) FUNGI IN RHIZOSPHERIC SOIL OF WHEAT FIELDS OF PARNER TAHSIL

**S. L. Khapke**

Department of Botany, New Arts, Commerce and Science College, Parner- 414302 (M. S.)

E-mail: [sajankhapke@gmail.com](mailto:sajankhapke@gmail.com)

#### ABSTRACT:

AM (Arbuscular mycorrhizal) fungi are important components of biodiversity in the agricultural fields in India. To study their diversity the soil samples from different localities were collected to find out abundance of specific species of mycorrhiza in rhizospheric soil and analyzed for the study of soil parameters as well as isolation of spores, microscopic observation and identification of AM spores of wheat field. AM spores were isolated, collected and quantified. Different species of *Gigaspora*, *Glomus* and *Scutellospora* were identified from soil in the present study. The *Glomus mosseae* species was dominant than other observed species of *Glomus* as well as all the species of *Gigaspora* and *Scutellospora*.

**Keywords :** AM fungi, Diversity, Wheat, Parner Tahsil

#### INTRODUCTION:

Arbuscular mycorrhizal fungi (AMF) belong to class Zygomycetiae under order Glomales. They show symbiotic association with roots of terrestrial plants belonging to approximately 80% of plant families worldwide. Remarkable work has been done in India on the distribution of AM fungi in agricultural fields, forest soil and many other horticultural fields (Kulkarni, 2007). Mycorrhizae are primarily categorized into two types, ectomycorrhiza and endomycorrhiza, based on the type of fungi involved and changes in the morphogenesis of fungi and roots (Harley and Smith, 1983). Endomycorrhiza type basically falls in three categories (Wilcox, 1991): (i) Ericaceous mycorrhizae, (ii) Orchidaceous mycorrhizae, (iii) Arbuscular mycorrhizal fungi. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Vesicles are thin-walled or thick-walled globose to subglobose, irregular shaped structures. Earlier, the name Vesicular Arbuscular Mycorrhizal (VAM) fungus was used, but since not all the groups produce vesicles, the term AMF is

preferred (Friberg, 2001). Some of the important genera of AMF are *Glomus*, *Acaulospora*, *Gigaspora*, *Scutellospora*, *Enterophospora* and *Sclerocystis*. In India, 106 species of 6 dominant genera of AMF have been reported which are more abundant in cultivated than in non-cultivated lands. They are found in all kinds of soil but more where chemical fertilizers are not used. These fungi are represented by 60 species of *Glomus*, 14 species of *Acaulospora*, 12 species of *Gigaspora*, 15 species of *Scutellospora*, 3 species of *Enterophospora*, 2 species of *Sclerocystis* (Gupta and Mukerji, 2001).

The presence of AM fungi increases the overall absorption capacity of roots, mobilization and transfer of nutrients and tolerance of roots to soil born pathogen. The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. It is evident from their effects upon soil health and host plant growth that AM fungi are an important part of sustainable agricultural systems. The general process of phosphorus uptake consists of three sub-processes; (i) absorption from soil by AMF hyphae, (ii) translocation along the hyphae from external to

187

Page 187



internal (root cortex) mycelia, (iii) the transfer of phosphate to cortical root cells (Barea, 1991). The extensive extrametrical hyphae of AMF extend out into the soil for several centimeters so that it bridges the zone of nutrient depletion.

AMF associated plants have increased nitrogen content in shoots. The hyphae of AMF have the tendency to extract nitrogen and transport it from the soil to plants. AM improves growth, nodulation and nitrogen fixation in legume-*Rhizobium* symbiosis. AMF hyphae improve nitrogen transfer in communities, since the network of AM mycelia links different plant species growing nearby and helps overlap the pool of available nutrients for these plants. AMF are able to alter plant physiological and morphological properties in a way by which plant can handle the stress (Miransari *et al.*, 2008). AM fungi facilitate better survival of plants under stress conditions through a boost up in uptake of nutrients particularly P, Zn, Cu and water. Thus AMF make the host resilient to adverse conditions created by unfavorable factors related to soil or climate. This study aims improving and understanding the distribution and diversity of AM fungi in different wheat growing fields of Parner Tahsil.

#### **MATERIALS AND METHODS**

##### **Soil analysis of different localities**

Rhizospheric soil samples were collected from four places like, Kanhur Pathar, Loni Haveli, Nighoj and Supa village of Parner tahsil, Ahmednagar district. AM fungal spores of the collected soil samples were isolated by following method.

##### **Isolation of AM spores**

A. Wet sieving and decanting method (Gerdemann and Nicolson, 1963)

Mixed 50 g of soil in 200 ml of water in a large beaker until all the soil aggregates dispersed to

form a uniform suspension. Allowed the heavier particles to settle down. Decanted most of the suspension through different sieves like 1 mm, 250 µm, 75 µm and 45 µm consecutively. Wash each sieve and collect the debris on filter paper. Most of the spores were collected from 100 µm and 75 µm sieves.

##### **B. Mass collection of VAM spores (Mertz *et al.*, 1979)**

Chemical used 30% sucrose solution. Collected soil expected to contain large number of mature spores and stored at 4°C. Wet-sieved and decanted bulk amount of soil with cold water. Collected the spore fraction with debris between 425 µm and 250 µm sieves. Removed subsequently the debris by decanting. Gently took the debris in water in wax coated (on sides) petri plates. Due to gravity, debris got settled and spores floated on the surface. Decanted the supernatant water and collected the spores in cold water. These spores were used for inoculum production.

##### **C. Estimation of VAM spores (Adholeya and Gaur, 1994)**

A filter paper (Whatman No. 1, 11 cm diameter) was taken and given a horizontal fold followed by a second vertical fold. The filter paper was opened. Two lines were drawn to divide the filter paper into four equal quadrants. Vertical lines were drawn to divide the filter paper into four equal quadrants. Vertical lines were drawn on one half on the filter paper so as to divide it into approximately twenty columns, each column about 0.5 cm. Each column was numbered and the direction of counting marked. Soil suspension was filtered and the spores were collected only on the marked surface of the filter paper and rest of the filter paper was retained without spores. This filter paper with the sample spores was spread on a bigger petri plate. Care was taken that spores

did not go off the filter paper during spreading. Spores were counted from each column under a binocular and the sum total of all columns was made given in the 'Manual for identification of VAM fungi' by Schenck and Perez (1987, 1990) as well as 'Revised Synoptic Key' of Berch and Trappe (1991). Standard transparencies of Hall and Abbott (1981) were also used in aiding identification. Photomicrographs were taken by using Magnus compound microscope and eye piece mount camera (Pearl AB-14 B).

### RESULT & DISCUSSION:

#### Diversity of AM fungi

The AM fungal species present in agricultural fields are constantly subjected to human intervention. In the present study different species of *Glomus* (*Glomus aggregatum*, *G. australe*, *G. claroides*, and *G. mosseae*); *Gigaspora* (*Gigaspora decipens* and *G. candida*) and *Scutellospora* (*Scutellospora dipapillosa*, *S. calospora* and *S. gilmorei*) were identified in the rhizospheric soil of *Triticum aestivum* collected from four different localities. The photographs of representative AM fungal species observed in rhizospheric soil are depicted in Figure 1. The *Glomus mosseae* species was dominant than other observed species of *Glomus*, as well as all the species of *Gigaspora* and *Scutellospora*.

There are about 34 different species were reported from 11 wheat growing agro-climatic regions of India (Singh and Adholeya, 2013). During the present research work under genera *Glomus*, *Gigaspora* and *Scutellospora*, only eleven AM fungal species were isolated from the rhizospheric soil samples. The possible explanation for the observed reduction in number of mycorrhizal species found may be that the cultural practices probably exert strong selective pressure on AM fungal communities. Among the observed species, *G. mosseae* is found to be dominant species. These

finding were similar to the findings of Damodaran *et al.* (2010) which reported spores of all these species present in rhizospheric soil of cotton cultivars. Recently Sarkar *et al.* (2016) identified and recorded close association of different species of *Glomus*, *Acaulospora*, *Gigaspora* and *Scutellospora* with the roots of *Citrus* plant.

#### ACKNOWLEDGEMENTS:

I am thankful to Dr. R. K. Aher, Principal, New Arts, Commerce and Science College, Parner for rendering necessary guidance.

#### REFERENCES

- Adholeya, A. & Gaur, A. (1994). Estimation of VAM spores in soil: a modified method. *Mycorrhiza News*.6 (1):10-11.
- Barea, J. M. (1991). Vesicular-arbuscular mycorrhizae as modifiers of soil fertility. *Adv. Soil Sci.* 15:1-40.
- Berch, S. M. & Trappe, J. M. (1991). Revision of Trape's 1982. *Synoptic keys to Genera and species of Endogonaceae*. pp.1-30.
- Damodaran, P. N., Udaiyan, K. & Jee, H. J. (2010). Biochemical changes in cotton plants by Arbuscular Mycorrhizal colonization. *Res.Biotech.*1:6-14.
- Friberg, S. (2001). Distribution and diversity of Arbuscular mycorrhizal fungi in traditional agriculture on Niger Inland delta, Mali, West Africa. *CBN Skriftserie*.3:53-80.
- Gerdemann, J.W. & Nicolson, T. H. (1963). Spores of mycorrhizal *Endogone* species extracted from soil by wet sieving and decanting. *Transactions of British Mycological Society*. 46: 235-244.
- Gupta, R. & Mukerji, K. G. (2001). Microbial technology. A.P.H. Publishing Crop, New Delhi. pp: 233.
- Hall, I. R. & Abott, L. K. (1981). Photographic slide collection illustrating features of the Endogonaceae. Ed. 3, Plus 400 colour transparencies. *Invermay Agric. Res. Center and Soil Science Department, University of W. Australia*.pp: 1-27.

- Harely, J. L. & Smith, S.E. (1983). *Mycorrhiza Symbiosis*, Academic Press, London, pp: 483.
- Kulkarni,P.(2007). Arbuscular Mycorrhizal(AM) Association and diversity with some weeds of cultivated field. *Adv.in Plant Sci.*, 22 (2):349-351.
- Mertz S.M., Heithaus J.J. and Bush R.L. (1979): Mass production of axenic spores of the endomycorrhizal fungus *Gigaspora margarita*. *Trans. Br. Mycol. Soc.* 72:167-169.
- Miransari, M., Bahrami, H. A., Rejali, F. & Malakouti, M. J. (2008). Using arbuscular mycorrhiza to alleviate the stress of soil compaction on wheat (*Triticum aestivum* L.) growth. *Soil Biol. and Biochem.* 40(5):1197-1206.
- Sarkar, J., Ray, A., Chakraborty, B. & Chakraborty, U. (2016). Antioxidative changes in *Citrus reticulata* L. induced by drought stress and its effect on root colonization by arbuscular mycorrhizal fungi. *Euro.Jr.Bio. Res.* 6(1):1-13.
- Schenck, N.C. & Perez, Y. (1987). Manual for the identification of VA-mycorrhizal fungi. *Univ. of Florida, Gainesville, pp:* 1-245.
- Schenck, N. C. & Perez, Y. (1990). Manual for the identification of VA mycorrhizal fungi. *Third edition, IN VAM, Synergistic Publications, Gainesville, USA.*
- Singh, R. & Adholeya, A. (2013). Diversity of AM (Arbuscular mycorrhizal) Fungi in Wheat Agro-climatic Regions of India, *Virol Mycol.* 2(2):1-9.
- Wilcox, H. (1991). *Mycorrhizae*. In: Y. Waisel, A. Eshel and U.Kafkati (Eds.), *The Plant Root: The Hidden Half*, Marcel Dekker, New York. 731-765.

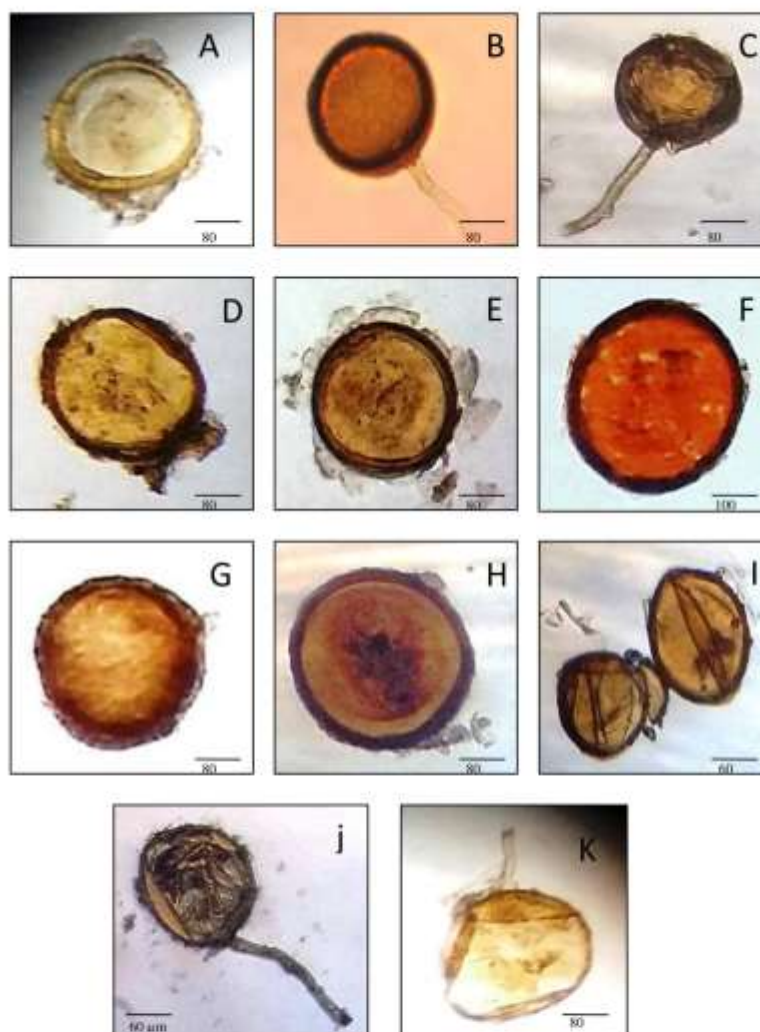



Figure 1: Representative of AM fungal species observed in rhizospheric soil. (A) *Glomus australe*; (B) *Glomus mosseae*; (C) *Glomus aggregatum*; (D) *Glomus* spp. (E) *Glomus claroides*; (F) *Gigaspra* spp.; (G) *Gigaspora decipens*; (H) *Gigaspora candida*; (I) *Scutellospora dipapillosa*; (J) *Scutellospora calospora*; (K) *Scutellospora glmorei*.

## 19. Mycorrhizal influence on RWC, MSI and Lipid Peroxidation in wheat (*Triticum aestivum* L.)



**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

---

**Mycorrhizal influence on RWC, MSI and Lipid Peroxidation in wheat (*Triticum aestivum* L.)**

**S. L. Khapke**  
Dept. of Botany, New Arts, Commerce and Science College, Parner -414302 (M. S.)  
E-mail: sajankhapke@gmail.com

---

**ABSTRACT**  
*The present study was aimed to determine the influence of an arbuscular mycorrhizal fungus (*Glomus mosseae*) on Physiological and biochemical changes in wheat (*Triticum aestivum* L.) at seedling and anthesis stage. The pot culture experiment was carried out in three replications by using four treatments as 25g, 50g, 75g and 100g of mycorrhizal soil along with control. Relative water content (RWC), Membrane stability index (MSI) and Lipid peroxidation was assessed during study. Results obtained clearly indicated that, increase in mycorrhizal treatment show enhancement in RWC and MSI over control at seedling and anthesis stage. RWC and MSI were recorded more in anthesis stage than seedling stage. Lipid peroxidation was decreased in all mycorrhizal soil treatment as compare to control.*  
**Key words:** - AM fungi, *Triticum aestivum*, RWC, MSI, Lipid peroxidation.

---

**Introduction**  
Wheat (*Triticum aestivum* L.) is the second most important cereal just after rice. It is eaten in various forms by more than one thousand million human beings in the world. In India it is second important staple food crop, which contain a high percentage of carbohydrates and proteins. Arbuscular mycorrhizal fungi (AMF) belong to class Zygomycetae under order Glomales. They show symbiotic association with roots of terrestrial plants belonging to approximately 80% of plant families worldwide. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Many thousands of experiments have shown that AMF can overcome nutrient limitation to plant growth by enhancing nutrient acquisition [1]. The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. AMF are able to alter plant physiological and morphological properties in a way by which plant can handle the stress [2]. The AMF association improves the hydraulic conductivity of the roots and improves water uptake by the plants or they alters the plant physiology to reduce the stress response to soil drought [3]. The inoculation of AM fungi improves the physico-chemical and biochemical properties of amended soil [4]. Arbuscular mycorrhizal fungi are important in sustainable agriculture because they improve plant water relations and thus increase the drought resistance of host plants, they improve disease resistance and increase mineral uptake by increased acquisition of phosphorus and other low mobile mineral nutrients, which reduce the use of fertilizers.

**Material and Methods**  
The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

**Mycorrhizal fungus inoculum**  
The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil (1:1 v/v) mixture [5]. After 90 days under green house conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

---

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com) Page No: 98



#### Experimental design for AM fungi

The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (16.5kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Plants were watered as required.

#### Analysis of physiological and biochemical parameters

The methodology used for such analyses is briefly described below.

##### Measurement of Relative Water Content (RWC)

The leaf samples were cut in to small discs of uniform size using leaf punch. Twenty-five such discs were weighed to obtain fresh weight. Then these discs were suspended in distilled water for four hours. Then the water was poured out carefully saving the discs. These discs were surface blotted rapidly and the turgid weight was recorded. These discs were placed in an oven at  $60 \pm 5^\circ\text{C}$  for about 72 hours to get dry weight. The relative water content was determined by using the formula given by [6]. RWC was determined with the formula given below,

$$\text{RWC (\%)} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{Dry weight}} \times 100$$

##### Membrane Stability Index (MSI)

Leaf membrane stability index (MSI) was determined according to the method of [7]. Leaf discs (0.2g) of control and stressed plants were thoroughly washed in running tap water and double distilled water, were placed in 20 ml of doubled distilled water at  $40^\circ\text{C}$  for 30 min, after that their electrical conductivity was recorded by conductivity bridge ( $C_1$ ). Subsequently the same samples were placed in boiling water bath ( $100^\circ\text{C}$ ) for 10 min, and their electrical conductivity was recorded as ( $C_2$ ). Leaf membrane stability index (MSI) was calculated as:  $\text{MSI} = [1 - C_1 / C_2] \times 100$   
 $C_1$  = Electrical Conductivity 1;  $C_2$  = Electrical Conductivity 2

##### Lipid Peroxidation

The level of lipid peroxidation was measured in terms of malondialdehyde (MDA) content, a product of lipid peroxidation by following the method of [8]. The leaf sample (2.0 g) was homogenized in 10ml of 5% trichloro acetic acid (TCA). The homogenate was centrifuged at 15000 g for 10 min. To the 2.0 ml of supernatant, 4.0 ml of 0.5% thiobarbituric acid (prepared in 20% TCA) was added. The mixture was heated at  $95^\circ\text{C}$  for 30 min, and then quickly cooled in ice bath. It was centrifuged at 1000 g for 10 min, and the supernatant was used to record the absorbance at 532 nm. The value for non-specific absorbance at 600 nm was subtracted from this value and then the MDA content was calculated using its extinction coefficient of  $155 \text{ mM}^{-1} \text{ cm}^{-1}$  and expressed as  $\mu\text{mol MDA per gram fresh weight}$ .

##### Statistical analysis

The data obtained from yield and biochemical parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients [9]. CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.



### Results and Discussion

**Table 1:** Effect of AM fungi on Relative Water Content, Membrane Stability Index and Lipid Peroxidation in leaves of wheat at seedling and anthesis stage.

AM (gm)	Soil	Relative water Content (%)		Membrane Stability Index (%)		Lipid (µmole F.W.)	Peroxidation MDA g <sup>-1</sup>
		Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage	Seedling Stage	Anthesis Stage
Control		85.75	82.60	48.79	78.10	2.19	3.06
25		86.01	82.94	49.12	78.48	2.01	2.90
50		86.55	83.33	53.08	79.10	1.78	2.58
75		87.17	84.09	56.25	80.87	1.45	1.98
100		88.72	85.43	58.67	82.17	1.12	1.66
SE		0.53	0.50	1.94	0.47	0.19	0.27
CD at 5%		1.47	1.40	5.40	2.14	0.54	0.74

#### Effect of mycorrhizal treatment on relative water content (RWC)

In the present study we evaluate the effect of mycorrhiza on wheat plant and observed that the percentage of relative water content was more in mycorrhiza treated wheat plant than non treated plants. The obtained results clearly indicate that, the percentage of relative water content increased with increasing mycorrhizal treatment to wheat plant at seedling and anthesis stage. The highest relative water content (88.72 and 85.43%) was recorded in plants treated with 100 gm mycorrhizal soil than control at seedling and anthesis stage respectively (Table 1). Similar results were reported by various researchers. Recently [10] reported that inoculated wheat cultivars showed higher amounts of RWC (74.3%) compared to non inoculated (70.5%) wheat cultivars. Previously, [11] reported that RWC of *Citrus* was increased by AM colonization. Previously, [12] stated that, RWC was higher in all mycorrhizal infected *Vigna radiata* plants than non mycorrhizal plants.

#### Effect of mycorrhizal treatment on Membrane Stability Index (MSI)

The effect of mycorrhizal treatments on wheat plant was assessed on the basis of MSI against control. All mycorrhizal treatments showed increasing effect on membrane stability index compare to control at seedling stage and anthesis stage. The membrane stability index was increased significantly along with increase in mycorrhizal treatment. The highest membrane stability index (58.67 and 82.17%) was recorded in 100 gm mycorrhizal treated plants compare to control plants (48.79 % and 78.10%) at seedling stage and anthesis stage respectively (Table 1). The results confirmed that AM plants have higher electrolyte concentration than non mycorrhizal plants which is attributed to improvement integrity and stability of the membrane [13]. In agreement to the results of present study, [14] reported that the cell membrane stability in mycorrhizal maize plants were higher than non-mycorrhizal plants.

#### Effect of mycorrhizal treatment on lipid peroxidation

The degree of lipid peroxidation measured in terms of malondialdehyde (MDA) content is one of the determinants which indicate the severity of stress experienced by any plant. Alteration of membrane phospholipids through lipid peroxidation is considered to be one of the primary key events in oxidative damages. The present work reveals that, mycorrhizal soil treated plants contained low level of lipid peroxidation than non-mycorrhizal plants (control) at seedling as well as anthesis stage. The amount of lipid peroxidation content was slightly decreased with increase in



amount of mycorrhizal soil (25, 50, 75 and 100 gm) treatment and it was recorded minimum i.e. 1.12 and 1.66  $\mu\text{mole/gm}$  FW in 100 gm mycorrhizal soil treatment over control (2.19 and 3.06  $\mu\text{mole/gm}$  fresh weight) at seedling and anthesis stage respectively (Table 1). Our results are in agreement to the reports of [15] which reported decrease in MDA content in AM maize plants compared to non AM plants. It suggested that AM symbiosis reduced the loss of membrane permeability and alleviated the oxidative damage by drought stress. In tune with this, [16] reported that the MDA content in mycorrhizal soybean plants remained lower than in non mycorrhizal plants.

#### Conclusion

From the present study it is concluded that, the inoculation of AM fungi (*Glomus mosseae*) in wheat (*Triticum aestivum* L.) enhanced the physiological changes like relative water content and membrane stability index but the amount of lipid peroxidation content was slightly decreased with increase in amount of mycorrhizal soil. The changes may be due to enhance most of water uptake and nutrient absorption, especially P from the soil, which may be due to AM fungus, since AM hyphae extend beyond the root hair zone increase the absorptive surface of the host.

#### References

1. Clark R.B. and Zeto S.K. (2000): Mineral acquisition by arbuscular mycorrhizal plants. *J. Plant Nutr.* **23**:867-902.
2. Miransari M., Bahrami H.A., Rejali F. and Malakouti M.J. (2008): Using arbuscular mycorrhiza to alleviate the stress of soil compaction on wheat (*Triticum aestivum* L.) growth. *Soil Biol. and Biochem.* **40**(5):1197-1206.
3. Safir G.R and Nelson C.E. (1985): VA-mycorrhizas plant and fungal water relations. In: *Proc 6th North. Am. Conf. on Mycorrhiza*, (Eds.) R. Molina, Corvallis: 471.
4. CARAVACA, F., ALGUACIL, M.M., AZCON, R., DIAZ, G. AND ROLDAN, A. (2004). Comparing the effectiveness of mycorrhizal inoculation and amendment with sugar beet, rock-phosphate and *Aspergillus niger* to enhance field performance of the leguminous shrub *Dorycnium pentaphyllum* L. *Appl. Soil Ecol.* **25**, 169-180.
5. Sylvia D. M. (1994): Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2-microbiological and Biochemical Properties*, 351-378.
6. Barrs H.D. and Weatherley P.E. (1962): A re-examination of the relative turgidity technique for estimation of water deficits in leaves. *Aust. J. Biol. Sci.* **15**:413-428.
7. Deshmukh P.S., Sairam R.K., and Shukla D.S. (1991): Measurement of ion leakage as a screening technique for drought resistance in wheat genotype. *Indian J. Plant Physiol.* **34**:89-91.
8. Heath R.L. and Packer L. (1968): Photoperoxidation in isolated chloroplast. I. Kinetics and stoichiometry of fatty acid peroxidation. *Arch. Biochem. Biophys.* **125**: 189-198.
9. Snedecor C.W. and Cochran W.G. (1980): *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press.
10. Ghoochani R., Riasat M., Rahimi S. and Rahmani A. (2015): Biochemical and physiological characteristics changes of wheat cultivars under arbuscular mycorrhizal symbiosis and salinity stress biological forum. *An In. J.* **7** (2): 370-378.
11. Wu Q. S., Zou Y. N., Xia R. X. and Wang M. Y. (2007): Five *Glomus* species affect water relations of *Citrus tangerine* during drought stress, *Botanical Studies* **48**:147-154.
12. Prabhu D., Shankar T., Sathyavathe V. and Senkaralingam S. (2013): Influence of arbuscular mycorrhizal fungi on the growth of green gram (*vignaradiata* L.) grown under water stress conditions. *World Appl. Sci. J.* **25** (4):561-567.





13. Kaya C., Ashraf M., Sonmez O., Aydemir S., Tuna A.L., and Cullu M.A. (2009): *The influence of arbuscular mycorrhizal colonisation on key growth parameters and fruit yield of pepper plants grown at high salinity. Scientia Horticulturae. 121 (1):1-6.*
14. Naghashzadeh Mohammadreza (2014): *Response of Relative Water Content and Cell Membrane Stability to Mycorrhizal Biofertilizer in Maize. Elec. Jr. Bio. 10(3): 68-72.*
15. Zhu X., Song F. and Liu S. (2011): *Arbuscular mycorrhiza impacts on drought stress of maize plants by lipid peroxidation, proline content and activity of antioxidant system. Jr. of Food, Agri. & Enir. 9(2):583-587.*
16. Taherianfar A., Tohidi Moghadam H.R. and Zahedi H. (2013): *Effect of cattle manure and mycorrhiza applications on physiological and biochemical changes in soybean (Glycine max (L.) Merr.) grown under water deficit stress. Revista Cientifica UDO Agricola. 13(1):85-92.*

**20. Characterization of wheat (*Triticum aestivum* L.) under water stress conditions.**

AMIERJ

ISSN-2278-5655

Volume-VII, Special Issue-XV,

April, 2018

**CHARACTERIZATION OF WHEAT (*TRITICUM AESTIVUM* L.)  
UNDER WATER STRESS CONDITIONS****S. L. KHAPKE**

Department of Botany,

New Arts, Commerce and Science College, Parner -414302 (M. S.)

E-mail : sajankhapke@gmail.com

**ABSTRACT :** A study was conducted to characterize the morphological and biochemical parameters in wheat during FC (Field Capacity) percent treatment at the seedling and anthesis stage. Wheat cultivar (var.496) was subjected to water stress (FC) percent treatment in pot culture. The study revealed that root length, shoot length, plant height, stem girth, number of leaves and leaf area decreased with increasing water stress at seedling and anthesis stage in the wheat. The concentration of proline increased significantly with an increase in the degree of water stress. Similarly phenolic contents also increased along with increased water stress level. However, photosynthetic pigments were highly reduced with increasing water stress at seedling and anthesis stage.

**Key words:** wheat, water stress, growth study, proline, phenol and chlorophyll.

**INTRODUCTION**

Wheat (*Triticum aestivum* L.), a member of family poaceae, is an important cereal for staple food. It plays an important role in human nutrition and agriculture economy of country. Food security in the world is challenged by increasing food demand and threatened by declining water availability (Zwart and Bastiaanssen 2004). Water deficit is considered to be among the most severe environmental stresses and the major constraint on plant productivity: losses in crop yield due to water stress probably exceed the loss from all other causes combined. The deficit has an evident effect on plant growth that depends on both severity and duration of the stress (Araus et al. 2002; Bartel and Souer 2004). The ability of a cultivar to produce high and satisfactory yield over a wide range of stress and non-stress environments is very important (Ahmad et al. 2003). Reduction in soil moisture affects plant metabolism, resulting in reduced growth, principally due to development of low osmotic pressure in the roots and leaves. Shangguan and Chen (1991) reported inhibition in leaf elongation and leaf area in wheat under water stress. Shah et al. (2004) reported that soil moisture stress as a major constrain limiting all the morphophysiological, biochemical and yield attributing

EduIndex Impact Factor 5.18 UGC Approved Journal No 48178, 48818

Aarhat Multidisciplinary International Education Research Journal (AMIERJ)

Page 58

parameters. In wheat the chlorophyll content decreased with increasing water stress in all the cultivars (Sairam and Saxena 2000). Gharti- Chhetri and Lales (1990) showed that in wheat cultivars leaf proline increased as drought progressed. The increase in polyphenols under stress may be due to triggered metabolism of shikimic acid pathway (Madhukar and Reddy, 1991). Therefore, an attempt was made to study the effect of water stress on plant growth, chlorophyll pigments, proline and phenolic contents in wheat.

#### MATERIALS AND METHODS

A pot experiment was carried out in the Department of Botany and Research Centre, New Arts, Commerce and Science College, Ahmednagar (Maharashtra) to study the effect of water stress on wheat. The seeds of *Triticum aestivum* L. var. 496 used as an experimental plant. Healthy seeds of wheat were taken, surface sterilized with 0.1% HgCl<sub>2</sub>, washed with distilled water for 3-4 times and seeds were soaked in the distilled water for 4 hours. Fifteen seeds were sown in each pot.

The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture regimes e.g. 100% FC, 80% FC, 60% FC, 40% FC, and 20% FC. For making different moisture regimes gravimetric method described by Narkhede (1989) was followed with some modifications. For which garden soil was used after determining its water holding capacity. Plastic buckets each of 30x30x27 cm size were filled with garden soil. The weight of each bucket was recorded every day in the morning and the loss of water (moisture) under different moisture regimes was replenished by adding an equal quantity of water. The growth parameters were recorded at seedling and anthesis stage. Chlorophyll pigments were extracted and estimated by Arnon's (1949) method. Proline was estimated by using Bates et al. (1973) method. Total contents of phenols were estimated by method of Farkas and Kiraly, (1962).

#### RESULTS AND DISCUSSION

The effect of different levels of FC% (moisture stress) on root and shoot length was tabulated in Table 1 clearly showed that root and shoot length was decreased with decreasing FC% from 80 to 20. The maximum decrease in root length was noted (1.2 and 2.5 cm) respectively in seedling and anthesis stage at 20% FC. At higher water stress level the cultivar showed maximum reduction in shoot length. The results recorded in Table 1 indicated very clearly that plant height and stem girth goes on decreasing with increase in

stress level. The maximum reduction in plant height and stem girth was noted at 20% FC at seedling and anthesis stage.

The effect of different levels of moisture stress on number of leaves and leaf area at seedling and anthesis stage was tabulated in Table 1. The results clearly showed that with increase in water stress, number of leaves per plant were decreased. The maximum reduction in leaf number was recorded at 20% FC. The maximum decrease in LA per plant Table 1 at seedling and anthesis stage was recorded. Under water stress conditions the total chlorophyll content of leaves decreased (Table 2). The lowest (0.76 mg/g fw) chlorophyll content was observed in 20% FC at seedling stage. Similar results of decreased chlorophyll content under moisture stress were also reported by Reddy et al. (2007) in rice genotype.

The water stress enhanced proline content in leaves. The highest proline content was observed in the cultivar under 20% FC (Table 2) at seedling and anthesis stage. Similar trend about the accumulation of proline during PEG induced water stress in different cultivars of rice was reported by Das and Kalita (2010). The effects of different levels of FC at seedling and anthesis stage on polyphenol content of wheat were tabulated in Table 2. The maximum increase in phenols was noted at 20% FC both at seedling and anthesis stage. Madhukar and Reddy (1991) attributed the increase in phenolic content under water stress to the triggered metabolism of shikimic acid pathway for phenol synthesis.

#### ACKNOWLEDGEMENT

The author is thankful to Dr. R. K. Aher, Principal, New Arts, Commerce and Science College, Parner for continuous encouragement and support.

#### REFERENCES

1. Ahmad, M., Mohammed, F., Maqbool, K., Azamand, A. and Iqbal, S. (2003). Genetic variability and traits correlation in wheat. *Sarhad J. Agril.* **19(3)**:347-351.
2. Araus, J. L., Slafer, G. A., Reynolds, M. P. and Royo, C. (2002). Plant breeding and water relation in C3 cereals: What to breed for? *Annals of Botany (London)*, **89**: 925-940.
3. Arnon, D. I. (1949). Copper enzymes in isolated chloroplasts polyphenol oxidase in *Beta vulgaris*. *Plant Physiol.* **24**:1-15.
4. Bartel, D. and Souer, E. (2004). Molecular responses of higher plants to dehydration. In: *Plant Responses to Abiotic Stress* (eds. Hirt H and Shinozaki K), pp. 9-38. Springer-Verlag, Berlin and Heidelberg, Germany.

5. Bates, L. S., R. P. Waldren, and I. D. Teare. (1973). Rapid determination of free proline for water stress study. *Pl. Physiol.* 39:205-207.
6. Das, R. and Kalita, P. (2010). Characterization of some upland rice cultivars under moisture stress condition. *Indian J. Plant Physiol.* 15:54-60.
7. Farkas, G. L. and Z. Kiraly. (1962). Role of phenolic compounds in the physiology of plant disease and disease resistance. *Phytopathol.* 44:105-150.
8. Gharti- Chhetri G. B. and J. S. Lales. (1990). Biochemical and physiological responses of nine spring wheat (*Triticum aestivum*) cultivars to drought stress at reproductive stage in the tropics. *Bel. J. Bot.* 123(1-2): 27-35.
9. Madhukar, J. and S. M. Reddy. (1991). Biochemical changes in guava fruits due to the infection by two pathogenic fungi. *Indian J. Mycol. Plant Pathol.* 21:179-182.
10. Narkhede, P. L. (1989). Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolites of rabi sorghum and soil factors controlling conservation of moisture. Ph.D. Thesis, M.P.K.V.Rahuri.
11. Reddy, A. M. Shankhdhar D. and Shankhdhar, S. C. (2007). Physiological characterization of rice genotypes under periodic water stress. *Indian J. Plant Physiol.* 12:189-193.
12. Sairam, R.K. and D. C. Saxena. (2000). Oxidative stress and antioxidants in wheat genotypes: possible mechanism of water stress tolerance. *J. Agro. Crop. Sci.* 184: 55-61.
13. Shah, R. A., A. Ghule and M. I. Khan. (2004). Morphophysiological and biochemical traits and their association with sink potential of chickpea (*Cicer arietinum* L.) in two different moisture regimes. National Seminar on Plant Physiol. Pune, India. pp. 193-197.
14. Shangguan, Z. P. and B. Y. Chen. (1991). Growth and physiological responses to soil drought in wheat. *Shaanxi J. Agri. Sci.* 1: 8-9.
15. Zwart, S. J. and Bastiaanssen, W. G. M. (2004). Review of measured crop water productivity values for irrigated wheat, rice, cotton and maize. *Agricultural Water Management.* 69:115-133.

## 21. Diversity of family malvaceae from parner tehsil of ahmednagar district, maharashtra (India).

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

### STUDIES ON EFFECT OF SALT STRESS ON SEED GERMINATION IN BRINJAL (*SOLANUM MELONGENA* L.)

MAHESH JADHAV AND TUSHAR CHIKANE

New Arts Commerce And Sci. College, Parner,  
Ahmednagar, (MS) 414307  
E-mail: jadhavmahesh24@gmail.com  
tusharchikane707@gmail.com

#### ABSTRACT

In the present study deals with the Brinjal or eggplant (*Solanum melongena* L.) was selected for seed germination in in vitro condition and also the biochemical studies were carried under different salinity levels. The different concentration of NaCl levels, i.e. 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100mM was applied per Petri dish and all the observations were recorded on the 21st day after germination were used in the mature seeds. The salt stress significantly influenced the germination percentage was reduced gradually with increasing salt stress from 10 to 100 mM NaCl. The rate of proline accumulation was observed much higher (205.4 mg/g) at 100 mM NaCl stress as compared to control (70.15mg/g). A continuous decrease in protein content with increase in salt stress was observed where around 64% reduction was observed in plants under 100 mM NaCl stress as compared to the control plants. The starch content was higher in control (617.2) than sample (345.5) with salt stress. Among this study investigated that the overall showed better tolerance to salt stress with a lesser extent of antagonistic effect of NaCl on germination and biomass production at seedling stage.

Figure: 00

References: 10

Table: 00

Key words: Salt stress, Seed germination, *Solanum melongena* L., Proline

#### Introduction

Brinjal is one of the most important world food crops, serving as the staple food for world's population. It is one of the most widely grown crops in coastal areas frequently inundated with saline sea water during high tidal period (Mori and Kawashita, 1987). Salinity is considered as one of important physical factors influencing brinjal production. At the present, salinity is the second most widespread soil problem in brinjal growing countries after drought and is considered as a serious constraint to increased brinjal production worldwide (Gregorio, 1997). There exists tremendous variation for salt tolerance within species in brinjal, providing opportunities to improve crop salt-stress tolerance through genetic means. Various abiotic stresses including high or low temperature, water scarcity, high salinity and heavy metals exert drastic antagonistic effects on crop metabolism and thereby plant growth, development and ultimately crop productivity. Amongst these, soil salinity is a major factor

limiting the crop production globally (Duan *et al.*, 2010). Soil salinity affects large areas of the world cultivated land causing serious reductions in crop yield (Cevakkol *et al.*, 2011). In Asia alone, 21.5 million ha of land area is thought to be salt-affected, with India having 8.6 million ha of such area which constitutes a major part of problem soil in India (Sahu *et al.*, 2006). However, improvement in salt tolerance of crop plants remains elusive, due to the fact that salt affects almost every the physiological and biochemical of plants at both whole plant and cellular levels.

Generally, soil salinity affects plants through osmotic effects, ion toxicity and oxidative stress. (Pitman and Soole, 2002). In India and especially in coastal fields of Tamil Nadu state, soil salinity is a major stress that reduces the crop productivity to a great extent (Gnanaprakasam, 2008).

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

199

Salinity is detrimental to the various processes of crops such as seed germination, seedling growth and vigor, vegetative growth, flowering and fruit set and ultimately it causes diminished economic yield and also quality of produce (Saram and Tyagi 2004).

In response, plants have developed number of mechanisms to counteract high salt stress such as mineral ions homeostasis and accumulation of compatible solutes such as proline. Moreover, salt stress responses of plants may depend upon salt type, concentration, and genotype.

#### Materials and Methods

##### Collection of seeds:

Certified seeds were collected from local market of Ahmednagar, Maharashtra, India.

##### Salt treatments:

The experiment was conducted in laboratory at the room temperature. Every day 5 ml of distilled water (with or without varying NaCl levels, i.e. 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100mM) was applied per Petri dish and all the observations were recorded on the 21st day after germination. The physiological and biochemical studies were carried under the different salinity levels and all the experiments were carried out in triplicate.

##### Plant growth analysis:

Total germination was expressed as a percentage of the control for each variety. The germination percentage, root length, shoot length, and root shoot ratio of seedling were recorded on the 21st day of germination.

##### Biochemical analysis

##### Determination of proline content:

Free proline content was estimated by following the method of Bates *et al.* (1973).

##### Determination of total protein content:

Proteins were estimated using Lowry *et al.* (1951) method.

##### Determination of reducing and non-reducing sugar levels:

Reducing sugars were estimated using Fehling's solution (DNSA) reagent by following the method of Miller (1972).

##### Determination of Chlorophylls:

Chlorophyll was estimated by Arnon's method (1949).

##### Determination of Superoxide Dismutase:

Employed at Worthington is essentially that of Worthington *et al.* (1973) and is based on the ability of SOD to inhibit the reduction of nitro-blue tetrazolium by superoxide. One unit is defined as that amount of enzyme causing half the maximum inhibition of NBT reduction. The reaction viscosity will depend largely on somewhat variable assay condition such as light intensity and reaction temperature. Activity of SOD has been determined in two ways: Inhibition by enzyme of a O<sub>2</sub>-dependent reaction

a Pulse radiolytic method (Ragoer *et al.*, 1975)

##### Statistical analysis:

Each Petri dish was considered as replicate and all the treatments were repeated three times and data are expressed as mean and standard error (S.E.). All the statistical analyses were done using SPSS statistical software package.

##### Results and Discussion

In the present study the efficiency of seed germination in *Solanum melongena* L. under the different salt concentration. Results of the previous studies by Kumar *et al.* (2009) demonstrated that the salt tolerant cultivars produce greater biomass than salt sensitive mungbean and rice cultivars respectively when irrigated with NaCl dominated waters. Rapid accumulation of free proline is a typical response to salt stress. Similar responses were observed in the present investigation and salinity stress resulted into a sharp increase in proline content irrespective of the cultivars. In control plants the proline content was almost similar in both the varieties, however, as the magnitude of salinity stress increased, the rate of proline accumulation was observed much higher in (705% of control) and at 100mM NaCl stress. When exposed to high salt content in soil, many plants have been observed to accumulate high amounts of proline, in some

Table 4. Effects of different concentration of NaCl on Reducing and Non-reducing sugar content in *Solanum melongena* L.

Sr. No.	NaCl stress (mM)	Reducing sugar content (µg/g FW)	Non-reducing sugar content (µg/g FW)
1	Control	122.47±0.7	125.13±0.7
2	10	134.77±0.7	124.70±0.8
3	20	144.37±1.0	117.67±0.5
4	30	154.47±0.9	114.13±0.5
5	40	163.70±0.7	106.10±0.4
6	50	171.07±0.9	105.20±0.4
7	60	183.23±0.5	95.90±0.7
8	70	192.70±0.6	84.80±0.6
9	80	207.03±0.5	76.67±0.5
10	90	215.23±0.8	72.77±0.5
11	100	222.47±1.0	70.90±0.7

Table 5. Effects of different concentration of NaCl stress on chlorophyll content in *Solanum melongena* L.

Sr. No.	NaCl stress (µM)	Chl-a (µg/g FW)	Chl-b (µg/g FW)	Total Chlorophyll (µg/g FW)
1	Control	415.67±0.16	259.33±0.30	681.33±0.5
2	10	401.00±0.16	255.33±0.30	662.67±1.1
3	20	336.67±0.18	225.00±0.29	561.00±0.1
4	30	273.67±0.29	172.33±0.26	445.67±0.3
5	40	234.67±0.29	177.00±0.48	426.00±0.3
6	50	215.00±0.19	174.67±0.69	387.00±0.2
7	60	182.67±0.49	146.67±0.31	333.00±0.1

Table 6: Effects of different concentration of NaCl stress in SOD activity *Solanum melongena* L.

Sr. No.	NaCl stress (mM)	SOD activity (Units/min/mg)
1	Control	1.59
2	10	1.59
3	20	1.59
4	30	1.59
5	40	1.90
6	50	1.90
7	60	1.90
8	70	1.90
9	80	1.90
10	90	1.92
11	100	1.92

CONCLUSION

From the results obtained in the present investigation, I conclude that overall showed better tolerance to salt stress with a lesser extent of antagonistic effect of NaCl on germination and biomass production at seedling stage. In addition showed higher proline, protein content, less Chlorophyll, Non-reducing sugar levels under varying salt stress condition and all these biochemical parameters might have played an important role in its salt tolerance nature.



FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

#### References

1. ABDULLAH, Z., KHAN, M. A. and FLOWERS, T. J. (2001) Causes of sterility in seed set of rice under salinity stress. *J Agron Crop Sci* **167**:25–32
2. ABROL, I. P., YADAV, J. S. P and MASSOUD, F. I. (1988) Salt-affected soils and their management. *FAO Soils Bulletin* 39, Food and Agriculture Organization of the United Nations, Rome, Italy
3. AQUINO, G. (2007) Principles of plant genetics and breeding. Blackwell Oxford, p 385
4. AFZAL, I., BASRA, S and IQBAL, A. (2005) The effect of seed soaking with plant growth regulators on seedling vigor of wheat under salinity stress. *J Stress Physiol Biochem* **1**:6–14
5. BHATNAGAR-MATHUR, P., VADEZ, V. and SHARMA, K. K. (2008) Transgenic approaches for abiotic stress tolerance in plants: retrospect and prospects. *Plant Cell Rep* **27**:411–424
6. BORDI, A. (2010) The influence of salt stress on seed germination, growth and yield of canola cultivars. *Not Bot Hort Agrobot Cluj* **38**:128–133
7. CABOT, C., SIBOLE, J. V., BARCELO, J. and POSCHENRIEDER, C. (2009) Abscisic acid decreases leaf Na<sup>+</sup> exclusion in salt-treated *Phaseolus vulgaris* L. *J Plant Growth Regul* **28**:187–192
8. CARPICI EB, CELIK N and BAYRAM, G. (2009) Effects of salt stress on germination of some maize (*Zea mays* L.) cultivars. *Afr J Biotechnol* **8**:4918–4922
9. DANTAS, B. F., SARIBEIRO, L and ARAGAO, C. A. (2007) Germination, initial growth and cotyledon protein content of bean cultivars under salinity stress. *Rev Bras de Sementes* **29**:106–110
10. DAVID, A., YADAV, S. and BHATLA, S. C. (2010) Sodium chloride stress induces nitric oxide accumulation in root tips and oil body surface accompanying slower oleosin degradation in sun flower seedlings. *Physiol Plant* **140**:342–354
11. GUPTA, K., GUPTA, B., GHOSH, B. and SENGUPTA, D. N. (2012) Spermidine and abscisic acid-mediated phosphorylation of a cytoplasmic protein from rice root in response to salinity stress. *Acta Physiol Plant* **34**:29–40

## 22. Study of Growth and Yield of Fenugreek (*Trigonellafoenum-graecum L.*) in Hydroponic System.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

### Study of Growth and Yield of Fenugreek (*Trigonellafoenum-graecum L.*) in Hydroponic System.

M.A.Jadhav, B.A. Chaudhari

Department of Botany,

New Art's, Commerce and Sci. College, Parner, Ahmednagar.(MS) 414302

E-mail: jadhavmahesh247@gmail.com

#### Abstract

A Hydroponic experiment was carried out to study the growth and yield of Fenugreek (*Trigonellafoenum-graecum L.*) in Greenhouse. The experiment was laid out in Hydroponic tray system. Tray size 1.8 ft length × 1.0 ft width × 0.15 ft height was used for this experiment. Fenugreek local seeds were used. The results showed that the growth parameters viz., Mean plant height (16.97cm), Mean number of leaves per plant were found to be 22.6, fresh (3.09gm) and dry weight (0.8gm) per plant. Maximum yield of Fenugreek vegetable (3.862 kg/tray) was recorded after 25<sup>th</sup> day with application of VermiCompost Tea Liquid Fertilizer and chemical fertilizers. Application of Hydroponic System is better and sustainable for higher yield of Fenugreek vegetable in minimum days, minimum space and minimum water than the Soil.

**Key words:** Hydroponics, Fenugreek (*Trigonellafoenum-graecum L.*), growth, organic and chemical fertilizers, yield

#### Introduction

Hydroponics (Greek words 'hydro' water and 'ponos' labour) is a method of growing plants using mineral nutrient solutions without soil. It is also called as "controlled environment agriculture" (CEA) since raising plants hydroponically requires control of environmental factors such as light intensity and duration, temperature, humidity, pH of the solution/medium and mineral nutrients.

Fenugreek (*Trigonellafoenum-graecum L.*) belonging to the family Leguminosae (Fabaceae). It is an important minor spice regularly grown for its seeds and leaves. Seeds of Fenugreek (*Trigonellafoenum-graecum*) are used as a condiment for flavouring of foods regularly and leaves are used as vegetable. It has medicinal value in our daily life. Therefore it is used for treatment of flatulence, dysentery, diarrhoea, enlargement of liver and spleen, rickets and diabetes.

#### Materials and Methods

Green Fenugreek vegetable were produced at a hydroponic fodder production unit of 12 x 10 x 8.0 ft length, height and width, respectively, with 0.4% slope for adequate removal of excess water. The racks were prepared by using bamboo stands with four shelves (1 ft 2 distance each) with capacity of 70 plastic hydroponic trays, sized 1.8 ft length × 1.0 ft width × 0.15 ft height equipped with semi-automated sprayer irrigation. The trays with holes at the base were to allow drainage of excess water from irrigation. Water used was tap water free from any additives. Application of VermiCompost Tea Liquid Fertilizer and chemical fertilizers. The temperature and humidity inside the green house was controlled through micro-sprinklers irrigation to maintain a range of 22 - 27<sup>o</sup> C temperature and 70-80% relative humidity. Seeds of Fenugreek (*Trigonellafoenum-graecum*) were used and soaked for 12 hours in tap water. After 12-16 hours of germination in gunny bag, sprouted seeds were spread on the hydroponic tray at a rate of 100 gram per tray sized 1.8 ft length × 1.0 ft width × 0.15 ft height and 0.4 - 0.5 cm layer thickness. After 25 days maximum growth



**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

period, 38.62kg hydroponic Fenugreek were produced per kg of dry seeds.

**Table:1-** Water, Atmosphere and fertilizers characteristics.

Parameters	
pH	5.8-6.5
Temperature ( °c)	22-27°C
Moisture (%)	70-80%
N (%)	46
P (%)	52
K (%)	34

**Result and Discussion**

Results obtained in present investigation are discussed below.

**Table:2-** Growth Parameters of fenugreek (*Trigonella foenum-graecum* L.) after 25<sup>th</sup> days.

Parameters	
Mean plant height (cm)	16.97 cm
Mean No. of leaves/plant	22.6
Mean fresh weight (gm/plant)	3.09 gm
Mean dry weight (gm/plant)	0.8 gm

**Plant height (cm) after 25<sup>th</sup> day:**

Average plant height (cm) were found to be 15.84cm, 16.39cm, 17.20cm, 17.11cm, 18.28cm, 18.03cm, 15.58cm, 16.54cm, 18.22cm and 16.57cm respectively. Plant height of Fenugreek was maximum at 25<sup>th</sup> day is **18.28cm**.



**Number of leaves per plant after 25<sup>th</sup> day:**

Average number of leaves per plant was found to be 25, 24, 24, 21, 19, 22, 25, 23, 20 and 23 respectively.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

**Fresh and dry weight (gm/plant) after 25<sup>th</sup> day:**

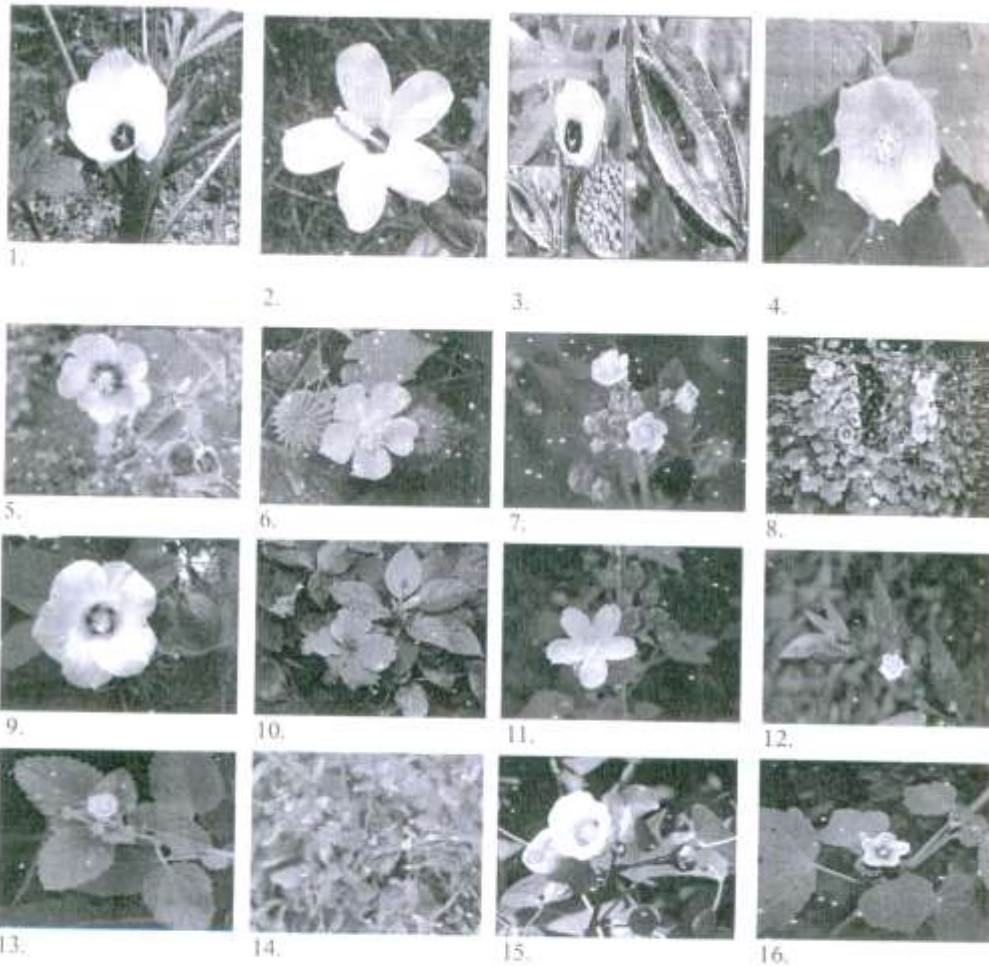
The results of the experiment after 25<sup>th</sup> days shows that Mean fresh weight per plant (3.09gm/plant) and dry weight (0.8 gm/plant)

**Yield /plot:**

Maximum yield of Fenugreek vegetable (4.862kg/tray) was recorded with applications of Biofertilizers and chemical fertilizers in Hydroponic system.

**Conclusion**

Based on result it is concluded that morphological characteristics such as plant height, fresh and dry weight of Fenugreek plant were better with the application of liquid vermicompost in hydroponics system.





INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(HFS)

**References**

1. B. Dutta, A. Pariari, and A. Debnath and S. Khan. Response of fenugreek (*Trigonella foenum-graecum*) to different levels of nitrogen and Rhizobium. *Journal of Crop and Weed*, 7(2); Pp28-29, 2011.
2. Sharif Zia M, F Husen, M Aslam, M Ehsan Akhtar and A Hamid. Basics for formulation of fertilizer recommendations for crop production. *International journal of agriculture and Biology*, (5)3, Pp392-396, 2003.
3. S Godara, U S Gupta, Ravindra Singh and R S Mehta. Effects of different combinations of organic and inorganic nutrient sources on productivity and profitability of Fenugreek (*Trigonella foenum-graecum*). *International journal of seed spices*, (2)2, Pp34-37, 2012.
4. M Anitha, D V Swami and D R Salomi Samitha. Seed yield and quality of Fenugreek (*Trigonella foenum-graecum* L.) CV Lam Methi-2 as influenced by integrated management. *The Bioscan the international quality journal of Life sciences*, 10(1), Pp103-106, 2015.
5. Sangita Ghadage and Bharati Jadhav. Effect of *Lantana* manure on nutrient content of Fenugreek (*Trigonella foenum-graecum*). *Bioscience Discovery*, 4(2), Pp189-193, 2013.
6. Jitendra Kumar Meena, Sanjay Kumar, Satish Mujji, Munoj Kumar and Devendra Kumar. Studies on effect of biofertilizers with chemical fertilizers on growth, yield and quality of Fenugreek (*Trigonella foenum-graecum* L). *International journal of agricultural sciences*, 11(1), Pp198-200, 2015.
1. Singh D P. *vermiculture biotechnology and biocomposting in: Environmental microbiology and biotechnology* (Eds. Singh DP and Dwivedi S K), New age international (p) limited publication, New Delhi, Pp97-112, 2004.
2. Abdol Amir Yousefi and Mehdi Sadeghi. Effect of vermicompost and urea chemical fertilizers on yield and yield components of Wheat (*Triticum aestivum*) in field condition. *International journal of Agriculture and crop Sciences*, 7(12), Pp1227-1230, 2014.
3. Jagannath Aryal and Anand Shova Tamrakar. Domestic organic waste composting in Madhyapur Thimi, Bhaktapur. *Nepal journal of science and technology*, 14(1), Pp129-136, 2013.
1. Krushidarshani (Bhimrao Dmek Ed.) *Mahatma Phule Krushi Vidyapeeth*. (Rahuri, India, 2014).

**23. Tasar Culture: sustainable low cost farm forestry for poverty alleviation endeavor for Kolhapur District of Western Maharashtra**



**TASAR CULTURE : A SUSTAINABLE LOW COST FARM FORESTRY FOR  
POVERTY ALLEVIATION ENDEAVOR FOR KOLHAPUR DISTRICT OF  
WESTERN MAHARASHTRA**

**S. R. WAGH**

Department of Zoology,

New Arts, Commerce & Science College, Parner,

Tal. Parner, Dist. Ahmednagar, Pin-414 302, Maharashtra State, India.

E mail: srwagh@rediffmail.com Cell: +91 9403190432.

**ABSTRACT :** *Sericulture is an agro-based cottage industry provides opportunities of employment to rural youths. Mulberry sericulture is well organized sector of small cottage industry and supported mainly by government agencies involving the farmers. Non- mulberry sericulture is practiced in certain traditional areas of the country but there is lot of scope to explore the available forest resources to undertake tasar culture on large scale. This will not only provide the alternative job opportunities but also help in conservation of forest resources. Taking into account the crucial role of tasar culture an effort has been made to popularize tasar sericulture in rural areas of Kolhapur district during 2014 to 2015.*

*The study involved assessment of tasar silkworm host plants from the forest area, motivation amongst villagers to disseminate tasar culture and transfer of tasar technology. After survey on the availability of tasar food plants from Kolhapur district, two sites were selected for study and the rearing was made on Terminalia tomentosa, as they are abundantly available. Workshop on the rearing of tasar silkworm was organized for beneficiaries. We have received great response from the villagers for tasar culture. 10 beneficiaries were selected from each site for rearing of tasar silkworm. In successive two years two experimental rearing's at Panhala and Ajara were carried out. In the first and second rearing beneficiaries have harvested 5000 and 7500 cocoons respectively. From these rearing average income of Rs. 4000/- was earned by the each beneficiary which stands to be 11 % of the annual income of the farmers. In the present work, an attempt was made to present the different aspects involved in tasar sericulture for the development of forest and rural people.*

**Key Words :** *Tasar culture, Sustainable Development, Rural area.*

## INTRODUCTION

Basically the sericulture is divided into two main categories that are mulberry sericulture and non-mulberry sericulture. Non mulberry sericulture includes utilization of wild sericigenous insects for the production silk either in semi domesticated condition or in the natural conditions (Dewangan, 2013). Diversity of sericigenous insects deals with the silk producing insects and their food plants (Srivastava et al., 2009). Several reports are available on the on the variety of sericigenous insects and their potential as a rich source of natural silk from the Indian subcontinent (Sinha & Sinha, 1994; Akai, 1998; Nayak et al., 2000; Srivastva et al., 2009).

Non-mulberry sericulture plays a crucial role in the socio-economic upliftment with employment generation. Non-mulberry sericulture of India consists of Indian tasar silkworm (*Antheraea mylitta* Drury), Oak tasar silkworm (*Antheraea proylei* J.), Muga silkworm (*Antheraea assamensis* Ww) and Eri silkworm (Bhatia et al., 2010). Bhatia et al., (2010) provided the list of commercially exploited sericigenous insects and their food plants. This list includes the host plants of tasar silkworm in Maharashtra viz. *Terminalia tomentosa*, *Terminalia arjuna*, *Zizyphus jujuba*, *Lagerstroemia purviflora*, *Anogeissus latifolia* and *Shorea robusta*. Non-mulberry sericulture is largely practiced in the forest area of the country with the help of tribals and rural people residing in the area. Bhatia et al., (2010) provided the information about state wise forest area and distribution of sericultural flora. In Maharashtra, the area under silkworm tropical tasar is 10.04 lakh hectares. Tasar culture is one of the promising agro- forestry based cottage industry and is one of the potential sector of applied biology. The establishment of tasar culture can be effective in alleviating poverty, generating employment opportunities in the form of primary or secondary income sources (Gangopadhyay, 2008). According to Ray et al., (2006), tasar culture generates sixty lakh man-days of employment every year in rural areas of India.

Tasar silkworm feed on wide range of forest plants. It can be semi-domesticated or can be reared in the natural conditions. The Kolhapur district has huge forest area which includes large number of tasar food plants like *Terminalia tomentosa*, *Terminalia arjuna*, *Terminalia bellerica*, *Terminalia catappa* *Zizyphus jujuba* and others. Considering this great availability of natural resources and wild sericigenous insects, during the present investigation an effort was made to disseminate the tasar culture technology in the Kolhapur district for the development of rural people.



## METHODOLOGY

The work was carried out in three phases during 2014 to 2015 in the Kolhapur district of Western Maharashtra, India.

1. Selection of sites: The present investigation was carried out by selecting 2 sites from Kolhapur district namely Ajara and Panhala due to the presence of large number of host plants in the nearby forest area.
2. Selection of Beneficiaries: By adopting various extension communication methods such as inter-personnel communication, organizing informal meeting and workshop and discussion in all 125 beneficiaries were selected initially for the tasar culture.
3. Experimental Rearing of tasar: During the two successive years (2014-2015) as per need, the rearing of late age larvae on host plant i. e. *Terminalia tomentosa* was carried out.

## RESULTS AND DISCUSSION

### Selection of Beneficiaries

In all 125 beneficiaries from 2 sites i.e. Ajara and Panhala of Kolhapur district were selected for tasar culture. The beneficiaries were trained in tasar culture by arranging workshop on tasar technology. The training was given on handling of worms, disinfection and late age rearing. From them only 10 beneficiaries from each site were selected for tasar culture. (Deka *et. al.*) (2015).

### Experimental Rearing:

The experimental rearing was carried out in selected sites in Kolhapur district during 2014 to 2015. In both years planned rearing was conducted at Panhala and Ajara. On an average 100 DFLs were provided to each beneficiary. Beneficiaries harvested 5000 and 7500 cocoons respectively. From these rearing average income of Rs. 4000/- was earned by the each beneficiary which stands to be 11% the annual income of the farmers. Similar results were noticed by Madhusudhan K.N. (2017).

### Tasar Food Plants:

In order to conserve the diversity of sericigenous insects and improve the livelihood of rural people residing in and around the forest areas, more concentrated efforts are needed on the dissemination of tasar culture technology. The Central Silk Board, Ministry of Textiles, Govt. of India is continuously engaged in the dissemination of this technology (Srivastva *et al.*, 2009; Bhatia *et al.*, 2010). Department of Biotechnology, University Grants Commission, New Delhi had provided financial support for tree plantation to the department of Zoology, Shivaji University, Kolhapur during the year 2008 to 2013. On the similar line

the Central silk board has made a trial on the conservation of seri-biodiversity and improvement of tribal livelihood in the state of Chhattisgarh. Under this effort, a detailed survey and multidisciplinary trials have been made to generate bivoltine tasar seed cocoons through adopted tasar silkworm seed rearing of *Antheraea mylitta* D. particularly with the tribal women self-help group. This study provides detailed information on performance of tribal women's tasar silkworm seed rearing in Surguja, Chhattisgarh. In all, 423 women were engaged in the tasar culture in the tribal area of Chhattisgarh. The income earned by per family was Rs.3,198.00/- (Bhatia et al., 2010). Similar type of experiment was conducted by Dewangan (2013) in Ghargoda tribal block of Raigarh district of Chattisgarh state and it provide the alternative source of income and full fill the livelihood of the tribals.

#### CONCLUSION

The geographical area of Kolhapur district is rich in tasar silkworm food plants and also has suitable climatic conditions for the tasar silkworm rearing. The results obtained from the experimental rearing are encouraging and is viable on commercial basis if the beneficiaries take regular rearing of tasar silkworm on their own by following all the standard methodologies of tasar culture.

#### ACKNOWLEDGEMENTS:

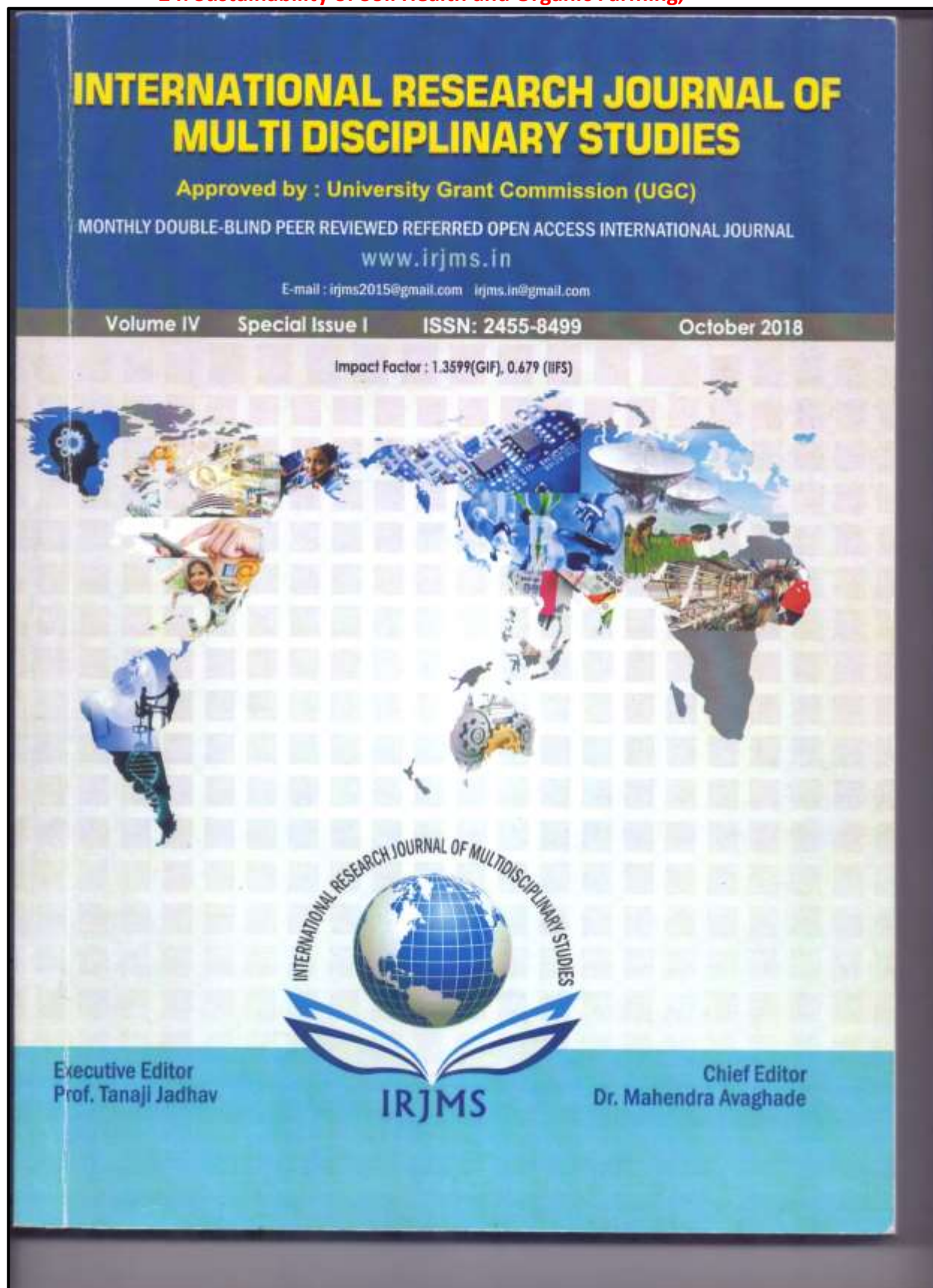
The author is grateful to Prof. G. P. Bhawane, Department of Zoology Shivaji University, Kolhapur for guidance and encouragement. The author is also thankful to the Principal, New Arts, Commerce and Science College, Parner for providing the facilities.

#### REFERENCES

1. Akai, H. (1998). Global scenario of wild silk. 3rd International Conference on wild silk moth. 11-14 Nov. 1998, Bhubneshwar, India
2. Chatterjee K.K., Chandra H., Gupta R. and Chakravorty D. (2007). Tasar culture -An approach of social upliftment of forest dwellers of achanakmar amarkantak biosphere Res. Procee. Workshop held at Trop. For. Res. Inst., Jabalpur on Research needs for Achanakmar- Amarkantak Biosphere Reserve.
3. Dewangan S.K., Sahu, K.R. and Achari, K.V. (2011). Sericulture: A tool of ecosystem checking through tribals. Journal of Environmental Research and Development Vol. 6 No. 1: 165-173.

4. Dewangan, S. K. (2013). Employment generation with sustainable development and biodiversity through sericulture: A study of three tribe blocks of Raigarh, India. *Journal of Environmental Research and Development* Vol. 8 No. 1: 175-182.
5. Gangopadhyay, D. (2008). *Sericulture Industry in India – A Review*. India, Science and Technology: S&T for Rural India and Inclusive Growth.
6. Nayak, B.K., Dash, A.K. and Patro, K. B. G. (2000). Biodiversity conservation of wild tasar silk moth *Antheraea paphia* L. of Simlipal biosphere reserve and strategy for its economic utilization. *Int. J. Wild Silkmoth Silk*. 5: 367- 370.
7. Ray, S, Agarwala, K.K. and Babu, C.R. (2006). tasar sericulture, an emerging discipline for conservation and sustainable utilization of natural resources, *The vision review point*. Pp 1-4.
8. Sohn K.W. (2003). Conservation status of sericulture germplasm resources in the world -2. FAO of the UN, Rome. <http://www.fao.org/DOCREP/005/AD108E/AD108E00.html>.
9. Sinha, S. S. and Sinha, A. K. (1994). Conservation strategies for important wild silkmoth population of *Antheraea mylitta* Drury (Lepidoptera: Saturniidae). *Int. J. Wild Silkmoth Silk*. 2: 159-162.
10. Srivastava, A. K., Kar, P.K., Sinha, R.B. and Prakash, N.B.V. (2009). Present status of biodiversity of wild sericigenous insects in India and strategy for conservation. *Proceedings of National Workshop on Seri-Biodiversity Conservation*, March 7-8, CSGRC, Central Silk Board, Hosur, India, pp. 167-172.
11. Deka M., Gargi G., Kumar R., Yadav H. and Sahay A., (2015). Silkworm-food plant-interaction: search for an alternate food plant for tasar silkworm (*Antheraea mylitta* Drury) rearing. *Int. J. of Industrial Entomology*, Vol. 30 No. 2, Pp. 58 - 63.
12. Madhusudhan K.N., Lahtankimi, Moorthy S.M., (2017). Impact of varying different abiotic factors on the survivability of tasar silkworm in outdoor rearing fields. *Journal of Entomology and Zoology Studies*; 5(6): 957-963

**24. Sustainability of Soil Health and Organic Farming,**



**Sustainability of Soil Health and Organic Farming**<sup>1</sup>S.S.Thube, <sup>2</sup>S.R.Wagh<sup>1</sup>Department of BBA – CA, <sup>2</sup>Head, Department of Zoology  
New Arts, Commerce and Science College, Parner  
thube.sunita@gmail.com, srwagh@rediffmail.com**Abstract**

To have sustainable agriculture is now a universal need and through intensive empirical research the way for achieving it is defined. Development of several indicators has been developed for sustainable agricultural systems. Relating to agricultural sustainability where synthetic fertilizers have been used, their effects on biodiversity consumption, soil health, crop production environmental quality and self-reliant farming systems. Use of synthetic fertilizers and their effects on crop production, soil health, environmental quality, biodiversity conservation and self-reliance of farming system has been discussed. One of the chief factors which have been mostly considered to be affective in the degradation of soil fertility is the use of agro inputs which are synthetic in nature. For the productivity of both livestock and crops and also for soil health the presence of the soil organic matter and the soil microbial population are the basic useful indicators. To standardize fertility management related to organic farming in consideration with the complex interactions amongst the no similar components of this system, a solution of long term integrated approach will be appropriate. A broad and methodical review on different quantitative and qualitative changes of soil health parameters for the management of improved nutrients supports the observations.

**Key words:** Sustainable agriculture, soil health, synthetic fertilizers, organic farming

**Introduction**

Sustainable production of crop is the basic objective of organic farming to maintain the long term fertility of the soil in accordance with the natural systems (International Federation of Organic Movement) and so for all the stakeholders of agricultural development the basic concern is to maintain the environmental quality and agricultural productivity through soil health management. The earth itself has an friendly atmosphere which not only nourishes the plant but also creates an atmosphere where soil organisms can survive. Thus, high production is achievable if the health of the soil is in good condition which also helps in enhanced development and growth of crop. For maintaining the good quality of surrounding environment and sustaining the biological productivity biological elements are the key to any ecosystem within the land use boundaries. This also leads to good and healthy conditions human health, animals and plants or degradation in soil can also lead to low production of goods and services. Imbalance of nutrient management, high use of chemical fertilizers and soil pollution are the main reasons of soil degradation.

India has an agricultural economy. In India, at present we find the same conditions of soil degradation where in past history it can be seen that India had a magnificent agricultural economy based on natural resources like green manure, oil cakes, animal manure and others which were free of manmade chemicals which leads to degradation in the soil quality. With the arrival of green revolution technologies or industrial agriculture based on chemical fertilizers there is degradation in the quality of soil due to intensive and continued use of chemical fertilizers for improving the quality of the soil. There is a continuing decline in the productivity factor and degradation in the quality of the soil.



Organic farming system which is based on the management of soil organic matter helps to maintain the chemical, biological and physical soil properties. Organically managed soil shows high soil organic carbon and nitrogen contents, biological soil quality and lower nitrate leaching than chemical or conventional management. Under long term management studies it was seen that under organic management soil biomass carbon is high than the conventional management.

#### Materials and Methods

##### Conceptualization of the Impact of Organic Farming on Soil Quality

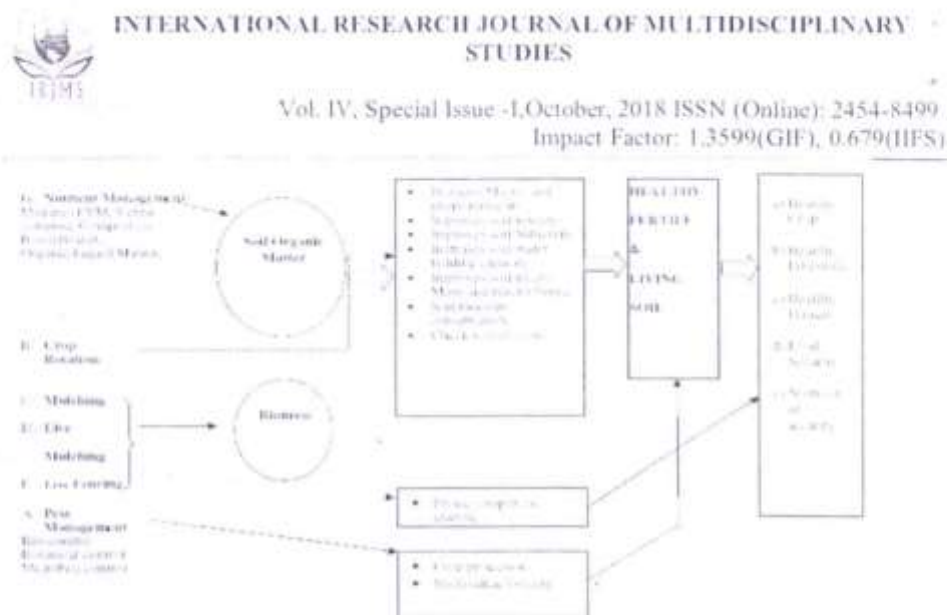
Crop productivity is the outcome of good quality soil often claimed as an ecosystem concept which integrates the diverse soil functions with nutrient supply. Figure No. 1 it shows the integration of different components of organic practices which enhances the soil properties for sustaining soil health.

##### Methodology

"Although systematic reviews have widely been quantitative in nature, recently, qualitative systematic reviews have been used as useful methodology 68. Following Plummer *et al*<sup>[10]</sup>, 78 a four-step approach for the systematic review and analysis of literature was undertaken for the present paper. First, the objectives of the review were set to study the impact of organic farming on soil health in terms of physical, chemical and biological properties of soil, and to compare the outcomes of organic and conventional soil health management. Second, we established a search protocol including selection of key words, bibliographic databases, establishing selection criteria for search engine 'hit' etc. We used a combination of key words involving "organic farming"/"organic agriculture" and all the soil quality parameters conceptualized in Fig. 1. Science direct, Google Scholar and DOAJ were used as the bibliographic database and the first 50 'hits' were considered for screening literature. Third, we screened the results as per the screening criteria, i.e. publication in the last 20 years, article published in English, key word match etc. Fourth, analysis of the literature was performed through the principle of qualitative analysis of literature. This employed iterative coding of themes related to soil quality parameters and their relationship with organic agricultural practices."<sup>[2]</sup>

##### Figure No. 1

Integration of different organic practices for sustainability of soil health.



Source : Journal of Food, Agriculture and Environment, 2014

**Results and Discussion**

**Outcome of Soil Management through Organic and Inorganic Means**

"At the end of 40-47 years of dairy farm management in Denmark, organically managed soil had greater fragment size, aggregate stability in water, and microbial biomass carbon than conventionally managed soil. Moreover, at the end of 21 years of long-term crop rotation management in Switzerland, soil organic carbon and total N were greater under biodynamic than conventional management, but organic management and integrated management (combination of manures, inorganic fertilizers, and herbicides) were moderate. Soil microbial biomass carbon and dehydrogenase activity were greater under organic than that of conventional management, but basal soil respiration did not vary between systems. In North Dakota and Nebraska, total and microbial C and N, and mineralizable C and N were greater under organic than that of conventional management. In Washington State, a comparative study of organic, conventional and integrated apple production systems from 1994 to 1999 indicated that the organic and integrated systems had higher soil quality and potentially lower negative environmental impact than the conventional system. Limited studies of intensive organic farming systems in Australia have generally shown an increase in soil health compared to conventional practice, Lampkin reported that nitrate leaching may be less under organic than conventional systems. It is reported that the bulk density of organic soil is less than the soil which was managed chemically, indicating better soil aggregations and soil physical conditions owing to increased soil organic matter. There is a 29.7% increase in organic carbon under organically managed farm (1.22%) as compared to conventionally managed farm (0.94%) 83. Dehydrogenase, alkaline phosphate, and microbial biomass carbon were higher in organic soils by 52.3%, 28.4%, and 34.4%, respectively, as compared to conventional farms. The multidimensional effects of organic soil management approaches on soil health are summarized in Table 1." 13)



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(HFS)

Table No. 1 Effects of selected organic farming practices on soil health properties.

Organic Components / Management	Soil Properties	Effects on Soil Properties	Citation
FYM, Vermicompost, Green Manuring, Household waste and sewage sludge and Soil Organic Matter	Physical	<ul style="list-style-type: none"> <li>• Improve soil structure, porosity, moisture retention capacity etc. in the soil.</li> </ul>	Altieri and Nicholls [16], Papadopoulos <i>et al.</i> [17] and Jannoura <i>et al.</i> [18].
	Chemical	<ul style="list-style-type: none"> <li>• Supply several macro and micro nutrients to the plants.</li> <li>• Increase total nitrogen, organic matter in the soil which "is an important substrate of cationic exchange, is the warehouse of most of the nitrogen, phosphorus, and sulphur potentially available to plants</li> </ul>	Bharadwaj and Guar [17] and Parthasarathy <i>et al.</i> [18].
	Biological	<ul style="list-style-type: none"> <li>• Soil Organic Matter is the main energy source for microorganisms and it increases the microbial population in the soil.</li> <li>• Soil micro-organisms are the living part of the soil organic matter.</li> <li>• Soil organic matter has a capacity to sink the atmospheric CO<sub>2</sub> and thereby increase in the carbon content in the soil which further enhance the microbial biomass and elevate respiration</li> <li>• In general, organic fertilizer application improved nodule dry weight (DW), photosynthetic rates, N<sub>2</sub> fixation, and N accumulation as well as N concentration in several crops.</li> <li>• Household waste and sewage sludge helps to have the highest number of colony forming heterotrophic bacteria in the soil.</li> </ul>	Ewel [19], Smith and Paul [16], Lal <i>et al.</i> [17], Dalal [17], Chowdhury <i>et al.</i> [13], Friedel <i>et al.</i> [14], Peacock <i>et al.</i> [15], Sparling <i>et al.</i> [16], Poulsen <i>et al.</i> [17] and Mattana <i>et al.</i> [18].
Crop Rotation	Physical	<ul style="list-style-type: none"> <li>• Architectural form of different root systems of several crops included in crop rotation and which influences the physical</li> </ul>	Clement and Williams [19], Chan and Heenan [20]





INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018. ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(HFS)

		structure of soil.	and Grace <i>et al.</i> <sup>[21]</sup> .
	Chemical	• Crop rotations significantly increased soil pH, available phosphate, exchangeable K and Ca in soil.	FAO <sup>[22]</sup> .
	Biological	• Crop rotation decreases the incidence of soil-born pathogen by increasing soil chemical properties and soil microbial biomass.	Dick <sup>[23]</sup> and FAO <sup>[24]</sup> .
Mulching	Physical	<ul style="list-style-type: none"> <li>• It makes the soil softer, pulverized and humid that ultimately helps to maintain bulk density and porosity in the soil.</li> <li>• It increases soil fertility, crop production and control soil erosion; residues become decomposed and add organic matter to the soil.</li> <li>• Better absorption and less run off-of water in the field.</li> <li>• Mulch materials improve soil physicochemical properties, suppress soil temperature, reduce evaporation and increase the soil moisture.</li> </ul>	Lampkin <sup>[25]</sup> , Pinamonti <sup>[26]</sup> , Naeini and Cook <sup>[27]</sup> , Lotter <i>et al.</i> <sup>[28]</sup> , Garcia-Moreno <i>et al.</i> <sup>[29]</sup> , Inyang <sup>[30]</sup> and Gbadebor <sup>[31]</sup> .
	Chemical	• The mulching materials become decomposed and add organic matter and other nutrients to the soil.	Agbede <i>et al.</i> <sup>[32]</sup> .
	Biological	<ul style="list-style-type: none"> <li>• Mulching helps to increase the population, species diversity and activity of macro fauna in the soil.</li> <li>• It improves biological activities in the soil and after decomposition it adds nutrients to the soil.</li> </ul>	Lal <sup>[33]</sup> , Ojeniyi and Adetoro <sup>[34]</sup> , Awodun and Ojeniyi <sup>[35]</sup> .

Source : Journal of Food, Agriculture and Environment, 2014

**Conclusion**

For achieving sustainable livestock production and crops, its basic need is maintaining soil health and its fertility. Good soil health can be maintained by organic farming but since it is highly complex, a integrated biological systems can be maintained. Organic practice has both direct and indirect effect on the properties of the soil because simultaneously it has effects on more than one components of the system. The prior studies on the impact of organic practices on different characteristics of soil health, environment and crop production foresee the potentiality of organic farming in maintaining the soil fertility and soil health.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

Reference

1. Plummer, R., Crona, B., Armitage, D. R., Olsson, P., Tengö, M. and Yudina, O. (2012) *Adaptive comanagement: A systematic review and analysis. Ecol. Soc.* 7(3), p.11
2. Sudarsan Biswas, Md. Nasim Ali\*, Rupak Goswami and Somsubhra Chakraborty.(2014) *Journal of Food, Agriculture & Environment* Vol.12, p. 237 – 243
3. Sudarsan Biswas, Md. Nasim Ali\*, Rupak Goswami and Somsubhra Chakraborty.(2014) *Journal of Food, Agriculture & Environment* Vol.12, p. 237 – 243
4. Altieri, M. and Nicholls, C. (2005) *Agroecology and the Search for a Truly Sustainable Agriculture. UNEP Environ. Train. Netw. Lat. Am. & Caribb., Mexico*, p. 29
5. Papadopoulos, A., Bird, N., Whitmore, P. A. and Mooney, J. S. (2014) *Does organic management lead to enhanced soil physical quality?. Geoderma* 213: p. 435–443
6. Jannoura, R., Joergensen, G. R. and Bruns, C. (2014) *Organic fertilizer effects on growth, crop yield, and soil microbial biomass indices in sole and intercropped peas and oats under organic farming conditions. Eur. J. Agron.* 52(B): p. 259-270
7. Bhradwaj, K. K. and Guar, C. A. (1985) *Recycling of Organic Wastes. ICAR, New Delhi.*
8. Parthasarathy, V. A., Srinivasan, V., Devasahayam, S. and Anandaraj, M. (2004) *Organic farming in spice crops. In Souvenir, 'The International Conference on Organic Food'. ICAR Research Complex for NEH Region, Umiam, Meghalaya*, p. 24-34
9. Ewel, J. (1986) *Designing agricultural ecosystems for the humid tropics. Annu. Rev. Ecol. Syst.* 17: p. 245-271
10. Smith, J. L. and Paul, E. A. (1990) *The significance of soil microbial biomass estimations. In Bollag, J. M. and Stotzky, G. (eds). Soil Biochemistry. Marcel Dekker, Inc., New York, N.Y.*, p. 6:357-396
11. Lal, R., Blum, W. E., Valentin, C. and Stewart, B. A. (eds) (1998) *Methods for assessment of Soil Degradation. Vol. 9. CRC Press, USA.*
12. Dalal, R. C. (1998) *Soil microbial biomass—what do the numbers really mean? Aust. J. Ex. Agr.* 38: p. 649-665
13. Chowdhury, M. A. H., Kouno, K., Ando, T. and Nagaoka, T. (2000) *Microbial biomass, S mineralization and S uptake by African millet from soil amended with various composts. Soil Biol. Biochem.* 32: p. 845-852
14. Friedel, J. K., Gabel, D. and Stahr, K. (2001) *Nitrogen pools and turnover in arable soils under different durations of organic farming: Source- and -sink function of the soil microbial biomass or competition with growing plants? J. Plant Nutr. Soil Sci.* 164: p. 421–429
15. Sparling, G., Parfitt, R. L., Hewitt, A. E. and Schipper, L. A. (2003) *Three approaches to define desired soil organic matter contents. J. Environ. Qual.* 32: p. 760-766
16. Poulsen, B. H. P., Magül, J., Lushoi, J. and Neergaard, A. (2013) *Effects of fertilization with urban and agricultural organic wastes in a field trial – waste imprint on soil microbial activity. Soil Biol. Biochem.* 57: p. 794–802
17. Mattana, S., Petrovičovi, B., Lamli, L., Gelsonimo, A., Cortés, P., Ortiz, O. and Renella, G. (2014) *Sewage sludge processing determines its impact on soil microbial community structure and function. Appl. Soil Ecol.* 75: p. 150-161

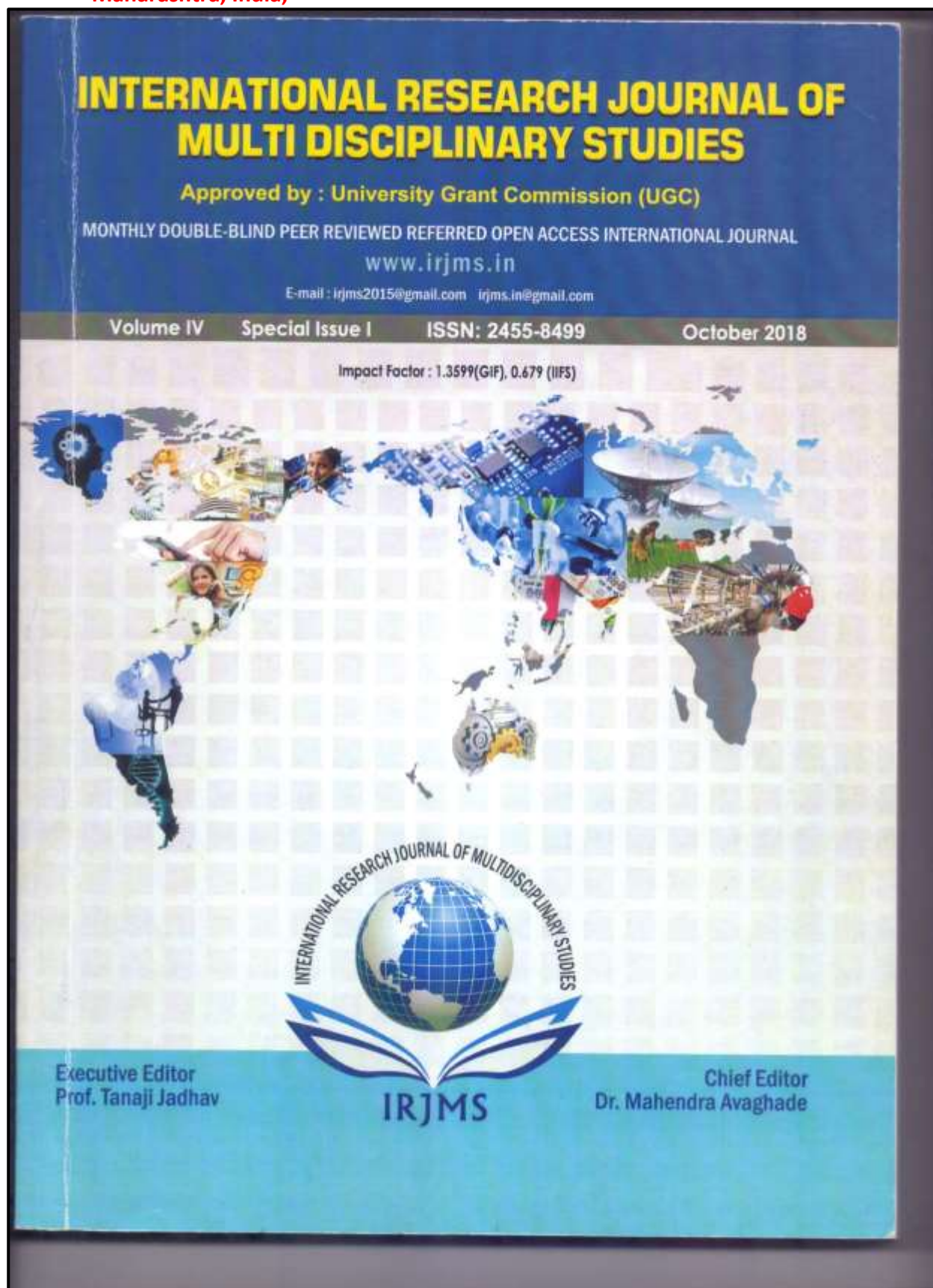


INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IJFS)

18. Clement, C. R. and Williams, E. T. (1967) Leys and soil organic matter II. The accumulation of nitrogen in soils under different leys. *J. Agr. Sci.* 59: p. 133-138
19. Chan, K. Y. and Heenan, D. P. (1991) Differences in surface soil aggregation under six different crops. *Aust. J. Ex. Agr.* 31: p. 683-686
20. Grace, P. R., Oudes, J. M., Keith, H. and Hancock, T. W. (1995) Trends in wheat yields and soil organic carbon in the permanent rotation trial at the Waite Agricultural Institute, South Australia. *Aust. J. Ex. Agr.* 35: p. 857-864
21. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
22. Dick, P. R. (1992) A review: Long-term effects of agricultural systems on soil biochemical and microbial parameters. *Agr. Ecosys. Environ.* 40: p. 25-36
23. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
24. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
25. Lampkin, N. (1990) *Organic Farming*. Farming Press Books, Ipswich, U.K.
26. Pinamonti, F. 1998. Compost mulch effects on soil fertility, nutritional status and performance of grapevine. *Nutr. Cycl. Agroecosys.* 51: p. 239-248
27. Navini, S. A. R. M. and Cook, H. F. (2000) Influence of municipal compost on temperature, water, nutrient status and the yield of maize in a temperate soil. *Soil Use and Manage.* 16: p. 215-221
28. Lotter, D. W., Seidel, R. and Liebhardt, W. (2003) The Performance of organic and conventional cropping systems in an extreme climate year. *Am. J. Alternative Agr.* 18(3): p. 146-154
29. Garcia-Moreno, J., Zavala, M. L., Jordán, A. and Pereira, P. (2013) Mulch application in fruit orchards increases the persistence of soil water repellency during a 15-years period. *Soil. Till. Res.* 130: p. 62-68
30. Inyang, E. U. (2005) An evaluation of tillage and storage systems applied by traditional root crop farmers in Cameroon. *Agr. Envir. J.* 7(2): p. 15-22
31. Gbadebor, P. U. (2006) The climate, the soils and the West African traditional farmers. *Agroecosys. Bull.* 4: p.12-17
32. Agbede, M. T., Adekiya, O. A. and Ogeh, S. J. (2013) Effects of chromolaena and tithonia mulches on soil properties, leaf nutrient composition, growth and yam yield. *West Afr. J. Appl. Ecol.* 21(1): p. 15-29
33. Lal, R. (1988) Effects of macrofauna on soil properties in tropical ecosystems. *Agr. Ecosys. Environ.* 24: p. 101-116
34. Ojeniyi, S. O. and Adetoro, A. O. (1993) Use of chromolaena mulch to improve yield of late season tomato. *Niger. J. Tech. Educ.* 10: p. 144-149
35. Atkinson, D. and Watson, C. A. (2000) The research needs of organic agriculture – distinct or just part of agricultural research? *The BCPC Conference - Pests & Diseases 2000*, p.151-158

**25. Analysis and Management of e-waste from Parner region of Ahmednagar District, Maharashtra, India,**





## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

**Analysis and Management of e-waste from Parner region of Ahmednagar District, Maharashtra, India**

Wagh S. R.<sup>1</sup> and Lasure A.U.<sup>2</sup>

<sup>1</sup>Department of Zoology, New Arts, Commerce and Science College, Parner, Dist.

<sup>2</sup>Department of Computer Science, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar - 414302, Maharashtra, India

Email: srwagh@rediffmail.com, amollasure9@gmail.com,

**Abstract**

*Electronic waste or e-waste is a term used to describe any electronic device that is outdated, obsolete, broken, donated, discarded, or at the end of its useful life. The study examines electronic waste analysis and management in Parner tehsil. It employs survey research and comparative study. The main data gathering tools are questionnaires, interviews, observation and review of documents. The findings of the study highlighted that homes, computer and computer equipments sells and service providers, mobile sells and service provider, computer institutes, school, colleges, electronic appliances sells and service provider etc are engrossed with e-waste. Peoples in all these sectors are not aware of issues related to e-waste even they have no idea that electronic waste is hazardous and we are keeping it in homes, shops, offices regularly which directly or indirectly affect our environment. It was realized that absence of legislation, absence of recycling centres, and lack of awareness are the major challenges in e-waste management. After all the study recommends to create partnership with governmental and non-governmental organization to obtain legislation, management options, and infrastructures to ensure proper e-waste management for better human and environmental health.*

**Key words:** Analysis, Management, e-waste, Parner region.

**Introduction**

Due to village areas, less industrialization and easy availability of free space as compared to cities peoples easily gets free places to throw their e-waste. But due to technological evolution, urbanization, peoples response to modernization and wish to purchase or avail luxurious things these e-waste collection increases very rapidly and free spaces acquired for development very rapidly if not considered these problem is becomes bigger and bigger day by day.

**About Parner:** Parner is a large village located in Parner Tehsil of Ahmednagar district, Maharashtra with total 2806 families residing. As per census 2011 there are 131 Villages are in Parner tehsil. The Parner village in Parner tehsil has population of 13119 of which 6699 are males while 6420 are females as per Population Census 2011. In Parner village population of children with age 0-6 is 1442 which makes up 10.99 % of total population of village. Average Sex Ratio of Parner village is 958 which is higher than Maharashtra state average of 929. Child Sex Ratio for the Parner as per census is 842, lower than Maharashtra average of 894. Parner village has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Parner village was 81.97 % compared to 82.34 % of Maharashtra. In Parner Male literacy stands at 87.71 % while female literacy rate was 76.08 %.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IJFS)

**Area details of Parner tehsil**

Type of Land	Area in km2	Area %
Agriculture	1,477.63	76.55%
Forest	187.92	9.74%
Other	264.73	13.71%
Total	1,930.28	100.00%

**3) Population**

The table below shows the population of the taluka by sex. The data is taken from the 2001 census.

	Population	% of Total Population	Number of Literate	Literacy (% of Population)
Male	123902	50.26	89698	72.39
Female	122633	49.74	63927	52.13
<b>Total</b>	<b>246535</b>	<b>100</b>	<b>153625</b>	<b>62.31</b>

**Materials and Methods**

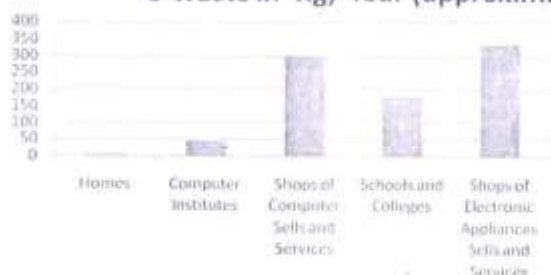
To do analysis data is important. In this we collect data from different sectors like home, mobile shop (seller as well repairer), computer Institutes, electronic product seller as well as repairer, schools, Colleges. We collect data from 50 homes which are Tarawadi, Parner, Chambhuzdi, Nigboj, Loni-Mavala, Vankute, Ukhalgaon, Nimbavi, Pimpalgaon Pise, Mungusgaon, Jakhangaon, SaraolaSomvanshi, Pimpardalsen, Panoli, RaleganShiddhi, Pimpalner, Vadule, Gatewadi. All these villages are in Parner tehsil, 8 shops of computer sells and services, 6 Computer institutes, 6 schools and colleges, 10 shops of electronic appliances sells and services.

For all this stakeholders we made different quaternaries. From questionnaires we made comparative analysis and we found all these sections are directly or indirectly involved in e-waste because of lack of awareness, traditional behaviour etc.

Sr. No.	Stakeholders	Number	E-waste in Kg/ Year(approximate)
1	Homes	50	6
2	Computer Institutes	6	48
3	Shops of Computer Sells and Services	8	300
4	Schools and Colleges	6	180
5	Shops of Electronic Appliances Sells and Services	10	336



**e-waste in Kg/ Year (approximate)**



Average e-waste available in one home which are unusable approximately 1/2 Kg/month and 6 Kg./year. (This weight is considered for the larger electronic appliances like fan, water-motor, etc. Generally if small appliances like bulb, wire etc. are get damaged they are thrown by people in empty places away from their homes. The fault in one of the major equipment may happen in a year so it is not suitable to consider consistently 1/2 Kg of electronic waste is generated from home). As per 2011 census data Parner tehsil contains 131 villages. From above collected information if one home contain 1/2 Kg of e-waste during one month then the e-waste generated in Parner tehsil is far more than one's expectation.

From interviews with families we found that some of the unusable electronic appliances are present in home from years and years. Peoples in the home stores their e-waste any one of the corner of home or in the area surrounding home. Sometimes they have specific area allotted to store e-waste but not stored in categorised manner. Generally there is no awareness present in the people about e-waste. Also from Gram Panchayat there is no specific guideline provided to people, no awareness program is taken, also no mechanism present for collection of e-waste.

Average collection of e-waste from computer institutes approximately 4 Kg./month and 48 Kg per year. Data collected from 8 shops of computer sells and services. Average collection of e-waste from shops of computer sells and services 24.87 approximately 25 Kg./ month and 300 Kg./year. Some parts of old equipments are usable for repairing of same kinds of equipments, so these parts are withdraw from this equipments and remaining e-waste is sold to some private agencies that purchases these e-waste. Further information about these private agencies and management of e-waste is not known. But with discussion of seller these agencies withdraw some important parts from these and sold them in profit basis.

Average collection of e-waste from schools and colleges approximately 15 Kg./month or 180 Kg./year.(It is found that colleges has large number of e-waste as compared to schools, but because of government adopted few technical education courses in schools they also required computer labs and related equipment).

Data collected from ten shops of electronic appliances sells and services. Average e-waste collected from electronic appliances sells and services 28.4 approximately 28 Kg./month and 336 Kg./year.

Some parts of old equipment are usable for repairing of same kinds of equipment, so these parts are withdraw from this equipment and remaining e-waste is sold to some private

**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**

Vol. IV, Special Issue -1, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(HFS)

agencies that purchases these e-waste. Some shops throw their e-waste in dump area which is not sells to waste collection peoples. It shows that in every sector e-waste is gathered this is not properly dispose or send to recycling.

**Results and Discussion**

A lot of electronic appliances are used in day to day life of human being. After time being these appliances are wear and tear. A lot of things are responsible for polluting environment E-Waste is one of them.

Due to urbanization and rapid development in all sectors peoples in rural areas also uses a lot of electronic appliances and for repairing and selling they have facilities in villages also. They need not to go in cities for that. But still for valuable products they have to visit cities. But it found that because of lack of awareness about E-waste peoples in rural area doesn't take any care of e-waste? They throws e-waste material in empty places and take part in environment pollution

As valuable things are sell and repair only in urban areas automatically e-waste are transfer from rural to urban areas. Most of time unusable parts of electronic appliances are not carried by owners because of their low cost value or large volume. So these parts created dugs in cities. Sometimes some agencies collect that e-waste but what happen after that is not known. If faulty large volume or costly electronic appliances are sold in lower price sometimes peoples prefer to sold them instead of carrying them again at home.

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as gold, silver, platinum, etc. and such base metals as copper, iron, aluminium, etc. But this case is not present as per concern about e-waste collected in Parner tehsil. Because peoples are not much aware about this things. Also they have not such kind of equipments and raw material available to do such kind of things.

**Conclusion**

State government can give task to every Gram panchayat to collect e-waste from village to every month or quarterly (according to population of villages). Also for proper cooperation from peoples they must give awareness to villagers through Gramsevak in 'Gramsabha' so that peoples collect their e-waste properly and handover it to Gram panchayat. For this central or state government has provided funds to Gram panchayat. After that governmental appointed agency must collect that e-waste for disposal or recycle.

While giving licence to computer institutes, shops of electronic seller-repairer, mobile shops (seller-repairer) government compulsorily check that institute create a separate section for e-waste disposal and regularly the hand over their e-waste to government appointed agencies.

So it is important to make rules and regulation by central or state government for collecting, disposing or recycling e-waste properly. It needs continues monitoring so that it works fine with rules and regulations.

Every school college must create separate section to store their e-waste properly. It must be compulsory to every school college e-waste material must be sold to governmental authorised agencies.

**Recommendations**

Government must appoint region wise or district wise agencies for collecting e waste.

Based on the findings of the study in every village there must be awareness program organized by gram panchayat through 'gram Sabha' and posters/ flex in village. Also there is a collection of e-waste from every home of villages half yearly so that e waste collected in



**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

every home can gather together and send it to authorized agency that dispose them in proper way or recycle them.

In Nagarpanchayat area or place of tehsil where electronic shops are largely present e-waste must be collected in every month and send them for proper dispose or for recycle.

For this state or central government has to take initiative and have to make some practices compulsory. If some budget is allocated for such task it helps a lot. In very few budget we can avoid large population and it also helps for healthy life and environment to rural or semi urban area people.

**Limitation of the Study**

Though, the study will pave ways for other scholars to undertake intensive research on the issue, it was not free of limitations.

Firstly, the researcher has encountered tackles in generating accurate data with regards to quantity of electronic waste in the selected institutions.

Though information is considered in weights but these weights are not actually taken. These weights are told by various stakeholders by approximate assumption.

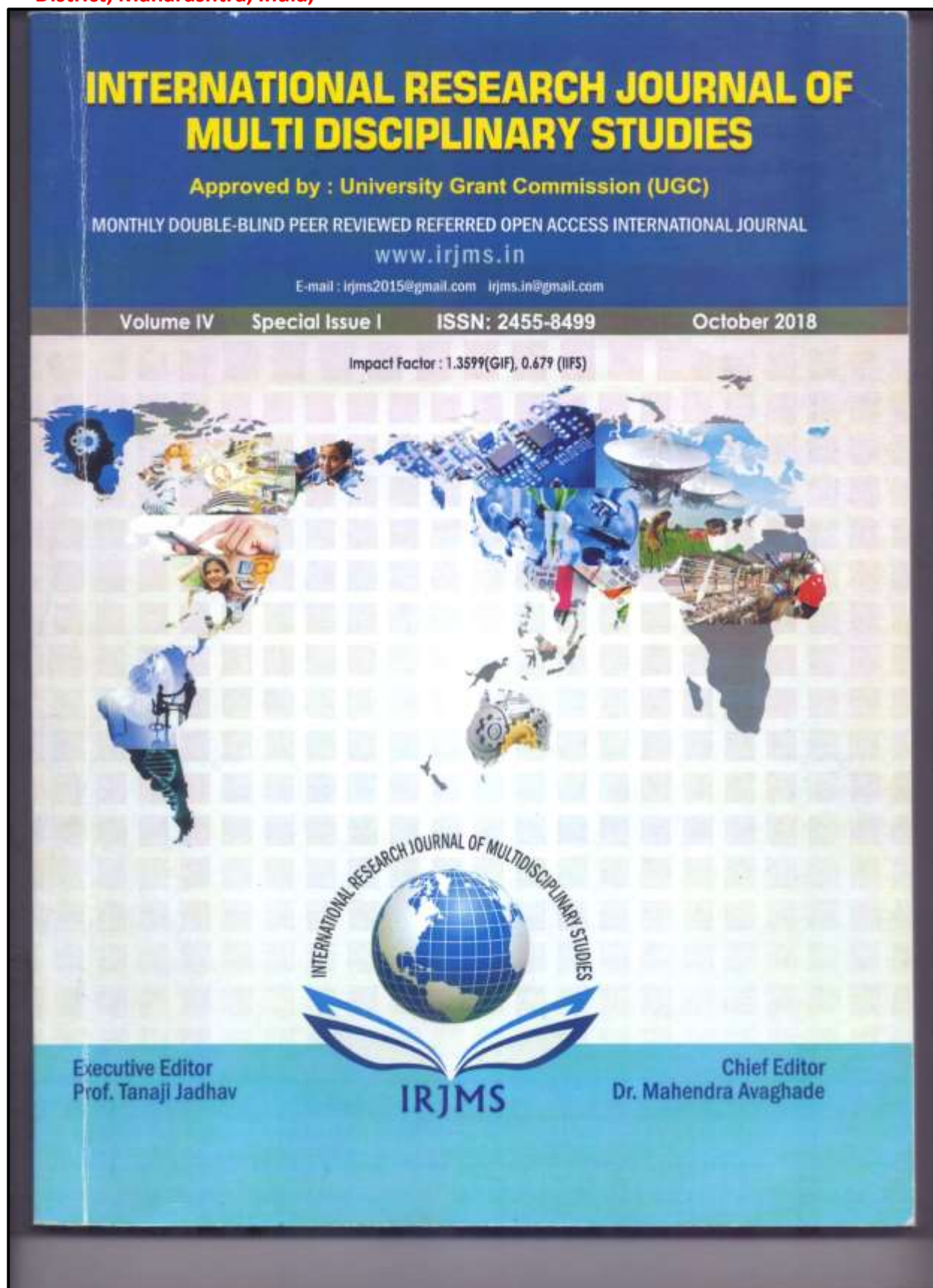
**Acknowledgment**

I take this opportunity to express my gratitude to Dr. R. K. Aher, Principal, New Arts, Commerce and Science College, Parner for his encouragement to undertake research. I would also like to thank all the students of S. Y. B. Sc. Computer Science whose role have been uncountable in generating data pertaining to the study.

**References**

1. <https://villageinfo.in/maharashtra/ahmadnagar/Parner.html>
2. [https://en.wikipedia.org/wiki/Parner,\\_Tuluka](https://en.wikipedia.org/wiki/Parner,_Tuluka)

**26. Assessment of Physico-chemical parameters from dams of Pathardi Tehsil of Ahmednagar District, Maharashtra, India,**



**Assessment of Physico-chemical Parameters from Dams of Pathardi Tehsil, of Ahmednagar District, Maharashtra, India.****B.B. Tilekar<sup>1</sup> and S. R. Wagh<sup>2</sup>**<sup>1</sup>Dada Patil Rajale Arts, Science and Commerce College, Adinathnagar, Tal. Pathardi, Dist. Ahmednagar, Pin. 414 505, Maharashtra, India.

E mail: babatilekar@gmail.com

<sup>2</sup>Department of Zoology, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar, Pin. 414 302, Maharashtra, India.

E mail: sudbirwagh19@gmail.com

**Abstract**

The water quality is of vital role for mankind since it is directly linked with human welfare. The present study is undertaken to investigate the physical and chemical entities comprising of nine parameters, which will help understanding the status of aquatic field. Water sample collected from four Pathardi dam located in eastern part of Pathardi Tahasil, District-Ahmednagar (MS). The physical and chemical parameters are Atmospheric Temperature (AT), Water Temperature (WT), Potential Hydrogen (pH), Electrical Conductivity (EC), Total Dissolve Solids (TDS), Acidity (Acid), Alkalinity (Alk), Carbon dioxide (CO<sub>2</sub>), Dissolve Oxygen (DO) were mentioned on monthly basis on period of one time annual cycle from January, 2017 onwards December, 2017. The given reservoir or lake investigate the result on that the water is used for drinking as well as safe for human use.

**Key words:** Physico-chemical parameters, Assessment, Dams, Pathardi Tehsil.**Introduction**

Asian dams are constructed in some rivers for providing irrigation to crop fields. The increase of human population beyond the carrying capacity of a watershed with respect to the resources available in the urban as well as rural area. It will destabilize the ecosystem balance in the environment, pollution causing environmental problems in the recent era. The problem of pollution in the fresh water eco-systems in our country is mainly because of anthropogenic activities (Haniffa *et al.*, 1993)<sup>1</sup>. Domestic and industrial effluents pollute majority of freshwater resources in India (Jain *et al.*, 1995)<sup>2</sup>.

Environment is a specific physical, chemical and biological factor in dynamic equilibrium. The environment can be defined as physical surrounding of which part on he is dependent on biotic and abiotic factors and his activities like physiological functioning, production and consumption. The physical environment stretches from air, water and plants and all over ecosystems.

**Study Area**

This present study conducted for one year i.e. January 2017 - December 2017 through the monthly sampling of Pathardi reservoir. Pathardi dam located in southern part of the (19° 9' N, 75° 10' E) Pathardi Tahasil, reservoir falls in Arangaon range of Balaghat, District: Ahmednagar. The reservoir is situated in southern part of Tehsil, which is hilly area with drought condition. In Pathardi tehsil present four reservoir namely Mohari lake, Manikdaundi lake, Kutterwadi lake and Shiratwadi lake. The Mohari lake is Minor irrigation project type of reservoir near Pathardi and about 11km from Pathardi Tehsil. It is constructed during the year 1974 having height of 2.64 meter. The catchment area is 4.28 square miles, which stores 25 00 mcf water and area under submergence is 350 acres.



The diversity of zooplanktons and phytoplanktons are depending on water quality and quantity of reservoir. The zooplanktons is microscopic free living floating organism, which occupy a central position between the autotrophy and other heterotrophs and from an important link in aquatic food web. Human life is living pattern without the presence of aquatic animals.

#### Materials and Methods

The water samples were collected monthly. The physical and chemical parameters are Atmospheric Temperature (AT), Water Temperature (WT), Potential Hydrogenii (pH), Electrical Conductivity (EC), Total Dissolve Solid (TDS), Acidity (Acid), Alkalinity (Alk), Carbon dioxide (CO<sub>2</sub>), Dissolve Oxygen (DO), were carried out on field. The analysis was carried out by standard method as described by (Trivedy et al. 1986)<sup>3</sup> (Maini, 2006)<sup>4</sup>

#### Results and Discussion

##### Atmospheric Temperature (AT)

Atmospheric temperature of surface water ranges from 22.0°C to 40.2°C during the study period. Minimum (22.0°C) and Maximum (40.2°C) atmospheric temperature (AT) were recorded during the winter and summer season respectively. The water temperature was maximum during summer (40.2°C) and minimum during winter (22.0°C). The result showing that water temperature varies from atmospheric temperature, that similar result were found by (Singhal et al; 1990)<sup>5</sup> also found by a direct relationship between air and water temperature. During the summer season, solar radiation is and clear sky condition enhanced the atmospheric temperature become high. Where the during monsoon and winter season, rainfall and cloudy-skies brought down the atmospheric temperature and subsequently the water temperature to minimum (Goel P.K et al 1997),<sup>6</sup>

##### Water Temperature (WT)

Water temperature (WT) is of enormous significance as it regulates various abiotic and biotic activities of an aquatic ecosystem in fauna, which is recognized by many authors (Sharma and Sarang, 2004)<sup>7</sup>, (Radhika et al, 2004)<sup>8</sup>. It is clear from there were no significant variations in surface-water temperature across stations and over years during the pre-monsoon and the north east monsoon in the Lake, whereas the various in surface water temperature across the stations and over the years were significant during the southwest monsoon. A comparison of the average of surface-water temperature of the year period showed that the variations in temperature across the different stations were insignificant.

**pH:** pH value of all sample lies in the range of 6.5 to 8.8 are slightly alkaline and suitable to irrigation purpose i.e. there is no alkalinity hazard. The pH (7.5 to 8.1) during winter and higher value (8.0 to 8.8) during summer pH balance in an ecosystem is maintained when it is within the range of 5.5 to 8.3 (Chandrasekhar et al, 2003)<sup>9</sup>. Similarly higher pH range is also recorded by (Zafer, 1966)<sup>10</sup> He observed that pH of the water seen to be dependent upon the relation of organism which is found in aquatic quantities of calcium carbonate and bicarbonates, it is alkaline when disposal of wastes also bring about uses of water to crop.

**Electrical Conductivity (EC):** Electrical Conductivity (EC) is main component of aquatic organism, which shows salt content of water in the form of ion. EC value ranges from 189 µS/cm, to 292 µS/cm. It is an average of 235 µS/cm in the reservoir. The month wise value shows the minimum during November. The concentration of EC increase during summer and reaches maximum in August. The increase in EC during pre-monsoon period may be due to evaporation. This is in proof is obtained by (Shankar et al.: 2002)<sup>11</sup>.

**Total Dissolved Solid (TDS):** Total Dissolve Solid (TDS) are various kinds of minerals substances present in water. Some dissolve organic matter may also contribute to total dissolve



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

solid TDSA value ranges from 105mg/l to 150 mg/l. The season wise value obtained during minimum in winter. The concentration of TDS in water gives an idea about stability of this water for various uses including potable water and using washing clothes and animals (Trivedy; 1995)<sup>17</sup>. All the values of TDS were within the (520 mg/l) highest desirable limit (WHO; 1992)<sup>18</sup>.

**Acidity (Acid):**Acidity is found maximum during winter and minimum during summer. Acidity values of all sample lies in the ranges of 17.1 mg / l to 32.2 mg/l. Acidity of water is its quantitative capacity to react with a strong base to designated pH. Value of the acidity is about 200 mg/l (Dwivedi and Sonar; 2004)<sup>14</sup> and observed value are far less than this, indicating that acidity of sample water is a safe for using drinking range.

**Alkalinity (Alk):**Total Alkalinity shows seasonal variation in the study. Alkalinity value ranges from 220 mg/l to 281 mg/ l. The given values are high during the summer and low during winter period. The fall in values during monsoon may be due to dilution of water. The high value of alkalinity indicates the presence of weak and strong base such as carbonate and hydroxide in the water body (Jain et al; 2002)<sup>17</sup>, (Abhasi et al; 1999)<sup>15</sup>. All the values of Alkalinity shows present reservoir water using safe for life.

**Carbon Dioxide (CD):**The carbon dioxide level fluctuated between 1.8/l to 2.5mg/l. The seasonal values were 3.82 mg/l in winter, 2.16 mg/l in summer and 3.05 mg/l in rainy season. Low values of free CO<sub>2</sub> as observed during summer are mainly because of CO<sub>2</sub> is utilized in the polysynthetic activities. The concentration increases in rainy season, because rate of photosynthesis being low due to cloudy weathers (Sharma et al; 2004)<sup>17</sup> were within the (520 mg/l) highest desirable limit (WHO; 1992)<sup>18</sup>. The obtained readings shows given water is uses for increasing the phytoplankton's and zooplanktons.

**Dissolve Oxygen (DO):**The dissolve oxygen is most important factor in fresh water life. In present study DO is ranged between 3.02 mg/ l to 4.05 mg/l. The average DO values were 3.56 mg/l in summer , 4.05mg/l in winter and 3.95 mg/l during rainy season The value of DO was obtained as following order, winter> rainy> summer season in present study. The obtain result are similar and related to the investigation. The phenomenon of re-oxygenation of water during monsoon may be due to the circulation and mixing by in flow water monsoon rains (Hannam, 1979)<sup>19</sup>. It further progressed in winter; it should be due to the circulation by cooling and down the dissolve oxygen in water.

**Total Hardness (TH)**The total hardness of river water in Jagatungasamudra from Kandhar, Dist-Nanded (MS). The water samples of Bhilodataluka region in North Gujarat ranged from 3.1 to 11.3 mg/l. The lowest value is recorded from Sunokh and the highest value from Kebava. The values of total harden of 77% samples are within the permissible range i.e. 30mg/l. The higher values of hardness clearly indicate that the river water is very hard and it is unfit for consumption and domestic use in washing and cleaning. (Hiwarer, *et al.*, 2004)<sup>19</sup>. The reported values recorded the total hardness of water is safe for life.

**Chloride (Cl):**The chloride of the Hindan river water near East Delhi and Sahibabad varied from 22 to 40 mg/L. The higher values were attributed to industrial effluents and sewage. The chloride concentration of Karamnariver in Thiruvananthpuram district, South Kerala ranged from 1.2 to 13.807 mg/L. The higher chloride recorded during pre-monsoon may be due to inflow of sewage (Jayaraman, *et al.*, 2003)<sup>20</sup>. The obtain result are similar that of other reading which is related by water is uses for life.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(HFS)

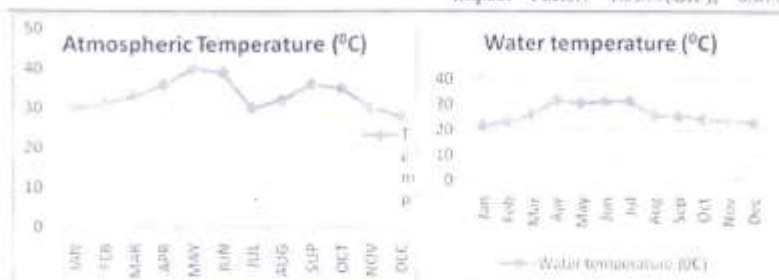


Fig. 1: Atmospheric Temperature (°C), Month (January 2017- December 2017.)

Fig. 2: Water Temperature (°C), Month (January 2017- December 2017.)

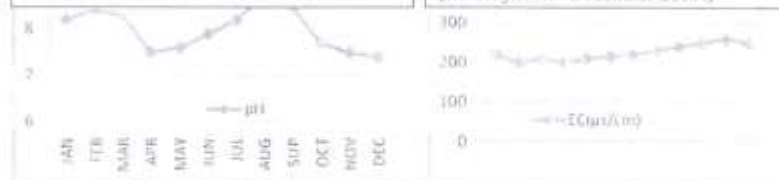


Fig. 3: pH, Month (January 2017- December 2017.)

Fig. 4: Electrical Conductivity (EC), Month (January 2017- December 2017.)

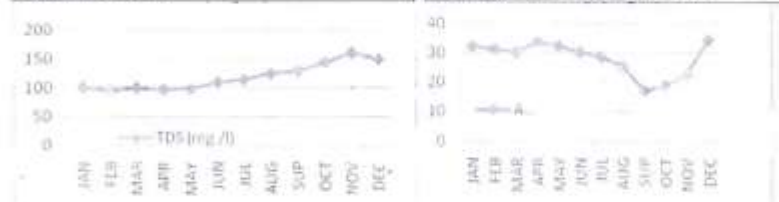


Fig. 5: Total Dissolve Solid (TDS), Month (January 2017- December 2017.)

Fig. 6: Acidity (Acid), Month (January 2017- December 2017.)



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8490

Impact Factor: 1.3599(GJIF), 0.679(IJES)



Fig. 7. Alkalinity (Alk), Month (January 2017- December 2017.)

Fig. 8. Carbon dioxide (CO<sub>2</sub>), Month (January 2017- December 2017.)



Fig. 9. Dissolve Oxygen (DO), Month (January 2017- December 2017.)

1. Haniffa, M. A., S. Arackkuzak P. Marim, (1993). Physico-chemical and microbiological studies in the Perennial River Thubarapovan for the Env. Sci, 6: 97-116.
2. Jain, S., S. K. Gupta & S. Salman, (1995). Seasonal changes in heavy metals in water and sediment of a Eutropic Lake. Indian J. of Envst, Pten. 16 (5): 197-202.
3. Trivedi, R.K. and Goel P.K. 1986. Chemical and biological methods for water pollution studies. Environmental publications, Koval (India).
4. Maiti, D., Kole, R.K. and Das, D.K., (2006). Occurrence of Various metals in Surface water of River Ganga in west Bengal: Their toxicity and Ecological impact. Poll. Res. 25(3): 609-612.
5. Singha S.Ramani G.M. and Gupta., U.S., (1990). Seasonal variation and relationship of different physicochemical characteristics in newly made Tansa Reservoir. Limnological (Berlin, Res J 21, (1), 293-301).
6. Goel, P.K., (1997). Water Pollution causes, Effects and control. New Age international publishers, New Delhi, 143-149.
7. Sharma I. L. & N. Savang (2004). Physico-chemical limnology and productivity of Jaysamand Lake, Udaipur (Rajasthan). Poll. Res. 23(1):87-92.
8. Radhika V. G., I. Mini & T. Gangadevi, (2004). Studies on abiotic parameters of a tropical fresh water lake - Vellayani Lake, Trivandrum, Kerala. Poll. Res 23(1):49-63.



## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -1October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

9. Chandrasekhar J. S., K. L. Babu & R. K. Somasekar, (2003), Impact of urbanization on Bellandur Lake, Bangalore – A case study, *J. Environ. Biol.* 24 (3): 223-227.
10. Zafar, A.R. (1966). *Limnology of Hussiansagar Lake, Hyderabad. India phykas*, 5: 115-126.
11. Shankar P. Jayaraman, P.R. and Gangadevi T., (2002), Studies on the Hydrography of the lotic ecosystem 'Killiar' Thiruvanthapuram, Kerala, *India Poll. Res. J.* 21 (2):113-121.
12. Trivedi R.K., (1995), Sources of water pollution and water quality Parameters, *Encyclopedia of environmental pollution and Control* (Ed. By Trivedy, R.K.) Environ media Karad.
13. WHO, (1992), *our planet our health- report of the WHO commission on health and Environment*, Published by WHO, Geneva: 130-131.
14. Dwivedi, P. and Sonar., (2004), Evaluation of physiological and characteristics of water sample in water reservoir around Rono Hills, Doimukh (Dist. Papumpare) Arunachal Pradesh, *Poll. Res.* 23(1):101-104.
15. Jain, C. K., D. C. Singhal & M. K. Sharma., (2002), Survey and characterization of waste effluents polluting river Hindon, *Indian J. of Envil. Prctn.* 22(7): 792-799.
16. Abhasi, S.A. and Vinithan S (1999), Studies on water quality in and around on industrial disturb of Pondicherry, *Indian j. Env. Hth.* 41(4) : 253-263.
17. Sharma L. L. & N. Sarang, (2004), Physics-chemical limnology and productivity of Jaisamand Lake, Udaipur (Rajasthan), *Poll. Res.* 23(1): 87-92.
18. Hannam H., (1979), Chemical modification in reservoir regulated Streams In: *The ecology of regulated streams* (Eds) Ward, J.W. and Stanford, J.A. Edition plenum corporation publication, 5: 75-94.
19. Hisare C.J. Ugale B.J. and Walunekar A.G., (2004), Studies of some physiochemical characteristics of jagatungasamudra from Kandhar, Dist- Nanded (MS), *Nat. J. of Life Sci.* 1(1): 73-75.
20. Jayaraman, P. R., T. G. Devi and T. V. Navar., (2005), Water quality studies on Karamana River, Thiruvananthapuram District, South Kerala, India, *Poll. Res.* 22 (1): 89-100.



## 27. Artificial Intelligence and Education

© 2018 IJRAR January 2019, Volume 6, Issue 1

www.ijrar.org (E-ISSN 2348-1269, P- ISSN 2349-5138)

# Artificial Intelligence and Education

Asst. Prof. Amol Uttamrao Lasure  
*New Arts, Commerce and Science College, Parner*  
 Head, Department of Computer Science

Email: amollasure9@gmail.com

Abstract- Artificial Intelligence has already been used in education to develop skills. As Artificial Intelligence educational solutions continue to mature, the hope is that Artificial Intelligence can help fill needs gaps in learning and teaching and allow teaching institutes and teachers to do more than ever before. Artificial Intelligence can drive efficiency, personalization and streamline admin tasks to allow teachers the time and freedom to provide understanding and adaptability—uniquely human capabilities where machines would struggle. By leveraging the best attributes of machines and teachers, the vision for Artificial Intelligence in education is one where they work together for the best result and overall improvement of students. Since the students of today will need to work in a future where Artificial Intelligence is the reality, it's important that our educational institutions expose students to and use the technology.

Even though most experts believe the critical presence of teachers is irreplaceable, there will be many changes to a teacher's job and to educational best practices.

**Index terms-** Artificial Intelligence, tutoring, global classrooms

## I. Introduction

Skill based education have a priority for educators for years, but Artificial Intelligence will allow a level of differentiation that's impossible for teachers who have to manages students in class. There are several organizations that use Artificial Intelligence to provide learning, testing and feedback to students from primary to college level that gives them the challenges they are ready for, identifies gaps in knowledge and redirects to new topics when appropriate. As Artificial Intelligence gets more sophisticated, it might be possible for a machine to read the expression that passes on a student's face that indicates they are struggling to grasp a subject and will modify a lesson to respond to that. The idea of customizing curriculum for every student's needs is not viable today, but it will be for Artificial Intelligence powered machines.

There will always be a role for teachers in education, but what that role is and what it entails may change due to new technology in the form of intelligent computing systems. As we've already discussed, Artificial Intelligence can take over tasks like grading, can help students improve learning, and may even be a substitute for real-world tutoring. Yet Artificial Intelligence could be adapted to many other aspects of teaching as well. Artificial Intelligence systems could be programmed to provide expertise, serving as a place for students to ask questions and find information or could even potentially take the place of teachers for very basic course materials. In most cases, however, Artificial Intelligence will shift the role of the teacher to that of facilitator.

Teachers will supplement Artificial Intelligence lessons, assist students who are struggling, and provide human interaction and hands-on experiences for students. In many ways, technology is already driving some of these changes in the classroom, especially in teaching institutes that are online or embrace the flipped classroom model.

## II. Various Roles of Artificial Intelligence In Education

### 1. Differentiated and individualized learning change the role of teachers

Skill based education have a priority for educators for years, but Artificial Intelligence will allow a level of differentiation that's impossible for teachers who have to manages students in class. There are several organizations that use Artificial Intelligence to provide learning, testing and feedback to students from primary to college level that gives them the challenges they are ready for, identifies gaps in knowledge and redirects to new topics when appropriate. As Artificial Intelligence gets more sophisticated, it might be possible for a machine to read the expression that passes on a student's face that indicates they are struggling to grasp a subject and will modify a lesson to respond to that. The idea of customizing curriculum for every student's needs is not viable today, but it will be for Artificial Intelligence powered machines.

There will always be a role for teachers in education, but what that role is and what it entails may change due to new technology in the form of intelligent computing systems. As we've already discussed, Artificial Intelligence can take over tasks like grading, can help students improve learning, and may even be a substitute for real-world tutoring. Yet Artificial Intelligence could be adapted to many other aspects of teaching as well. Artificial Intelligence systems could be programmed to provide expertise, serving as a place for students to ask questions and find information or could even potentially take the place of teachers for very basic course materials. In most cases, however, Artificial Intelligence will shift the role of the teacher to that of facilitator.

Teachers will supplement Artificial Intelligence lessons, assist students who are struggling, and provide human interaction and hands-on experiences for students. In many ways, technology is already driving some of these changes in the classroom, especially in teaching institutes that are online or embrace the flipped classroom model.

### 2. Universal access to students

Artificial Intelligence tools can help make global classrooms to all including those who speak different languages or who might have visual or hearing impairments. Presentation Translator is a free plug-in for PowerPoint that creates subtitles in real time for what the teacher is saying. This also opens up possibilities for students who might not be able to attend school due to illness or who require learning at a different level or on a particular subject that isn't available in their own school. Artificial Intelligence can help break down silos between teaching institutes and between traditional grade levels.

### 3. Tutoring and support outside the classroom

Due to Artificial Intelligence Tutoring and studying programs are becoming more advanced and able to respond to a range of learning styles. There are many more Artificial Intelligence applications for education that are being developed including Artificial Intelligence mentors for learners, further development of smart content and a new method of personal development for educators through virtual global conferences. Education might be a bit slower to the adoption of Artificial Intelligence and machine learning, but the changes are beginning and will continue.

While there are obviously things that human tutors can offer that machines can't, at least not yet, the future could see more students being tutored by tutors that only exist in zeros and ones. Some tutoring programs based on Artificial Intelligence already exist and can help students through basic mathematics, writing, and other subjects.

These programs can teach students fundamentals, but so far aren't ideal for helping students learn high-order thinking and creativity, something that real-world teachers are still required to facilitate. Yet that shouldn't rule out the possibility of Artificial Intelligence tutors being able to do these things in the future. With the rapid pace of technological advancement that has marked the past few decades, advanced tutoring systems may not be a pipe dream.

### 4. Educational software can be adapted to student needs

From primary to college level, Artificial Intelligence will impact education is through the application of greater levels of individualized learning. Some of this is already happening through growing numbers of adaptive learning programs, games, and software. These systems respond to the needs of the student, putting greater emphasis on certain topics, repeating things that students haven't mastered, and generally helping students to work at their own pace, whatever that may be.

This kind of custom-tailored education could be a machine-assisted solution to helping students at different levels work together in one classroom, with teachers facilitating the learning and offering help and support when needed.

### 5. It can point out places where courses need to improve and helps to Automate administrative tasks.

Teachers may not always be aware of gaps in their lectures and educational materials that can leave students confused about certain concepts. Artificial Intelligence offers a way to solve that problem. Coursera, a massive open online course provider, is already putting this into practice. When a large number of students are found to submit the wrong answer to a homework assignment, the system alerts the teacher and gives future students a customized message that offers hints to the correct answer.

This type of system helps to fill in the gaps in explanation that can occur in courses, and helps to ensure that all students are building the same conceptual foundation. Rather than waiting to hear back from the professor, students get immediate feedback that helps them to understand a concept and remember how to do it correctly the next time around.

An educator spends a large amount of time grading homework and tests. Artificial Intelligence can step in and make quick work out of these tasks while at the same time offering recommendations for how to close the gaps in learning. Although

machines can already grade multiple-choice tests, they are very close to being able to assess written responses as well. As Artificial Intelligence steps in to automate admin tasks, it opens up more time for teachers to spend with each student. There is much potential for Artificial Intelligence to create more efficient enrolment and admissions processes.

### 6. Artificial Intelligence-driven programs can give students and educators helpful feedback

Artificial Intelligence can not only help teachers and students to craft courses that are customized to their needs, but it can also provide feedback to both about the success of the course as a whole. Some teaching institutes, especially those with online offerings, are using Artificial Intelligence systems to monitor student progress and to alert professors when there might be an issue with student performance.

These kinds of Artificial Intelligence systems allow students to get the support they need and for professors to find areas where they can improve instruction for students who may struggle with the subject matter. Artificial Intelligence programs at these teaching institutes aren't just offering advice on individual courses, however. Some are working to develop systems that can help students to choose majors based on areas where they succeed and struggle. While students don't have to take the advice, it could mark a brave new world of college major selection for future students.

### 7. It is altering how we find and interact with information

We rarely even notice the Artificial Intelligence systems that affect the information we see and find on a daily basis. Google adapts results to users based on location, Amazon makes recommendations based on previous purchases, Siri adapts to your needs and commands, and nearly all web ads are geared toward your interests and shopping preferences.

These kinds of intelligent systems play a big role in how we interact with information in our personal and professional lives, and could just change how we find and use information in teaching institutes and academia as well. Over the past few decades, Artificial Intelligence-based systems have already radically changed how we interact with information and with newer, more integrated technology, students in the future may have vastly different experiences doing research and looking up facts than the students of today.

### 8. Artificial Intelligence can make trial-and-error learning less intimidating

Trial and error is a critical part of learning, but for many students, the idea of failing, or even not knowing the answer, is paralyzing. Some simply don't like being put on the spot in front of their peers or authority figures like a teacher. An intelligent computer system, designed to help students to learn, is a much less daunting way to deal with trial and error. Artificial Intelligence could offer students a way to experiment and learn in a relatively judgment-free environment, especially when Artificial Intelligence tutors can offer solutions for improvement. In fact, Artificial Intelligence is the perfect format for supporting this kind of learning, as Artificial Intelligence systems themselves often learn by a trial-and-error method.

### III. Conclusion

Artificial Intelligence is at the centre of a new enterprise to build computational models of intelligence. Aspects of intelligent behaviour, such as solving problems, making inferences, learning, and understanding language, have already been coded as computer programs, and within very limited domains, Artificial Intelligence programs can outperform human experts. Now the great challenge of

Artificial Intelligence is to find ways of representing the common sense knowledge and experience that enable people to carry out everyday activities such as holding a wide-ranging conversation, or finding their way along a busy street. Conventional digital computers may be capable of running such programs, or we may need to develop new machines that can support the complexity of human thought.

Progress and implementation of Artificial Intelligence in various sectors have been very impressive. However, in comparison to non-education sectors, Artificial Intelligence application in the education sector has been very pale. However, the application of Artificial Intelligence is spreading daily and so are e-learning platforms. According to EdTech Magazine, a research predicts that through 2021, the application of Artificial Intelligence in the education sector will grow by 47.5%. So, the possibilities for Artificial Intelligence to make significant contributions in education is tremendous. This huge potential shouldn't be wasted. Education could look a whole lot different a few decades from now.

#### References

- [1] <https://www.forbes.com/sites/bernardmarr/2018/07/25/how-is-Artificial-Intelligence-used-in-education-real-world-examples-of-today-and-a-peek-into-the-future/#21c9caf5586e>
- [2] <https://www.teachthought.com/the-future-of-learning/10-roles-for-artificial-intelligence-in-education/>
- [3] <https://www.mckinsey.com/featured-insights/artificial-intelligence/the-role-of-education-in-Artificial-Intelligence-and-vice-versa>
- [4] <https://www.cs.bham.ac.uk/research/projects/poplog/computers-and-thought/chap1/node8.html>
- [5] <https://www.analyticsinsight.net/Artificial-Intelligence-in-education/>

## 28. Novel supported TiO<sub>2</sub> nanocomposites: an efficient photocatalyst for water cleaning technology

conferenceseries.com

Dilip R Thube, J Nanomater Mol Nanotechnol 2018, Volume 9  
DOI: 10.4172/2157-7439-C8-088

International Conference on

### POLYMERIZATION CATALYSIS, FLEXIBLE POLYMER AND NANOTECHNOLOGY

September 06-07, 2018 Dubai, UAE

#### Novel supported TiO<sub>2</sub> nanocomposites: An efficient photocatalyst for water cleaning technology

Dilip R Thube

Savitribai Phule Pune University, India

Supported TiO<sub>2</sub> nanoparticles were synthesized by sol-gel method using blue-green phosphor and characterized using X-ray diffraction (XRD), diffused reflectance UV-Visible spectroscopy, Fourier-transform infrared and electron microscopy techniques. The XRD study reveals that the TiO<sub>2</sub> crystal structure does not transform from anatase to rutile phase till 600 °C. Covalent interaction between the phosphor and TiO<sub>2</sub> is evident from the diffuse reflectance spectra showing red shift in wavelength. The band-gap has been tuned to absorb light in the visible range. TEM micrographs of the as-prepared materials revealed presence of well dispersed polycrystalline TiO<sub>2</sub> nanoparticles on the surface of the phosphor substrate. The difference in size of TiO<sub>2</sub> particles that are bonded to the phosphor is attributed to the magnitude of Lewis acid-base interactions between TiO<sub>2</sub> and phosphor support. Photocatalytic activity of as-prepared nanocomposite was investigated by photodegradation of model organic pollutant methylene blue under UV and visible light. The nanocomposite catalyst showed highest photocatalytic activity.

#### Biography

Dilip R Thube has completed his PhD from Pune University, India. He has been honored with Brain Pool International Fellowship from Korea Research Institute of Chemical Technology, South Korea. He is the Professor of Chemistry at New Arts, Commerce and Science College, Parner, Savitribai Phule Pune University, India. He has over 40 publications and has been serving as an Editorial Board Member of reputed journals.

drthube@rediffmail.com

Notes:

Journal of Nanomedicine & Nanotechnology

Polymer Nanotechnology 2018  
September 06-07, 2018

Volume 9

Page 31

**29. Electrochemical synthesis of  $\text{CuS}_x\text{Se}_{1-x}$  thin film for supercapacitor application**

## Accepted Manuscript

Electrochemical synthesis of  $\text{CuS}_x\text{Se}_{1-x}$  thin film for supercapacitor application

M.A. Yewale, A.K. Sharma, D.B. Kamble, C.A. Pawar, S.S. Potdar, S.C. Karle

PII: S0925-8388(18)31531-7

DOI: [10.1016/j.jalcom.2018.04.208](https://doi.org/10.1016/j.jalcom.2018.04.208)

Reference: JALCOM 45846

To appear in: *Journal of Alloys and Compounds*

Received Date: 17 January 2018

Revised Date: 16 April 2018

Accepted Date: 18 April 2018

Please cite this article as: M.A. Yewale, A.K. Sharma, D.B. Kamble, C.A. Pawar, S.S. Potdar, S.C. Karle, Electrochemical synthesis of  $\text{CuS}_x\text{Se}_{1-x}$  thin film for supercapacitor application, *Journal of Alloys and Compounds* (2018), doi: [10.1016/j.jalcom.2018.04.208](https://doi.org/10.1016/j.jalcom.2018.04.208).

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



ACCEPTED MANUSCRIPT

## Electrochemical synthesis of $\text{CuS}_x\text{Se}_{1-x}$ thin film for supercapacitor application

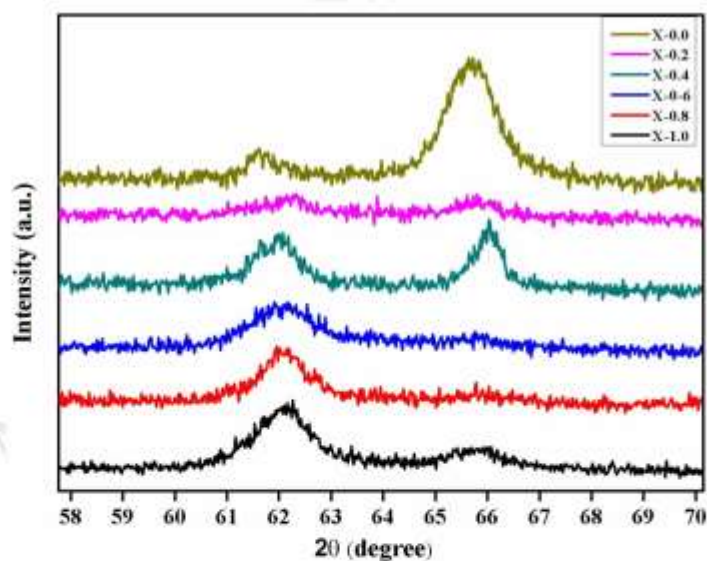
M. A. Yewale<sup>1,2\*</sup>, A. K. Sharma<sup>1</sup>, D. B. Kamble<sup>1</sup>, C. A. Pawar<sup>1</sup>, S. S. Potdar<sup>1</sup>,  
S. C. Karle<sup>2</sup>

<sup>1</sup>Thin film, Earth and Space Science Laboratory, Department of Physics,  
Shivaji University, Kolhapur, India

<sup>2</sup>Department of physics, New arts commerce and science college, Ahmednagar 414001

Corresponding Author \*: [maneshphd@gmail.com](mailto:maneshphd@gmail.com)

### Graphical Abstract



ACCEPTED MANUSCRIPT

## Electrochemical synthesis of $\text{CuS}_x\text{Se}_{1-x}$ thin film for supercapacitor application

M. A. Yewale<sup>1,2\*</sup>, A. K. Sharma<sup>1</sup>, D. B. Kamble<sup>1</sup>, C. A. Pawar<sup>1</sup>, S. S. Potdar<sup>1</sup>,  
S. C. Karle<sup>2</sup>

<sup>1</sup>Thin film, Earth and Space Science Laboratory, Department of Physics,

Shivaji University, Kolhapur, India

<sup>2</sup>Department of physics, New arts commerce and science college, Ahmednagar 414001

Corresponding Author \*: [maneshphd@gmail.com](mailto:maneshphd@gmail.com)

### Abstract

The  $\text{CuS}_x\text{Se}_{1-x}$  thin films were deposited on conducting substrates using copper sulphate sodium thiosulfate and selenium dioxide as a source of Cu, S, and Se by electrodeposition (ED) technique. The effect of the change in composition S and Se the structural and electrical properties of the  $\text{CuS}_x\text{Se}_{1-x}$  thin films was studied. The crystallite size, composition, microstructure, contact angle and capacitance studied using XRD, EDAX, SEM, CA, and CV. The X-Ray diffraction (XRD) graph reveals that the  $\text{CuS}_x\text{Se}_{1-x}$  films were polycrystalline in nature and  $\text{CuS}_{0.6}\text{Se}_{0.4}$  shows crystallite size of 34 nm, Energy dispersive analysis X-Ray (EDAX), scanning electron microscopy (SEM) show the elemental composition and microstructures were changes with S and Se composition. The  $\text{CuS}_{0.6}\text{Se}_{0.4}$  film show  $31^\circ$  contact angle and specific capacitance of 159 F/g

**Keywords:**  $\text{CuS}_x\text{Se}_{1-x}$  thin films; Electrodeposition; X-ray Diffraction (XRD); Scanning Electron Microscopy (SEM); Energy dispersive analysis X-Ray (EDAX); Supercapacitor.

ACCEPTED MANUSCRIPT

## 1 Introduction

CuS and CuSe are vital p-type semiconductors, they are used in various applications such as solar cells [1,2], Supercapacitor [3], photo-catalysts [4-6] Li-ion batteries [7], medical devices [8,9], gas sensors [10] due to their good optical, electrical, chemical, physical and biochemical properties. These properties of material were depend on surface morphology [11,12]. The precise preparation of CuS and CuSe are assumed to be essential for extensive requests. Specially, preparation of nano rods, nanogranuals, nano flakes-of CuS and CuSe have extensive requests in recent years.

Cu-S-Se is a ternary semiconducting material have interesting physical, chemical and optical property over a binary. The properties of the ternary material are changed with altering the atomic composition [13]. Gopi et al. [14] prepared the CuS electrode to improved photovoltaic efficiency in QDSCs. Solar cell shows highest efficiency 4.67 % in sulfide and poly sulfide electrolyte. Sabah et al. [15] synthesised multi-layered CuS thin film by spray pyrolysis method. Flower like microstructure cover whole surface of the substrate films which is found to exhibit the high recovery and response time for hydrogen and other gas sensing. Gosavi et al. [16] prepared the CuSe films with the help of SGT method. XRD study show polycrystalline nature. Grain size is 145 nm, band gap is 2.03 eV and roughness of CuSe film is 13.1 nm. Electrical properties displayed film were utilised in optoelectronic application. Gao et al. [17] synthesized a series of  $\text{CuS}_x\text{Se}_{1-x}$  in non-aqueous medium by reflux method. The synthesis mode is useful for the  $\text{CuS}_x\text{Se}_{1-x}$  ternary material with a different content of sulfur and selenium compositions. X-ray data shows that lattice parameter deviates with variation of sulfur and selenium content. Optical spectra reveals that absorption changes according to deviation of chemical content.  $\text{CuS}_x\text{Se}_{1-x}$  ternary material were display very good photocatalytic activity for photodegradation of RhB in aqueous



## ACCEPTED MANUSCRIPT

solution, decomposition is dependent on composition of compound.  $\text{CuSe}_{1-x}\text{S}_x$  nanoflakes have effectively been prepared by Ni et al. [18] using copper chloride, Selenium and Sulfur powder as precursor materials through hydrothermal method. FESEM study reveals that for composition in  $\text{CuSe}_{1-x}\text{S}_x$  hexagonal nanoflakes shows the same morphologies in the range 200-600 nm while the thickness is 15-50 nm and all nanoflakes have smooth surfaces. The band gap energy of  $\text{CuSe}_{1-x}\text{S}_x$  nanoflakes was altered by change in sulfur and selenium composition. The  $\text{CuSe}_{1-x}\text{S}_x$  material was utilised to study the photo degradation of methyl blue in a non-aqueous solvent. The performance of  $\text{CuSe}_{1-x}\text{S}_x$  was very good and the MB was degraded within 15 min.

Xu et al. [19] prepared homogeneous ternary hexagonal  $\text{CuS}_y\text{Se}_{1-y}$  nanoplates and fcc  $\text{Cu}_{2-x}\text{S}_y\text{Se}_{1-y}$  nanoplates through a simple and low-temperature solution scheme. As phase changes hexagonal  $\text{CuS}_y\text{Se}_{1-y}$  to fcc  $\text{Cu}_{2-x}\text{S}_y\text{Se}_{1-y}$  an optical study observes red shift in absorption. The peak corresponding to the vibrational mode of S-S, S-Se, and Se-Se, was observed in Raman study. Resonance peak was shifted with altering the chemical composition. Prepared  $\text{CuS}_y\text{Se}_{1-y}$  and  $\text{Cu}_{2-x}\text{S}_y\text{Se}_{1-y}$  was utilised as counter electrode in QDSC and shows PCEs of 4.63 and 5.01 % respectively. Phase identification and quantitative analysis of mixed crystals by abrasive stripping voltammetry was stated by Meyer et al. [20]. Dilena et al. [21] prepared cubic & hexagonal  $\text{Cu}_{2-x}(\text{S}_y\text{Se}_{1-y})$  nanocrystals having same Cu/S/Se stoichiometry by varying the reaction parameter. Wang et al. [22] prepared monodispersed ternary alloyed  $\text{Cu}_{2-x}\text{S}_y\text{Se}_{1-y}$  nanocrystals using a facile one-pot method. The structure of the synthesized nanocrystals change from hexagonal to cubic by varying the reaction parameter. The morphology and size of the cubic phase nanocrystals depend on amount of dodecanethiol and the type of copper precursors. The compositions of both the hexagonal and the cubic nanocrystals also depend on quantities of diphenyl diselenide and dodecanethiol. UV-vis absorption study displays the band gap of the  $\text{Cu}_{2-x}\text{S}_y\text{Se}_{1-y}$

## ACCEPTED MANUSCRIPT

nanocrystals can be altered by the chalcogen ratio in the ternary alloyed nanocrystals, as well as the crystal structure. Liu et al. [23] prepared  $\text{CuS}_x\text{Se}_{1-x}$  NCs. The nanocrystals used in numerous applications, such as photothermal therapy, photoacoustic imaging, and plasmonic photodetectors.

In present work  $\text{CuS}_x\text{Se}_{1-x}$  thin films are prepared by electrodeposition technique. Electrodeposition technique is beneficial because this technique has some advantages over other deposition technique. Experiments were performed under the distinct composition ratio of sulfur and selenium and studied their electrical, morphological, physical properties.

## 2 Experimental

### 2.1 Substrate cleaning

Fluorine doped Tin Oxide (FTO) glass slides (75 mm × 25 mm × 1 mm) were used as substrates. The FTO glass substrates were first cleaned by a detergent, and then were rinsed into labogent, acetone and deionized water each for 10 min by using an ultrasonic cleaner. Finally, substrates were dried in alcohol (methanol) vapours.

### 2.2 Preparation of solution

#### Bath - 1

Bath - 1 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 20ml aqueous solution of 0.1M  $\text{SeO}_2$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

#### Bath -2

Bath - 2 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 16ml aqueous solution of 0.1M  $\text{SeO}_2$ , 4ml aqueous solution of 0.3M  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

#### Bath -3

## ACCEPTED MANUSCRIPT

Bath - 3 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 12ml aqueous solution of 0.1M  $\text{SeO}_2$ , 8ml aqueous solution of 0.3M  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

**Bath -4**

Bath - 4 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 8ml aqueous solution of 0.1M  $\text{SeO}_2$ , 12ml aqueous solution of 0.3M  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

**Bath -5**

Bath - 5 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 4ml aqueous solution of 0.1M  $\text{SeO}_2$ , 16ml aqueous solution of 0.3M  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

**Bath -6**

Bath - 6 contains 20 ml aqueous solution of 0.1M  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 20ml aqueous solution of 0.3M  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  and the pH of the mixture is maintained at 2-3 by drop wise addition of 10 % sulphuric acid.

The fine cleaned conducting SS substrate were used for electrodeposition of  $\text{CuS}_x\text{Se}_{1-x}$  thin films. The deposition was performed for the distinct composition of Sulfur and Selenium.  $\text{CuS}_x\text{Se}_{1-x}$  films were prepared with the help of three electrode electrodeposition arrangement in which graphite, SS substrate, and SCE are used as a counter, working and a reference electrode. Prepared films were placed in air tight box for further characterization.

The different characteristics like structural, compositional and electrical properties of the electrodeposited CuS thin films were studied by various techniques. X-ray diffraction (XRD) study was done by a Rigaku Rint-2000 X-ray diffractometer using  $\text{Cu}/30\text{kv}/15\text{ mA}$  radiation with a scan step of 0.001. The compositional analysis of CuS was confirmed by energy-dispersive X-ray analysis, using JEOL model, JSM-6300 (LA). The surface

## ACCEPTED MANUSCRIPT

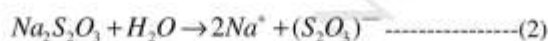
morphology of the as synthesized CuS films were studied by using scanning electron microscopy (SEM) using JEOL model, JSM-6360 (LA).

### 2.3 Growth process and formation mechanism

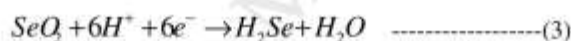
Electrodeposition process depends on electrolysis of material at a boundary of electrode-electrolyte because of a pathway of current through an electrolyte and form solid layer on substrate. It contains four steps ionic transport, discharge, nucleation and growth. Seeing the development of dipped films, the probable reaction in electrolyte represented by following eq.



next step  $(S_2O_3)^{2-}$  ions are released from  $Na_2S_2O_3$  represented by following eq.



Meanwhile electrochemical reduction of  $SeO_2$  becomes



And sulphur and selenium atom combine with copper by following reaction



### 2.4 Cyclic Voltammetry (CV)

CV is an important electro analytical procedure to analyse electro active kinds. Generally this technique is utilised to study qualitative knowledge of chemical reaction. CV is the demonstration of current vs potential of depositing material. The CV curves are repeated after every scan. It is a dominant tools to analyse proper reduction and oxidation potential of material, kinetics study of chemical reaction. Fig. 1 shows the CV of  $CuS_xSe_{1-x}$  thin film deposited on SS substrate in aqueous electrolyte having 0.1M  $CuSO_4$ , 0.3M  $Na_2S_2O_3$  and 0.1M  $SeO_2$  as a source of Cu, S and Se respectively, the pH of the mixture is maintained at 2-3 by drop wise addition of 10 %  $H_2SO_4$  in order to find an appropriate

ACCEPTED MANUSCRIPT

deposition potentials of  $\text{CuS}_x\text{Se}_{1-x}$ . The deposition potential of  $\text{CuS}_x\text{Se}_{1-x}$  were found to be -1.0 V/SCE for all composition of Sulfur and selenium.

All composition of  $\text{CuS}_x\text{Se}_{1-x}$  were deposited by electrodeposition method at -1.0 V/SCE. Uniform  $\text{CuS}_x\text{Se}_{1-x}$  films were deposited at room temperature on SS and FTO substrate and prepared films were used for characterizations.

### 3 Results and discussion

#### 3.1 XRD study

The XRD patterns of  $\text{CuS}_x\text{Se}_{1-x}$  films deposited with different composition of S & Se with deposition time are shown in Fig. 2(a). The phases of  $\text{CuS}_x\text{Se}_{1-x}$  were studied by analysis of XRD patterns, peaks were indexed as (100), (006), (104), (107), (114), (204), (104), (206), (207) and (214) reported as cubic CuS (JCPDS Card No.03-65-3929) and cubic CuSe (JCPDS Card No.00-034-0171). Various patterns indicates the formation of polycrystalline  $\text{CuS}_x\text{Se}_{1-x}$ . XRD study shows that the precursors were converted into  $\text{CuS}_x\text{Se}_{1-x}$ . The crystallite size were obtained with the help of Scherer's formula. If we change the composition of the sulphur and selenium the intensity of peak at  $65^\circ$  also changes as shown in Fig 2 (b).

The average crystallite size is 67 nm, 51 nm, 56 nm, 34 nm, 42 nm, 29 nm for bath (1), bath (2) bath (3) bath (4) bath (5) and bath (6) respectively. The crystalline size of the material changes with change in composition of the sulphur and selenium. The growth occurs with multiple nucleation centres changes with composition. The crystallite size of the composition is enlisted in table 1

#### 3.2 SEM study

Fig. 3 display SEM micrograph of  $\text{CuS}_x\text{Se}_{1-x}$  thin films deposited by Electrodeposition for diverse composition of Sulfur and Selenium. From SEM observation it

## ACCEPTED MANUSCRIPT

is clear that as we alter the composition of S and Se in  $\text{CuS}_x\text{Se}_{1-x}$ , the surface morphology of the films also changes with composition. The nanograins of the  $\text{CuS}_x\text{Se}_{1-x}$  were smoothly covered over a whole surface of substrate. At lower concentration of the sulfur, the  $\text{CuS}_x\text{Se}_{1-x}$  particle was small and spherical, if we increase the Selenium percentage the particle size and shape also changes. The film of  $\text{CuS}_x\text{Se}_{1-x}$  at  $X = 0.6$  shows the porous morphology at this composition the nanograins were slightly separated and form void space. The porous structure of the material alter the electrochemical performance of material. The average particle size of  $\text{CuS}_{0.6}\text{Se}_{0.4}$  composition is  $0.57 \mu\text{m}$ .

### 3.3 EDAX study

Compositional study of  $\text{CuS}_x\text{Se}_{1-x}$  were done with the help of EDAX analysis. Element analysis of as synthesized  $\text{CuS}_x\text{Se}_{1-x}$  thin film for different compositions of sulphur and selenium with respect to deposition time as shown in Fig. 4. The ratio between the sulphur and selenium changes with variation of S and Se. EDAX spectra of  $\text{CuS}_x\text{Se}_{1-x}$  observed that the peak intensity of element were alter with variation of S and Se content in  $\text{CuS}_x\text{Se}_{1-x}$  films. The result of atomic and weight percentage is given in table 2. From observation of EDAX, conform that weight percentage of Cu, S, Se were nearly equal to atomic percentage. The  $\text{CuS}_x\text{Se}_{1-x}$  films were approximately stoichiometric for all composition of S and Se.

### 3.4 FT-IR Study

Fig. 5 display FT-IR spectra of  $\text{CuS}_x\text{Se}_{1-x}$  film at different composition of sulphur and selenium from  $550$  to  $1600 \text{ cm}^{-1}$  range. Peak at  $1110 \text{ cm}^{-1}$  and  $615 \text{ cm}^{-1}$  indicates the vibrational peaks of Cu-Se and Cu-S stretching modes [24–28], Intensity of FTIR peak were vary with change in S and Se composition in  $\text{CuS}_x\text{Se}_{1-x}$ . This peak may confirm the formation  $\text{CuS}_x\text{Se}_{1-x}$  at various composition.

### 3.5 Contact angle study

## ACCEPTED MANUSCRIPT

Relation between material surface and liquid were expressed by wettability study. Wettability performance of material was measured using contact angle measurement. The wettability of the material is inversely proportional to the contact angle and by the measurement of the contact angle, material was categorized. Fig. 6 gives the contact angle measurement of  $\text{CuS}_x\text{Se}_{1-x}$  films at the distinct composition of S and Se. The nanograins like CuSe thin film shows a CA of  $100^\circ$ , it may be due to the surface morphology of CuSe films. The contact angle of  $\text{CuS}_x\text{Se}_{1-x}$  films altered with a variation of composition. The contact angle changes from  $100^\circ$  to  $66^\circ$  for different composition of S and Se resp. This specifies that with composition variation the contact angle changes as shown in Fig. 7. As we vary composition from Se to S the contact angle is also decreased upto  $x = 0.6$  and again contact angle increases. For  $x = 0.6$  composition contact angle is  $31^\circ$  it may be due to porous morphology of the films. At this composition, the large amount of electrolyte interact with electrode and enhance electrical property. The material having minimum contact angle are the main necessities for supercapacitor study.

### 3.6. Cyclic voltammetry

Fig 8 (a,b,c,d,e,f) shows CV of the  $\text{CuS}_x\text{Se}_{1-x}$  nanograins electrodes electrodeposited at different deposition time and different composition of S and Se. CV of the material were obtained using three electrode system in 1M NaOH aqueous electrolyte. The CV curve were obtained between a potential windows from -0.4 to 0.8 V. Inside a potential window a minute hump was observed. That hump were equivalent to an anodic and cathodic peak demonstrate supercapacitive behaviour of  $\text{CuS}_x\text{Se}_{1-x}$  thin films in aqueous electrolyte. The probable reaction may be completed conversion from Cu (0) to Cu(II) species [29][30]. An oxidation of  $\text{CuS}_x\text{Se}_{1-x}$  to Cu (III) kinds may happen in selected potential window of -0.4 to 0.8 V [30]. The CVs of the  $\text{CuS}_x\text{Se}_{1-x}$  nanograins were noted in aqueous 1M NaOH electrolyte at different scan rates. If we rise scan rate the cathodic and anodic peak shift near negative and

## ACCEPTED MANUSCRIPT

positive potential respectively showing a quasi-reversible reaction. The capacitance are calculated from CV equation in chapter II. The capacitance at different compositions are enlisted in table 3. Fig 8 (a,b,c,d,e,f) shows CV of  $\text{CuS}_x\text{Se}_{1-x}$  electrode for different composition of S and Se ranging from  $x = 0.0$  to  $x = 1.0$ , all the electrodes showing that the deposited electrode are proficient electrodes for supercapacitor application. The values of super capacitance calculated from the CVs are 67, 86, 104, 159, 141 and 138 F/g for composition of sulphur and selenium. From table 3 it is clear that as selenium percentage decreases. The super capacitance of  $\text{CuS}_x\text{Se}_{1-x}$  electrode increases up to 159 F/g and this composition shows maximum capacitance this may be due to porosity and wettability of the  $\text{CuS}_x\text{Se}_{1-x}$  electrode. At  $\text{CuS}_{0.6}\text{Se}_{0.4}$  composition the contact angle very less and electron electrolyte interaction higher at small contact angle which increase the capacitance value

### 3.7 EIS study

Charge transport dynamics of supercapacitor cells was examined by using EIS technique. An effect of S and Se composition on the charge carrier dynamics has been observed by execution EIS measurement for  $\text{CuS}_{0.6}\text{Se}_{0.4}$  composition using 1 M NaOH electrolyte. The measurement is carried out in the AC frequency range 100 KHz–20 Hz. Fig. 9 shows the nyquist plots for  $\text{CuS}_{0.6}\text{Se}_{0.4}$  composition. The spectra have been fitted in a corresponding circuit shown in inset of Fig. 9. Zsimpwin 3.21 software has been used to fit plots. At maximum frequency a cut off to real axis is termed as equivalent series resistance  $R_s$ . The series resistance for  $\text{CuS}_{0.6}\text{Se}_{0.4}$  composition may be due to the combine resistance of substrate, electrolyte and depositing material which is about  $4.1 \Omega$

## 5 Conclusions

The synthesis of  $\text{CuS}_x\text{Se}_{1-x}$  thin films are accomplished by electrodeposition using  $\text{CuSO}_4$ ,  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{SeO}_2$  precursors onto stainless steel Substrates. The XRD spectra of  $\text{CuS}_x\text{Se}_{1-x}$  thin films reveal polycrystalline nature and the crystallite size changes with sulfur



ACCEPTED MANUSCRIPT

and selenium content. The SEM images indicate that porous nature of  $\text{CuS}_x\text{Se}_{1-x}$  thin films with spherical grains are agglomerated throughout the surface of thin film. The FT-Raman studies also confirm the deposition of  $\text{CuS}_x\text{Se}_{1-x}$ . The contact angle of  $\text{CuS}_x\text{Se}_{1-x}$  changes with change in sulfur and selenium content. Contact angle have minimum value at  $x = 0.6$  due to the porous morphology of film. The cell corresponding to  $x = 0.6$  exhibited high specific capacitance value of 159 F/g having minimum charge resistance 4.1  $\Omega$ .

### References

- [1] H. Lei, G. Fang, F. Cheng, W. Ke, P. Qin, Z. Song, Q. Zheng, X. Fan, H. Huang, X. Zhao, *Sol. Energy Mater. Sol. Cells* 128 (2014) 77.
- [2] H. Dong, A. Quintilla, M. Cemernjak, R. Popescu, D. Gerthsen, C. Feldmann, J. *Colloid Interface Sci.* 415 (2014) 103.
- [3] T. Zhu, B. Xia, L. Zhou, X. Wen (David) Lou, *J. Mater. Chem.* 22 (2012) 7851.
- [4] Y. Gu, Y. Su, D. Chen, H. Geng, Z. Li, L. Zhang, Y. Zhang, *CrystEngComm* 16 (2014) 9185.
- [5] S. Sonia, P.S. Kumar, D. Mangalaraj, N. Ponpandian, C. Viswanathan, *Appl. Surf. Sci.* 283 (2013) 802.
- [6] M. Tanveer, C. Cao, Z. Ali, I. Aslam, F. Idrees, W.S. Khan, F.K. But, M. Tahir, N. Mahmood, *CrystEngComm* 16 (2014) 5290.
- [7] Y.H. Chen, C. Davoisne, J.M. Tarascon, C. Guery, *J. Mater. Chem.* 22 (2012) 5295.
- [8] C.M. Hessel, P. V Pattani, M. Rasch, M.G. Panthani, B. Koo, J.W. Tunnell, B.A.

## ACCEPTED MANUSCRIPT

- Korgel, *Nano Lett.* 11 (2011) 2560.
- [9] Z. Zha, S. Zhang, Z. Deng, Y. Li, C. Li, Z. Dai, *Chem. Commun. (Camb.)* 49 (2013) 3455.
- [10] M.S. Zaman, C.H. Moon, E.D. Haberer, *Appl. Phys. Express* 7 (2014) 117002–1.
- [11] G. Xiao, J. Ning, Z. Liu, Y. Sui, Y. Wang, Q. Dong, W. Tian, B. Liu, G. Zou, B. Zou, *CrystEngComm* 14 (2012) 2139.
- [12] J. Kundu, D. Pradhan, *New J. Chem.* 37 (2013) 1470.
- [13] S.C. Riha, B.A. Parkinson, A.L. Prieto, *Communication* 133 (2011) 15272.
- [14] C.V.V.M. Gopi, M. Venkata-haritha, S. Kim, H. Kim, *J. Power Sources* 311 (2016) 111.
- [15] F.A. Sabah, N.M. Ahmed, Z. Hassan, H.S. Rasheed, *Sensors Actuators A. Phys.* 249 (2016) 68.
- [16] S.R. Gosavi, N.G. Deshpande, Y.G. Gudage, R. Sharma, *J. Alloys Compd.* 448 (2008) 344.
- [17] Y. Gao, Z. Zheng, F. Yang, F. Zhang, P. Li, W. Fa, H. Jia, *CrystEngComm* 2 (2011) 1441.
- [18] S. Ni, Y. Su, Z. Ai, J. Hu, Z. Yang, *Ceram. Int.* Accepted m (2015).
- [19] J. Xu, X. Yang, Q. Yang, W. Zhang, C.S. Lee, *Appl. Mater. Interface* 6 (2014) 16352.
- [20] B. Meyer, S. Zhang, F. Scholz, *Fresenius J. Anal. Chem.* 356 (1996) 267.
- [21] E. Dilena, D. Dorfs, C. George, K. Miszta, M. Povia, A. Genovese, A. Casu, M. Prato, L. Manna, *J. Mater. Chem.* 22 (2012) 13023.
- [22] J.J. Wang, D.J. Xue, Y.G. Guo, J.S. Hu, L.J. Wan, *Acs Commun.* 133 (2011) 18558.
- [23] X. Liu, X. Wang, B. Zhou, W.C. Law, A.N. Cartwright, M.T. Swihart, *Adv. Fun* 23 (2013) 1256.
- [24] S.S. Jadhav, C.K. Hong, P.S. Patil, P.N. Bhosale, G.N. Mulik, *J. Mater. Sci. Mater.*

## ACCEPTED MANUSCRIPT

- Electron. 1 (2015) 12.
- [25] S. Pandiarajan, M. Umadevi, M. Briget Mary, R.K. Rajaram, V. Ramakrishnan, J. Raman Spectrosc. 35 (2004) 907.
- [26] P. Huang, Y. Kong, Z. Li, F. Gao, D. Cui, Nanoscale Res. Lett. 5 (2010) 949.
- [27] P. Kumar, K. Singh, Struct. Chem. 22 (2011) 103.
- [28] M. Saranya, C. Santhosh, R. Ramachandran, P. Kollu, P. Saravanan, M. Vinoba, S.W. Jeong, A.N. Grace, Powder Technol. 252 (2014) 25.
- [29] C.J. Raj, B.C. Kim, W.J. Cho, W.G. Lee, Y. Seo, K.H. Yu, J. Alloys Compd. 586 (2014) 191.
- [30] Y. Hsu, Y. Chen, Y. Lin, Electrochim. Acta 139 (2014) 401.

ACCEPTED MANUSCRIPT

**Table 1** crystallite size of  $\text{CuS}_x\text{Se}_{1-x}$  thin film

Sr. No.	Deposition time(min.)	Composition	crystallite size (nm)
1	15	X=0.0	67
2	17	X=0.2	61
3	19	X=0.4	56
4	21	<b>X=0.6</b>	<b>34</b>
5	23	X=0.8	42
6	25	X=1.0	29

**Table 2** Chemical composition of Cu, S and Se in  $\text{CuS}_x\text{Se}_{1-x}$  (X=0.0 -1.0)

Composition	Film composition	Atomic percentage of bath			Atomic percentage of films		
		Cu	S	Se	Cu	S	Se
0.0	CuSe	50	00	50	49.54	00.00	50.46
0.2	$\text{CuS}_{0.2}\text{Se}_{0.8}$	50	10	40	52.02	09.16	38.62
0.4	$\text{CuS}_{0.4}\text{Se}_{0.6}$	50	20	30	49.18	21.07	29.12
0.6	$\text{CuS}_{0.6}\text{Se}_{0.4}$	50	30	20	52.21	27.16	20.63
0.8	$\text{CuS}_{0.8}\text{Se}_{0.2}$	50	40	20	51.16	38.19	10.65
1.0	CuS	50	50	00	53.60	46.40	00.00

**Table 3** Specific capacitance of  $\text{CuS}_x\text{Se}_{1-x}$  thin film for different composition

Composition of film x	Film composition	Specific capacitance F/g
0.0	CuSe	67
0.2	$\text{CuS}_{0.2}\text{Se}_{0.8}$	86
0.4	$\text{CuS}_{0.4}\text{Se}_{0.6}$	104
<b>0.6</b>	<b><math>\text{CuS}_{0.6}\text{Se}_{0.4}</math></b>	<b>159</b>
0.8	$\text{CuS}_{0.8}\text{Se}_{0.2}$	141
1.0	CuS	138

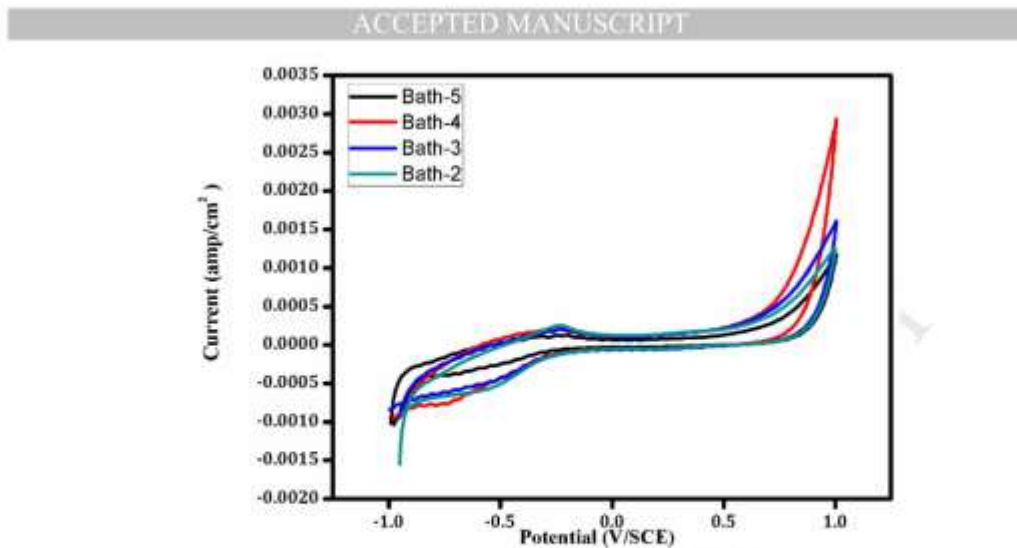


Fig. 1 CV of  $\text{CuS}_x\text{Se}_{1-x}$  thin film on SS substrate

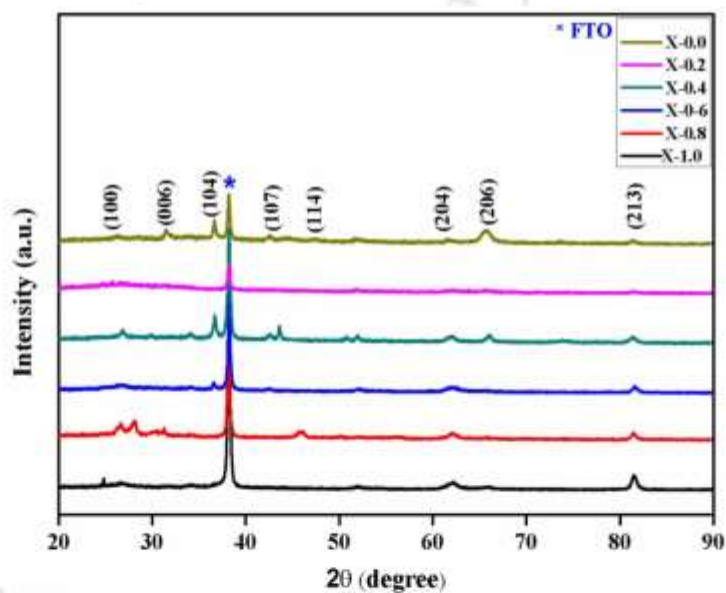


Fig. 2 (a) XRD patterns of  $\text{CuS}_x\text{Se}_{1-x}$  films for composition ( $0.0 < x < 1.0$ )

ACCEPTED MANUSCRIPT

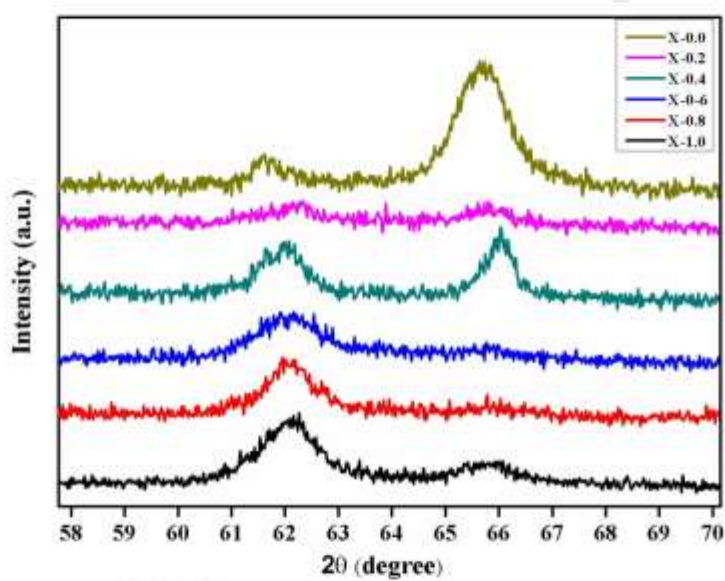
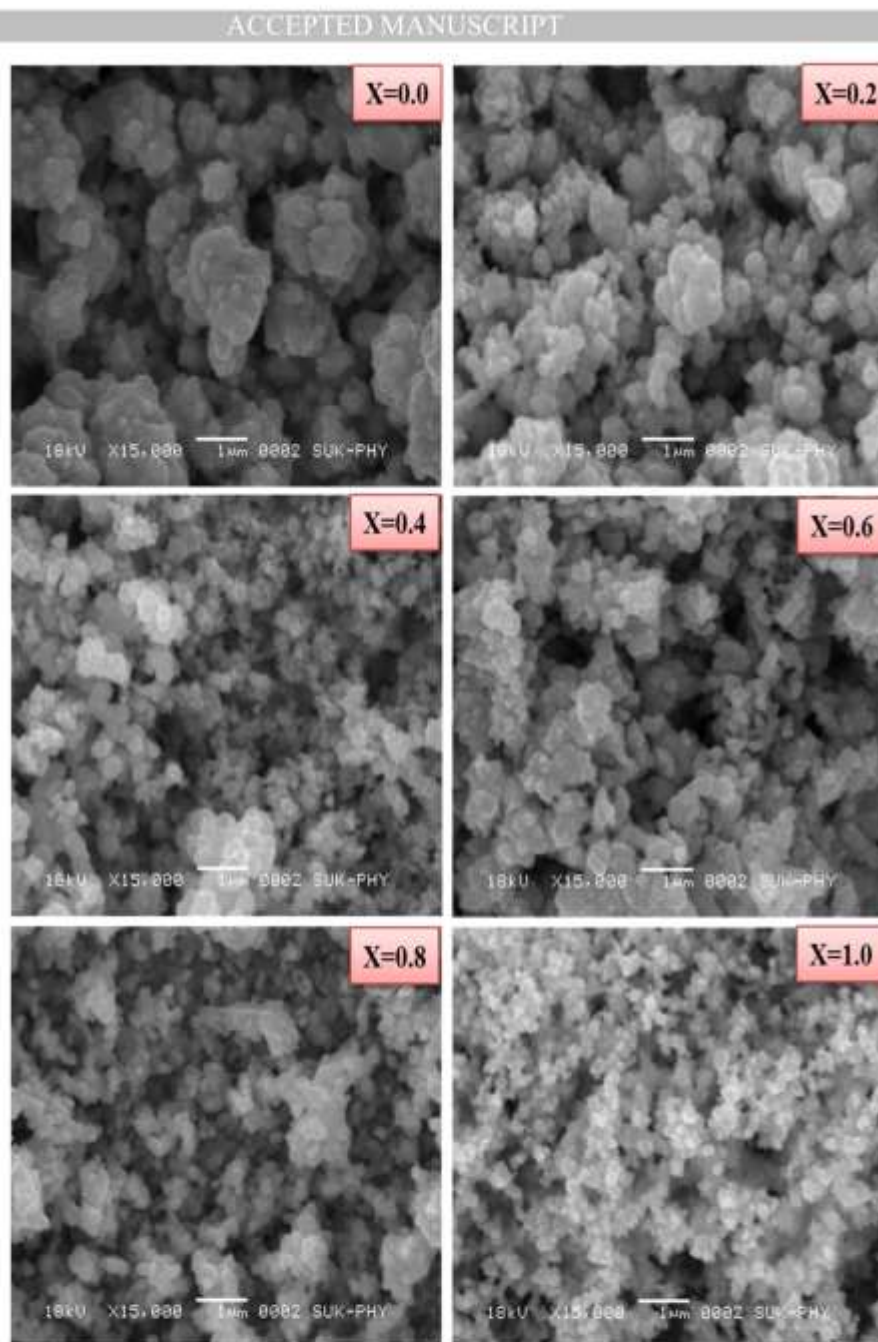


Fig. 2 (b) XRD patterns of  $\text{CuS}_x\text{Se}_{1-x}$  thin films



**Fig. 3 :** The SEM image of  $\text{CuS}_x\text{Se}_{1-x}$  thin films for composition ( $0.0 < x < 1.0$ )

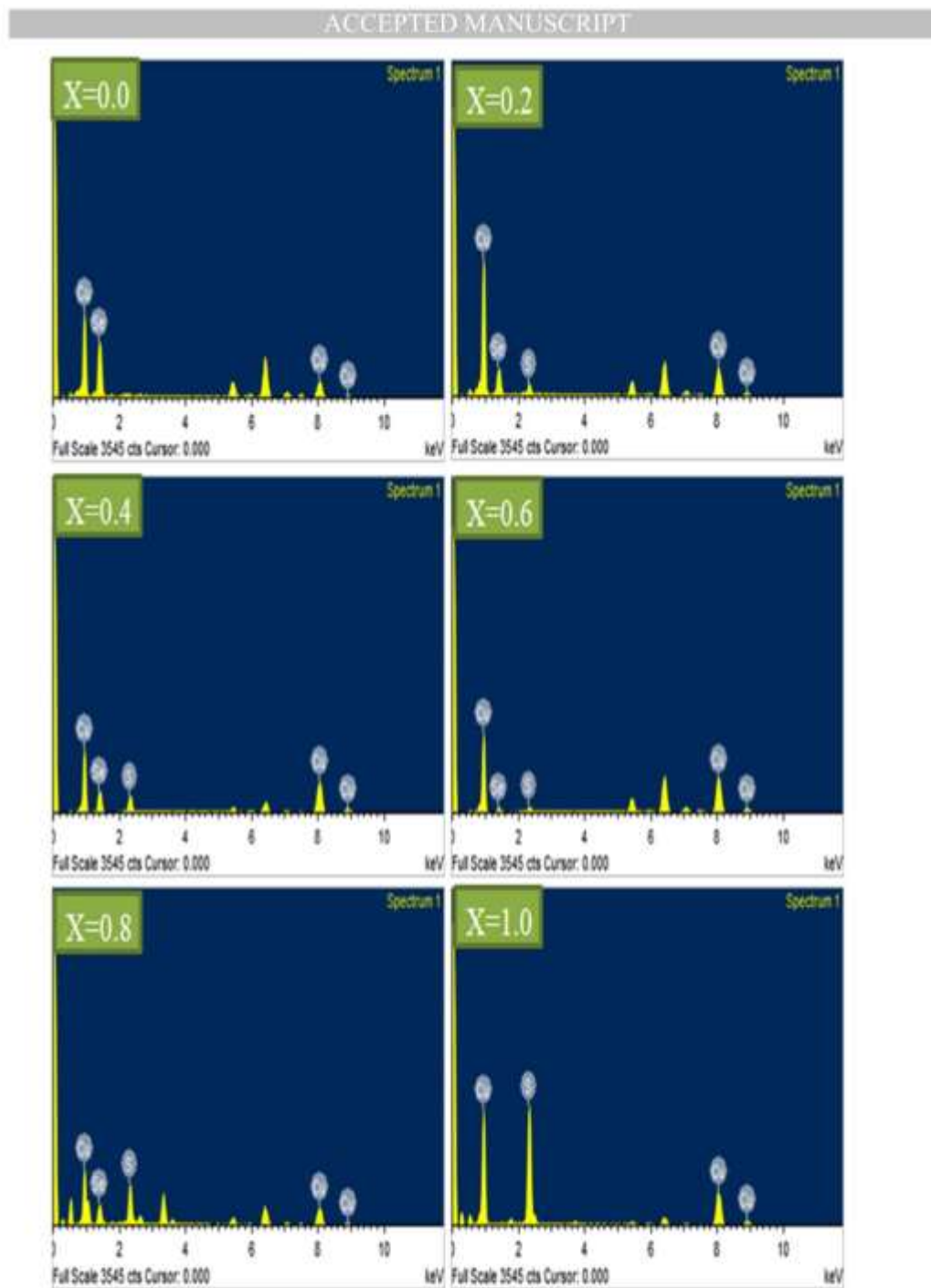


Fig. 4 : The EDAX spectra of  $\text{CuS}_x\text{Se}_{1-x}$  films for composition ( $0.0 < x < 1.0$ )



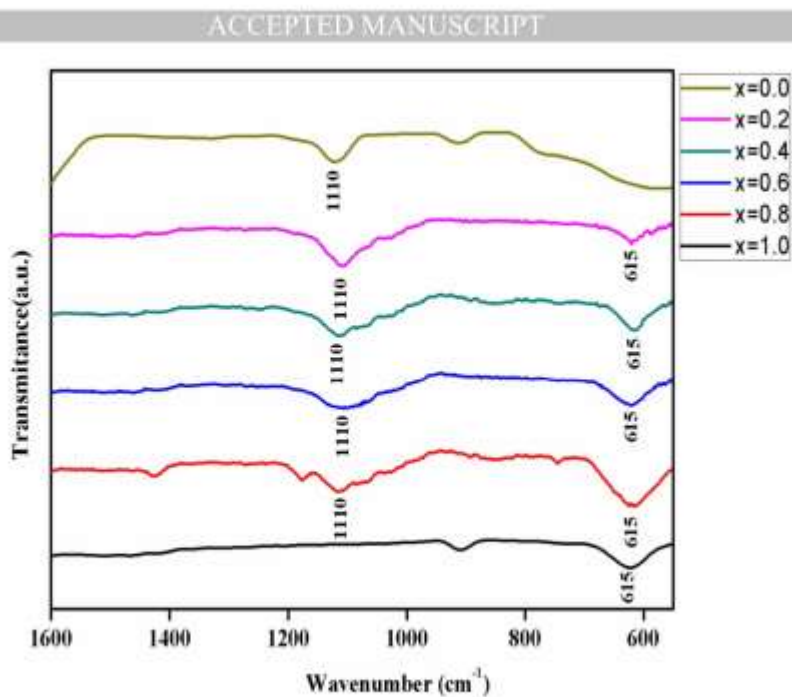


Fig. 5: FTIR of CuS<sub>x</sub>Se<sub>1-x</sub> films for composition (0.0 < x < 1.0)

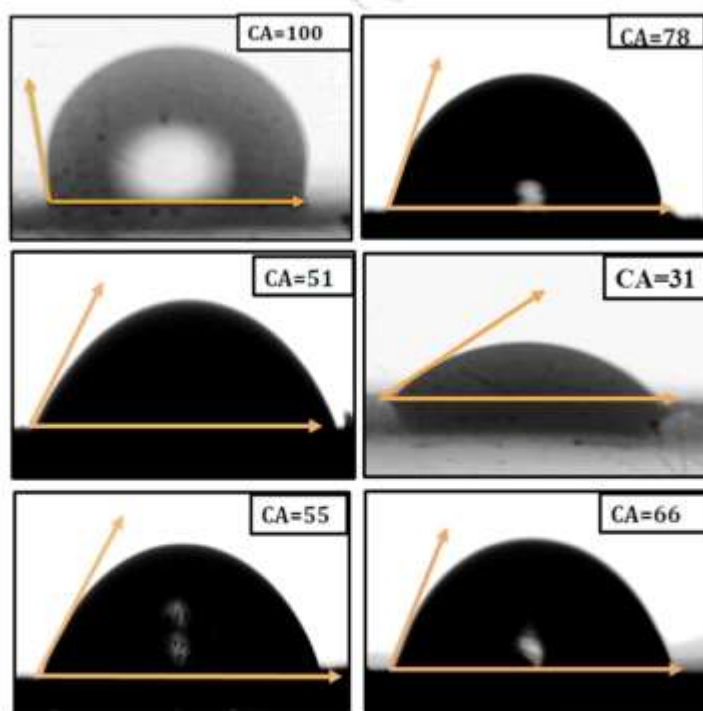


Fig. 6 Contact angle of CuS<sub>x</sub>Se<sub>1-x</sub> films for composition (0.0 < x < 1.0)

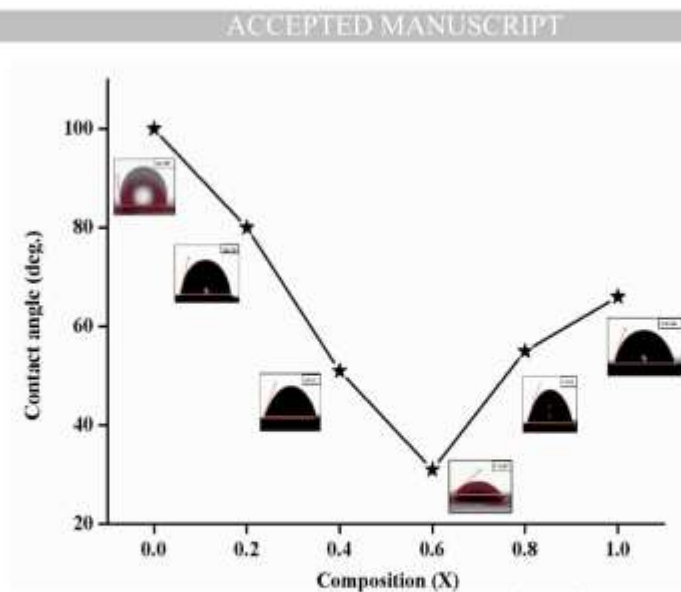


Fig. 7. Contact angle of  $\text{CuS}_x\text{Se}_{1-x}$  films for composition ( $0.0 < x < 1.0$ )

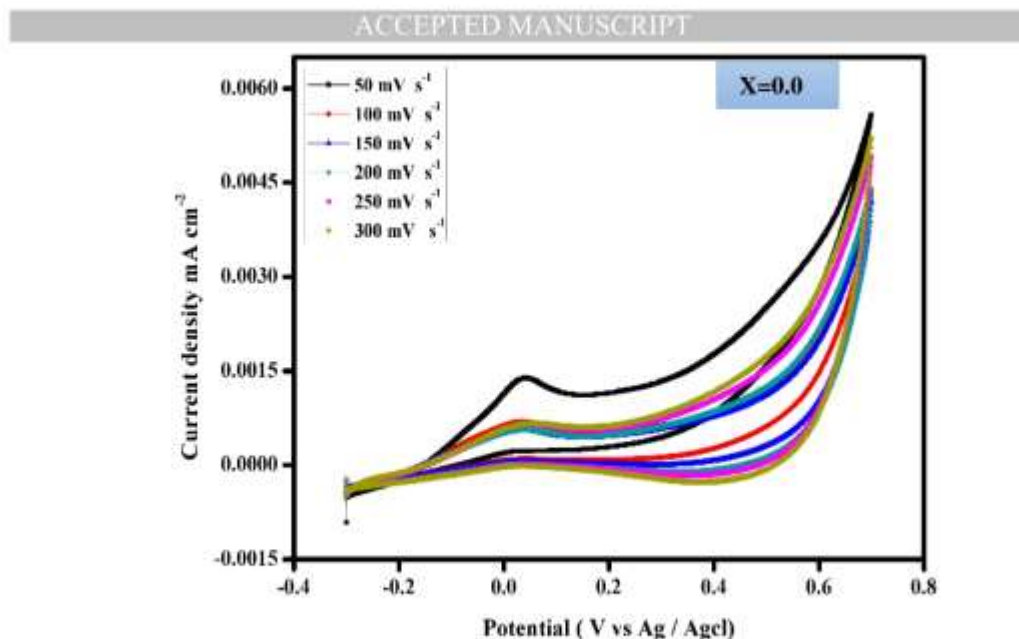


Fig. 8-a CV of CuSe electrodes in 1 M NaOH.

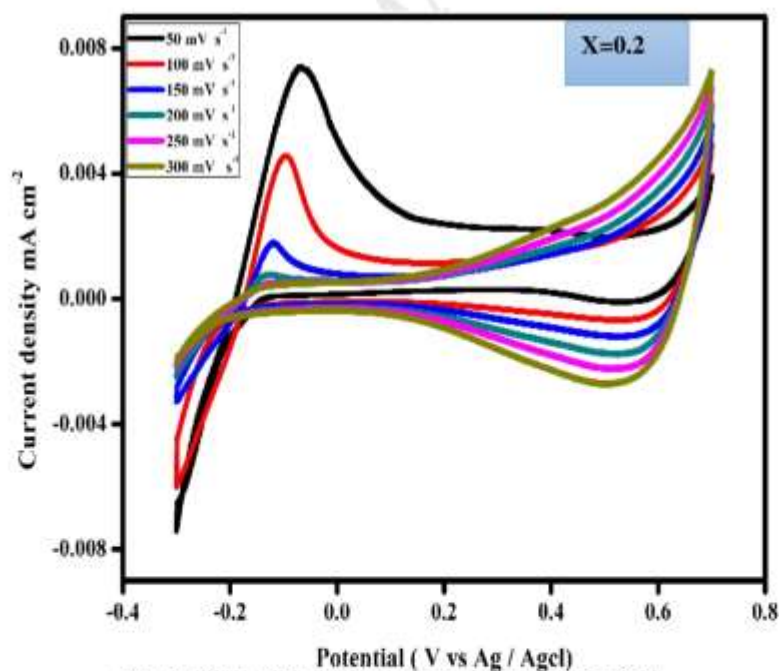


Fig. 8-b CV of  $\text{CuS}_{0.2}\text{Se}_{0.8}$  electrodes in 1 M NaOH

ACCEPTED MANUSCRIPT

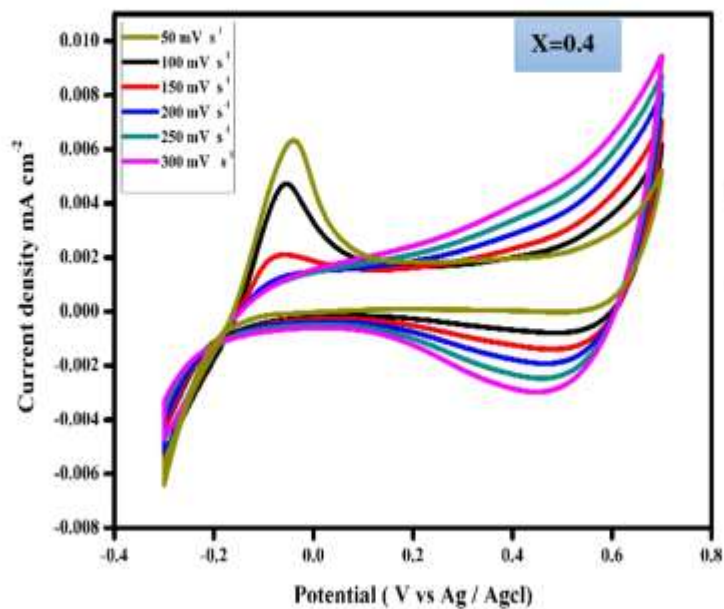


Fig. 8-c CV of  $\text{CuS}_{0.4}\text{Se}_{0.6}$  electrodes in 1 M NaOH

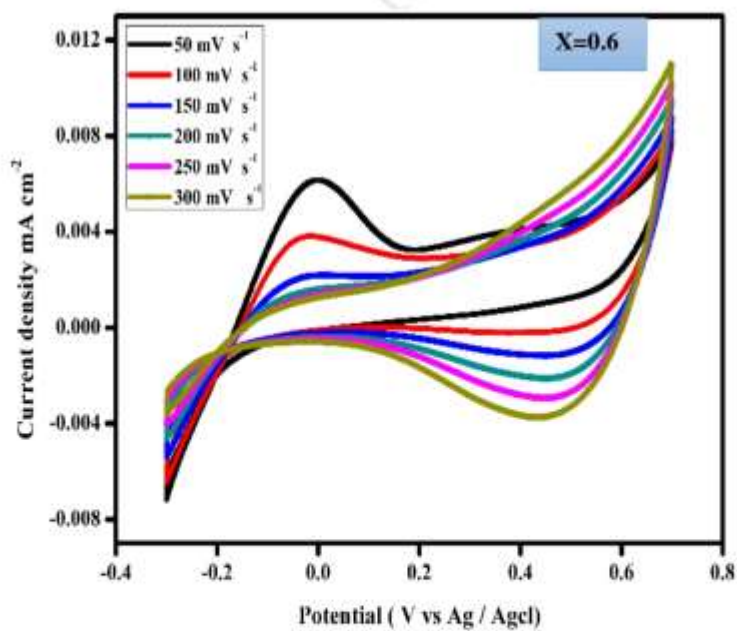


Fig. 8-d CV of  $\text{CuS}_{0.6}\text{Se}_{0.2}$  electrodes in 1 M NaOH

ACCEPTED MANUSCRIPT

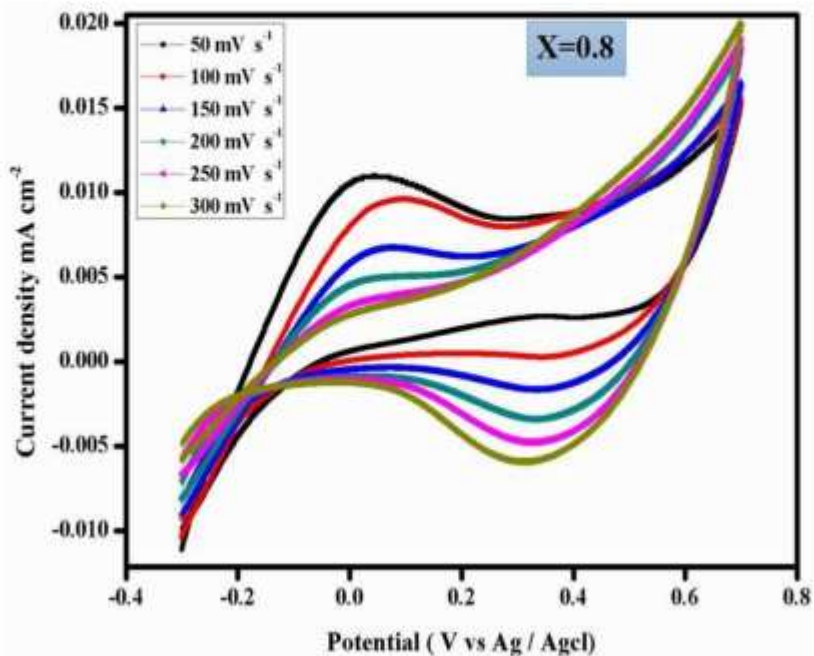


Fig. 8-e CV of  $\text{CuS}_{0.8}\text{Se}_{0.2}$  electrodes in 1 M NaOH

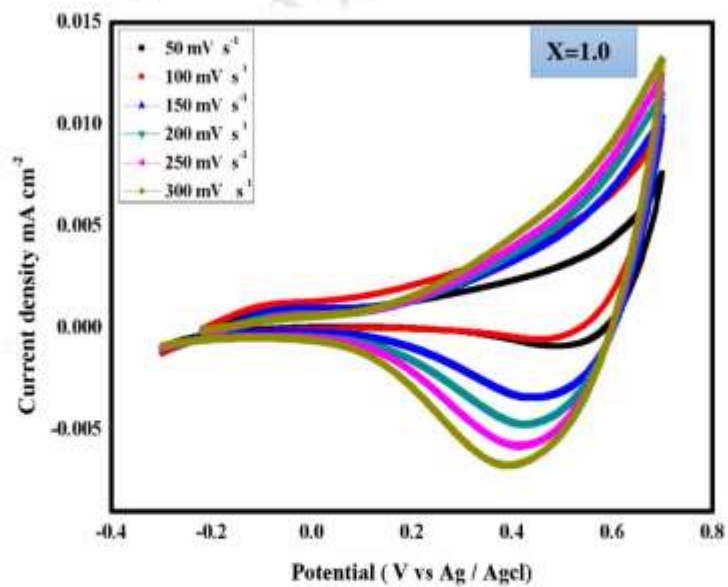


Fig. 8-f CV of CuS electrodes in 1 M NaOH

ACCEPTED MANUSCRIPT

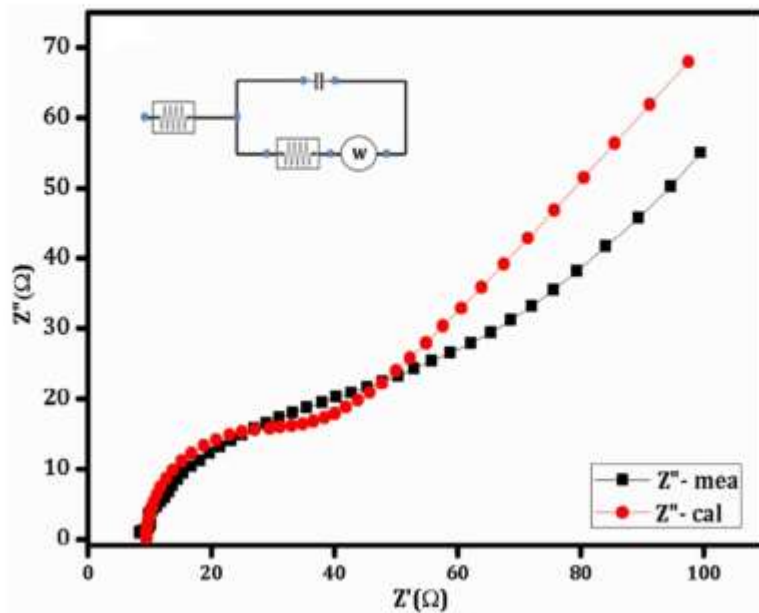


Fig. 9 Electrochemical impedance spectra of  $\text{CuS}_{0.6}\text{Se}_{0.4}$  electrode.

ACCEPTED MANUSCRIPT

## Electrochemical synthesis of $\text{CuS}_x\text{Se}_{1-x}$ thin film for supercapacitor application

M. A. Yewale<sup>1,2\*</sup>, A. K. Sharma<sup>1</sup>, D. B. Kamble<sup>1</sup>, C. A. Pawar<sup>1</sup>, S. S. Potdar<sup>1</sup>,  
S. C. Karle<sup>2</sup>

<sup>1</sup>Thin film, Earth and Space Science Laboratory, Department of Physics,

Shivaji University, Kolhapur, India

<sup>2</sup>Department of physics, New arts commerce and science college, Ahmednagar 414001

Corresponding Author \*: [maneshphd@gmail.com](mailto:maneshphd@gmail.com)

### Research Highlights

- ✓ Electrochemical synthesis of  $\text{CuS}$ ,  $\text{CuSe}$  and  $\text{CuS}_x\text{Se}_{1-x}$  thin films
- ✓ Nanograins like structure.
- ✓ Supercapacitive study

ACCEPTED MANUSCRIPT

XRD of  $\text{CuS}_x\text{Se}_{1-x}$  thin films (0.0 – 1.0).

ACCEPTED MANUSCRIPT



### 30. Antimicrobial efficacy of green synthesized iron oxide nanoparticles

<https://iopscience.iop.org/article/10.1088/2053-1591/aacf16/pdf>

IOPscience



Journals ▾

Books

Publishing Support



Login ▾

## Materials Research Express

PAPER

### Antimicrobial efficacy of green synthesized iron oxide nanoparticles

A K Sharma<sup>1</sup>, C A Pawar<sup>6,2</sup> , N R Prasad<sup>3</sup>, M A Yewale<sup>4</sup> and D B Kamble<sup>5</sup>

Published 4 July 2018 • © 2018 IOP Publishing Ltd

[Materials Research Express, Volume 5, Number 7](#)

Citation A K Sharma *et al* 2018 *Mater. Res. Express* 5 075402


References ▾

[+ Article information](#)

### Abstract

This paper reports experimental details for preparation of poly-dispersed hematite ( $\text{Fe}_2\text{O}_3$ ) nanoparticles using *Nyctanthes arbor tristis* flower extract at physiological pH and room temperature. The bio-inspired fabricated iron oxide nanomaterial is characterized by XRD patterns which reveal the formation of a high crystalline quality with rhombohedral structure having hematite phase. It is observed that XRD peak intensity is affected by the concentration of precursor. The FT-IR analysis reveals the existence of Fe-O bonding in the synthesized nanoparticles. The FE-SEM analysis reveals the nanostructure which is found to be poly-dispersed bead like agglomerates. The synthesized nanoparticles exhibit potential antimicrobial efficacies against *Kleb. pneumoniae* and *Staph. aureus*. Also the minimum inhibitory concentrations of the synthesized nanoparticles have been determined.

## 31. Marathi Gramin Sahitya Va Samajjivan



**'RESEARCH JOURNEY' International E-Research Journal**  
Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

---

Impact Factor – 6.261

ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

# RESEARCH JOURNEY

International E-Research Journal

---

PEER REFREED & INDEXED JOURNAL

February -2019 Special Issue - 139

ग्रामीण साहित्य : एक चिंतन

---

अतिथी संपादक  
डॉ. आर. जे. टेमकर  
प्राचार्य,  
दादा पाटील राजळे कला, वाणिज्य व विज्ञान महाविद्यालय,  
आदिनाथनगर, पायडी, जि. अहमदनगर

कार्यकारी संपादक  
डॉ. जालिंदर कानडे (मराठी विभागप्रमुख)  
डॉ. चंद्रकांत काळे  
डॉ. सुभाष देशमुख  
दादा पाटील राजळे कला, वाणिज्य व विज्ञान महाविद्यालय,  
आदिनाथनगर, पायडी, जि. अहमदनगर

मुख्य संपादक  
डॉ. धनराज घनगर (येवला)

---

**SWATIDHAN INTERNATIONAL PUBLICATIONS**

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 800/-

---

1

Website – [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015) (GIF)-0.676 (2013)  
Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

### अनुक्रमणिका

अ.क्र.	शीर्षक	लेखक/ लेखिका	पृ.क्र.
1	मराठी ग्रामीण कादंबरीतील सहकाराचे चित्रण	डॉ. सदाशिव सरकटे	5
2	१९८० नंतरच्या ग्रामीण कादंबरीतील राजकीय चित्रण	डॉ. सुभाष शेकडे	12
3	मराठी ग्रामीण साहित्यातील स्त्री चित्रण	डॉ. माहेश्वरी गावीत	16
4	मराठी ग्रामीण साहित्याची संकल्पना, स्वरूप व प्रेरणा	डॉ. मच्छिंद्र मालुंजकर	23
5	१९६० नंतरच्या मराठी ग्रामीण कवितेचा विकास	डॉ. अनिल गर्जे	32
6	गत दशकातल्या ग्रामीण कादंबरीतील राजकीय चित्रण	डॉ. कैलास दौंड	38
7	'प्रार्थनेची घंटा' मधील समाजदर्शन	प्रा. लक्ष्मण कोठावळे	45
8	साठोत्तरी ग्रामीण कादंबरी : प्रेरणा व स्वरूप	डॉ. जालिंदर कानडे	49
9	जागतिकीकरण आणि ग्रामीण कादंबरी	डॉ. रावसाहेब ननावरे	52
10	१९६० नंतरचे ललित लेख, ललित गद्य : काही निरीक्षणे	डॉ. सुभाष देशमुख	56
11	मराठी ग्रामीण कादंबरी व समाजपरिवर्तन	डॉ. द. के. गंधारे	58
12	मराठी ग्रामीण कादंबरीतील स्त्री संघर्ष	डॉ. चंद्रकांत काळे	62
13	ग्रामीण साहित्य आणि मुकुंदराव पाटील	डॉ. संजय दरवडे	66
14	'पाणी' धरणग्रस्तांचे जीवन चित्रण करणारी कादंबरी	डॉ. ए.बी. उगले	70
15	मराठी ग्रामीण कथातील भाषिक वेगळेपण	डॉ. विठ्ठल जंबाले	75
16	मराठी ग्रामीण साहित्याचे स्वरूप व वेगळेपण	डॉ. निवृत्ती मिसाळ	81
17	मराठी ग्रामीण साहित्य व समाज जीवन	डॉ. अशोक डोळस	83
18	डॉ. नागनाथ कोतापल्ले यांची ग्रामीण कथा : एक शोध	डॉ. सुभाष पुलावळे	87
19	ग्रामीण कादंबरीचे बदलते स्वरूप	डॉ. देविदास शेते	92
20	ग्रामीण कादंबरीतील बदलते स्त्री चित्रण	डॉ. अनिता आढाव	96
21	ग्रामीण साहित्यातील राजकीय चित्रण	डॉ. व्ही. बी. बनसोडे	101
22	साठोत्तरी ग्रामीण कादंबरीतील सामाजिकता	डॉ. जी. पी. बोडधे	104
23	१९६० नंतरच्या ग्रामीण कादंबऱ्यांचे रचनाविशेष	डॉ. प्रकाश सूर्यवंशी	107
24	ग्रामीण साहित्य : स्वरूप, प्रेरणा आणि वैशिष्ट्ये	डॉ. निलेश खरात	110
25	मराठी ग्रामीण साहित्य व समाज जीवन	डॉ. रंजना कदम	114
26	१९८० नंतरच्या ग्रामीण कवितेतील स्त्री भावनांचा आविष्कार	डॉ. वसंत सपकाळ	119
27	मुस्लिम साहित्यिकांच्या ग्रामीण मराठी कथा : एक चिकित्सक अभ्यास	डॉ. रमेश खिळदकर	122
28	१९९० नंतरचे मराठी साहित्यातील बदलते संदर्भ	प्रा. डी. बी. हारकर	125
29	मराठी ग्रामीण कादंबरी	डॉ. पोपट सिनारे	128
30	प्रयोगशील कादंबरीकार डॉ. अनिल सहखर्बुडे	श्री. संतराम साबळे	132
31	मराठी ग्रामीण साहित्यातील स्त्री चित्रण	डॉ. संभाजी शिंदे	135
32	इंद्रजित भालेराव यांची ग्रामीण कविता (पीकपाणी व दूर राहिला गाव)	डॉ. कार्तिकी नांगरे	140
33	मराठी ग्रामीण कविता	राजेश नेटके	144
34	'धग' : एक विलक्षण वास्तव	प्रा. महेंद्र पाटील	147
35	ग्रामीण नाटक वाङ्मय	डॉ. राखी सलगर	152
36	मराठी ग्रामीण कथेची वाटचाल	प्रा. पी. टी. कांबळे	154
37	मराठी ग्रामीण साहित्य व समाज जीवन	हरेश शेळके	157



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

### 'मराठी ग्रामीण साहित्य व समाज जीवन'

हरेरा संपत शेळके,  
मराठी विभाग प्रमुख  
न्यू आर्टस्, कॉमर्स अँड सायन्स कॉलेज,  
पारनेर - ४१४३०२  
प्रमाणध्वनी : ९७६७९७६६५९  
ईमेल : [hureshelke@gmail.com](mailto:hureshelke@gmail.com)

मराठीतील ग्रामीण साहित्याने ग्रामजीवनाच्या सर्व अंगांना स्पर्श करीत ग्रामजीवनाशी संबंधित असे जीवनानुभव विविध साहित्यप्रकारंतून म्हणजे कथा, कविता, कादंबरी, नाटक यांमधून व्यक्त केले आहेत. यामुळे पहिल्यांदाच ग्रामीण भागातील सामान्य माणूस साहित्याच्या केंद्रवर्ती येऊन नायक बनलेला आपणाला दिसून येतो.

सुरुवातीपासून आपण पाहिले तर ग्रामीण साहित्याचे आपल्याला सात टप्पे प्रामुख्याने दिसून येतात. केशवसुत यांची 'एक खेडे' (१८८७) सारखी कविता, ह.ना.आपटे यांची 'काळ तर मोठा कठीण आला' (१८९७ मध्ये दुष्काळ पडलेल्या परिस्थितीवरील) ही कथा, धनुर्धारी उर्फ र.वि.टिकेकर यांचा पिराजी पाटील (१९०३) ही ग्रामीण जीवनावरील छोटेखानी कादंबरी यांसारखे साहित्य म्हणजे तत्कालीन ग्रामीण साहित्याच्या पाऊलखुणाच होत.

ग्रामीण साहित्यनिर्मितीचा १९२५ ते १९४० हा दुसरा टप्पा मानता येईल. या काळात ग्रामीण साहित्यात कविता, कथा, कादंबरी या प्रकारांत निर्मिती झाली. ग्रामीण कथा-कादंबरीवर गांधीविचारातील निसर्गाच्या माहात्म्याचा, 'खेड्याकडे चला' च्या चळवळीचा, जनसामान्यांकडे दारिद्र्य नारायण म्हणून पाहण्याच्या प्रवृत्तीचा तसेच समाजवाद, साम्यवाद, ना.सौ.फडके यांची आनंदवादी व मनोरंजनवादी वाह्यमयीन दृष्टी, वि.स.खांडेकर यांचा ध्येयवाद यांचा परिणाम विशेष झालेला दिसतो.

ग्रामीण साहित्याचा तिसरा टप्पा १९४० ते १९५० असा दहा वर्षांचा मानावा लागतो. १९४० नंतरचे उल्लेखनीय ग्रामीण साहित्य म्हणजे श्री.म.माटे यांचे उपेक्षितांचे अंतरंग व माणुसकीचा गहिवर हे कथासंग्रह तळगाळतील समाजाचे निरीक्षण करताना आलेल्या अनुभवांतून उपेक्षितांच्या जीवनातले कारुण्य अतिशय सहानुभावाने माटे यांनी रेखाटलेले आहे. म्हणूनच वाचकाला त्यांच्या कथा हृदयस्पर्शा वाटतात. र.वा.दिघे यांच्या पाणकळ व सरई या कादंबऱ्या 'पाणकळ' या पहिल्याच कादंबरीत दिघ्यांच्या लेखनातील मनोहरी वैशिष्ट्ये स्पष्ट झाली. ग्रामीण जीवन व त्यातले प्रश्न हाताळताना विल्लधरारक प्रसंगांना दिघ्यांनी ग्रामीण निसर्गाच्या प्रत्यक्षकारी चित्रणाची जोड दिली. त्यांच्या व्यक्तिरेखांना कृषिसंस्कृतीचा अस्सल स्पर्श आहे. डोंगरदऱ्या, पहाड, वनराई, शेती यांच्यात मनाने गुंतून असणारी गावठराण माणसे त्यांच्या कादंबऱ्यांत जिवंत होतात. ग्रामीण व कृषिजीवनाचे वास्तवदर्शी चित्रण ही दिघ्यांच्या 'आई आहे शेतात', 'पड रे पाण्या' या कादंबऱ्यांचा खास विशेष ठरतो. या वगैरेच ग.ल.ढोकळ, म.भा.भोसले, वि.वा.हडप, बी.खुनाथ प्रभृतींचे कथात्मक साहित्य. माटे व दिघे यांच्या लेखनातून या टप्प्यावरील ग्रामीण साहित्यातील दोन प्रमुख प्रवृत्ती व्यक्त होतात. माटे यांच्या लेखनाची प्रवृत्ती प्रबोधनात्मक व वास्तवदर्शी आहे. तर दिघे यांच्या लेखनाची प्रवृत्ती रंजनात्मक व रोमांटिक स्वरूपाची आहे. या दोघांच्या प्रयत्नामुळे ग्रामीण साहित्याला वाह्यमयीन प्रतिष्ठा मिळण्यास प्रारंभ झाला.



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015) (GIF)-0.676 (2013)  
Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

ग्रामीण साहित्याचा चौथा टप्पा म्हणजे सर्वसाधारणपणे १९५० ते १९६० असा मानला जातो. हा प्रामुख्याने नवसाहित्याचा, नव्या कला जाणिवांच्या उदयाचा कालखंड होय. या नव्या साहित्य दृष्टीचा संस्कार त्या काळातील ग्रामीण साहित्यावरही झाला आहे. व्यंकटेश माडगुळकर, शंकर पाटील, रणजित देसाई, द.मा. मिरासदार इत्यादी काळातील महत्त्वाचे ग्रामीण लेखक होत.

बयाची अठरा वर्षे लहानशा खेड्यात घालवणाऱ्या माडगुळकरांचे भावविश्व भोवतीचा निसर्ग आणि अठरा पगड जातीतले शाळूशोबती यांच्या सहवासाने समृद्ध होत गेले. माडगुळकरांच्या लेखनात हरत-हेची माणसे, कुणबी, रामोशी, महार, न्हावी, सुतार, मुसलमान आपापल्या स्वभावविशेषांसह, धंद्याच्या वारकाव्यांसह येतात, निसर्गाचे, इतरांच्या लेखनात सहसा न आढळणारे तपशील जिवंत होतात त्याचे रहस्य हे होते. माणदेशी माणसे (१९४९), बनगरवाडी (१९५५) या कृतींनी माडगुळकरांना उदंड किर्ती मिळवून दिली. शंकर पाटील यांनी वळीव (१९५८), भेटीगाठी (१९६०), चावरी रोंग (१९६३), खुड्याची चावडी (१९६४) इत्यादी महत्त्वाचे कथासंग्रहाचे लेखन केले. १९६४ साली त्यांनी लिहिलेली टारफुला ही ग्रामीण भागातल्या राजकीय वातावरणाचे, सत्ताकांक्षेचे, गुंडगिरीचे चित्रण करणारी कादंबरी वैशिष्ट्यपूर्ण ठरली. पाटील यांचे कथाविश्व ग्रामीण परिसराशी, त्यातील माणसांशी निगडित आहे. गंभीर कथालेखनावरोबरच विनोदी कथाही त्यांनी लिहिल्या.

मिरासदार यांच्या कथांमधून खेड्यातील वातावरण, तेथील माणसे, त्यांच्या हालचाली, लकबींसह जिवंतपणे साकार झालेली आहेत. ग्रामीण माणसांमधला गोष्टी वेल्हाळपणा त्यांच्या कथेत आढळतो. माणसांच्या वर्तनातली विविधता, अंतर्विरोध टिपण्यात ते कुशल आहेत.

ग्रामीण वास्तवाचे सूक्ष्म भान, अनुभवाकडे अनुभव म्हणून पाहण्याची दृष्टी, भाषेसंबंधीची आधुनिक कलात्मक जाणीव यांमुळे त्यांनी घडविलेले ग्रामीण व्यक्तिजीवनाचे व समूहजीवनाचे चित्रण विशेष मूल्ययुक्त ठरले. याचमुळे या लेखकांचे ग्रामीण साहित्य पूर्वसुरीपेशा वेगळेपणाने उदून दिसते.

ग्रामीण साहित्याचा पाचवा टप्पा आपल्याला पुढीलप्रमाणे सांगता येईल. १९६० च्या आसपास हा टप्पा सुरू झाला असे मानता येईल. विदर्भातील उध्व शेळके, मनोहर तल्हार, मराठवाड्यातील रा.रं.बोरडे, भास्कर चंदनशिव, पश्चिम महाराष्ट्रातील आनंद यादव, चंद्रकुमार नलगे, महादेव मोरे, सखा कलाल, चारुता सागर, कोकणातील मधु मंगेश कर्णिक, हमीद दलवाई प्रभृती लेखक या टप्प्यावर लेखन करताना दिसतात. ग्रामीण महाराष्ट्राच्या विविध प्रदेशांतून ही साहित्यिक मंडळी पुढे आलेली दिसतात. त्यामुळे ग्रामीण साहित्यात विविध प्रदेशांतील ग्रामीण जीवनाचे प्रतिबिंब उळकपणे पडण्यास आणि साहित्यात एक प्रकारचे प्रादेशिक आणि ग्रामीण संतुलन निर्माण होण्यास सुरुवात झालेली दिसते. उध्व शेळके यांची 'धग' ही कादंबरी अतिशय गाजली. रा.रं. बोरडे यांचा पेरणी (१९६२), ताळमेळ (१९६६), मळणी, वाळवण (१९७६), राखण (१९७७), खोळंबा (१९८३), नातीगोती (१९८५), कणस आणि कडबा (१९९४) असे पंधरा कथासंग्रह तसेच कादंबरी, नाटके, वग व बालसाहित्य इत्यादींचेही विपुल लेखन. बोरडे यांनी गंभीर व विनोदी अशा दोन्ही प्रकारच्या कथा लिहिल्या. मराठवाड्यातील ग्रामीण जीवन विविधतेने व सामर्थ्याने त्यांच्या कथांतून चित्रित झाले आहे. माणूस, कुटुंब आणि समाज यांचे नाते त्यांच्या कथांतून व्यक्त होते. मराठा समाज, त्यातील लोकांचे जीवन जगण्याच्या पध्दती, त्यांचे आचार, नीतिकल्पना, श्रद्धा, सामाजिक संकेत यांचे बहुपेडी चित्रण त्यांची कथा करते. ग्रामीण स्त्रीच्या व्यथावेदना, तिची घुसमट, कोंडी, न्हास पावत चाललेली ग्रामीण संस्कृती, समकालीन समाजव्यवस्था आणि शासनाची तन्हा यांचे पीळ भरत त्यांच्या लेखनातून हळूहळू बदलत चाललेले अस्सल ग्रामीण वास्तव उभे



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

होते. ग्रामजीवनाशी बांधलेले बलुतेदार नव्या परिस्थितीत मोडीत निघाले आहेत. याचे प्रभावी शोकात्म चित्रण 'पाचोळ' त येते तर शेतकरी आणि जनावरे यांच्या संबंधीचा शासनाचा उदासीन दृष्टिकोन 'चारपाणी' मधून दिसतो. ग्रामीण, मराठवाड्यातील, बोलीचा कलात्मक वापर त्यांनी केलेला आहे.

१९६० च्या आसपास जे नव्या दमाचे ग्रामीण साहित्यिक लेखन करू लागले. ते ग्रामीण समाजाच्या खालच्या स्तरातून आलेले साहित्यिक होते. त्यांच्या ग्रामीण साहित्यात जनसामान्यांच्या जीवनाचे गांधीयाने आणि सूक्ष्मतेने चित्रण झालेले दिसते. त्यात बोलीच्या व अनुभवरूपांच्या दृष्टीने अधिक वैचित्र्य पूर्णता आली. याच काळात आनंद यादव, ना.बो.महानोर, विठ्ठल वाघ यांची वेगळी ग्रामीण कविताही लिहिली जाऊ लागली. १९७० च्या आसपास याच पिढीतील यादव, बोरडे यांच्यासारखे लेखक आपल्या कादंबऱ्यातून बदलत्या ग्रामीण जीवनाचा वेध घेताना दिसतात. आनंद यादव यांची गोतावळा, र.र.बोरडे यांची पाचोळ या दोन्ही लेखकांनी नव्या पिढीला हाताशी धरून ग्रामीण साहित्याची चळवळ सुरू केली.

गोतावळा या कादंबरीतून आनंद यादवांनी आधुनिक यंत्रपध्दती येऊ घातल्यावर हजारो वर्षांपासून चालत असलेल्या कृषि संस्कृतीतील जिवाळा, पशु-मानवसंबंध कसे लयाला जातात. याचे चित्रण करणारी ही कादंबरी नारबा या शेतात खपणाच्या मजुराच्या दृष्टिकोनातून, त्याच्या बोलीत आणि त्याचे विचार-संवेदनाविषय उलगडीत, वर्षभराच्या कृषि-निसर्गचित्राचे अनेक तपशील भरीत लिहिली आहे.

१९६० नंतर महाराष्ट्रीय समाज जीवनात महत्त्वाचे स्थित्यंतर घडू घातले. त्याचे परिणाम १९६५ नंतरच्या मराठी साहित्यावरही दिसू लागले. १९६० साली महाराष्ट्र राज्याची स्थापना झाली. महाराष्ट्र सरकारने आर्थिक दृष्ट्या दुर्बल घटकांना सर्व प्रकारचे शिक्षण जवळजवळ मोफत केले. त्यामुळे आजवर शिक्षणापासून वंचित असलेल्या ग्रामीण समाजातील विविध स्तरातून नवशिक्षित तरुणांची पिढी तयार होऊ लागली. ही पिढी झपाट्याने आर्थिक, सामाजिक, शैक्षणिक दृष्टींनी तसेच एकूणच जीवनामानाच्या संदर्भातही वेगळेपणाने उठून दिसू लागली. ग्रामीण विभागात एक नव-जागरूक, सुशिक्षित वर्ग तयार होऊ लागला.

या जागृतीचे परिणाम साहित्यक्षेत्रात दिसू लागले. दलित साहित्याची चळवळ १९६७ च्या आसपास सुरू झाली. ग्रामीण साहित्याची निर्मिती पूर्वापासूनच होत होती. परंतु तिला नवे परिणाम देण्याची गरज निर्माण झाली होती. ग्रामीण समाजातील परिवर्तनामुळे हे नवे परिमाण देणे अत्यावश्यक झाले होते. त्याच्या पाऊलखुणा १९७० पासून तोपर्यंतच्या ग्रामीण साहित्याच्या समीक्षेतून दिसू लागल्या याचा अंतिम परिणाम १९७७ पासून अधिकृतपणे ग्रामीण साहित्याची चळवळ आकाराला येण्यात झाला. ग्रामीण साहित्याचा हा सहावा टप्पा मानावा लागतो.

ग्रामीण साहित्याची चळवळ ही प्रामुख्याने सामाजिक व सांस्कृतिक स्वरूपाची होती. त्या त्या समाजात निर्माण होणाऱ्या साहित्यात त्या समाजाचे सर्वांगीण प्रतिबिंब पडावे, असे या चळवळीचे मुख्य सूत्र होते. या चळवळीची प्रमुख उद्दिष्टे पुढीलप्रमाणे होती. पूर्वसूरीच्या साहित्याचे नव्याने मूल्यमापन, वर्तमान समाजाचे बदलते वास्तव, त्याविषयीचे प्रश्न, समस्या यांचे विवरण, सर्वांगीण लेखनासाठी लेखकाला कोणत्या स्वरूपाचे आत्मभान येण्याची गरज आहे त्याची मीमांसा, नव्या ग्रामीण साहित्याची दिशा काय असू शकेल त्याचा आलेख काढणे, नव्या लेखकांच्या जाणीवा अधिक समृद्ध करण्यासाठी लेखन-शिबिरे, मेळावे, साहित्य संमेलने भरविणे, नव प्रेरणांचे साहित्य व समीक्षा प्रसिध्द करण्यासाठी माध्यमे उपलब्ध करून देणे इत्यादी. यांतून स्वातंत्र्योत्तर बदलत्या ग्रामीण समाजवास्तवाचे चित्रण करणारी एक नवी सिध्द झाली. १९८० च्या आसपास ती



**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 139 - ग्रामीण साहित्य : एक चिंतन  
 UGC Approved Journal

ISSN :  
 2348-7143  
 February-2019

नव्या प्रेरणांनी लेखन करू लागली. मराठीतील एकूणच नव्या ग्रामीण साहित्यावर या चळवळीचा परिणाम प्रत्यक्षाप्रत्यक्ष स्वरूपात झालेला दिसतो.

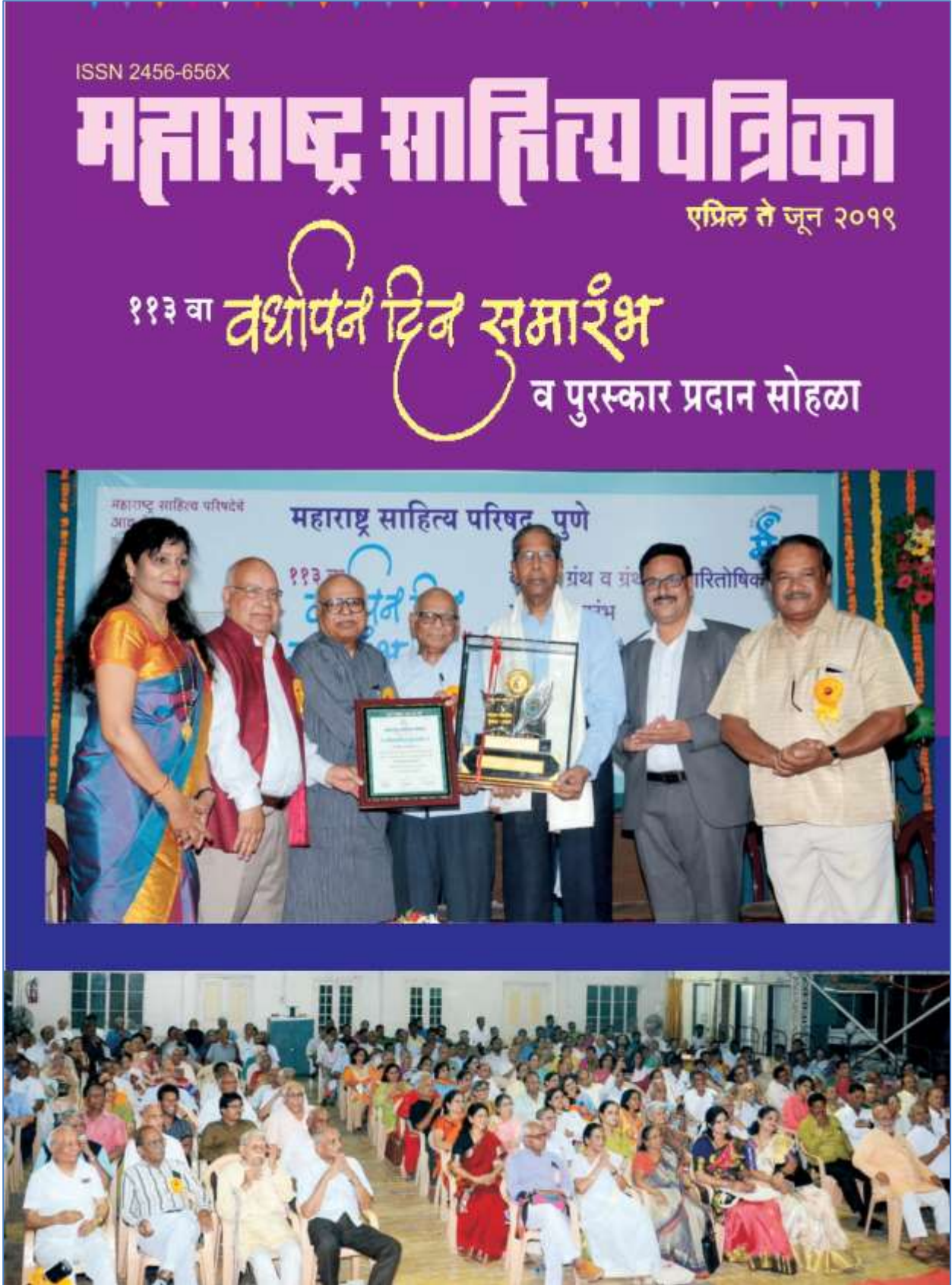
येथून पुढे म्हणजे १९९० नंतरचे ग्रामीण साहित्याचे स्वरूप आमूलाग्र पध्दतीने बदलत गेले आणि आज ते एका विशिष्ट ठंभीवर पोहचलेले आहे. मला वाटते ग्रामीण साहित्याचा सातवा टप्पा म्हणण्यास हरकत नसावी.

संदर्भ ग्रंथ :

- १ राजाध्याक्ष विजया (समन्वयक संपा.), मराठी वाङ्मयकोश, समीक्षा-संज्ञा, खंड चौथा, महाराष्ट्र राज्य साहित्य संस्कृती मंडळ, मुंबई, प्रथमावृत्ती नोव्हेंबर २००२.
- २ गणोरकर प्रभा व इतर (संपा.), संक्षिप्त मराठी वाङ्मयकोश (१९२० पासून २००३ पर्यंतचा कालखंड) खंड २, ग.रा.भटकळ फाउण्डेशन, मुंबई, पहिली आवृत्ती, फेब्रुवारी २००४, दुसरे पुनर्भरण, सप्टेंबर २०१३.



## 32. Vastu nishtha Drushti Konatun Sant Charitratmak Kadambariche Mulyamapan





महाराष्ट्र साहित्य परिषदेचे त्रैमासिक मुखपत्र  
**महाराष्ट्र साहित्य पत्रिका**

अंक क्र. ३६६, एप्रिल - जून २०१९



संपादक

डॉ. पुरुषोत्तम काळे



संपादन समिती

डॉ. मनोहर जाधव | डॉ. नीलिमा गुंडी | डॉ. भास्कर ढोके  
डॉ. रणधीर शिंदे | डॉ. वर्षा तोडमल | डॉ. संदीप सांगळे



प्रकाशक

प्रकाश पायगुडे

प्रमुख कार्यवाह



**महाराष्ट्र साहित्य परिषद**

टिळक रस्ता, पुणे ४११०३०. दूरभाष : ०२०-२४४७५९६३

संकेतस्थळ : [www.masapapune.org](http://www.masapapune.org)

ई-मेल : [masaparishad@gmail.com](mailto:masaparishad@gmail.com)

(कार्यालयाची वेळ : स. ९.३० ते १२, दु. ४.३० ते रा. ८)

एप्रिल-जून २०१९ { १ }



मुद्रक-प्रकाशक  
प्रकाश पायगुडे  
प्रमुख कार्यवाह  
महाराष्ट्र साहित्य परिषद,  
टिळक रस्ता, पुणे ४११०३०.

जाहिरात व्यवस्थापक  
वि. दा. पिंगळे  
९८८१२३५०३३

संपादकीय संयोजन  
संदीप खाडे

अक्षरजुळणी व सजावट  
आर्ट अँडव्हर्टायझिंग

मुखपृष्ठ  
जयदीप कडू

मुद्रितशोधन  
आरती देवगांवकर

मुद्रणस्थळ  
एम.ए. प्रिंटर्स, एल.एल.पी.  
फ्लॉट नं.५, ३रा मजला,  
सिद्धीविनायक अपा.,  
शिवदर्शन, पुणे ४११००९.

मूल्य : १५ रुपये

प्रकाशन क्र. ३६६  
एप्रिल-जून २०१९

या अंकात व्यक्त झालेल्या  
विचारांशी संपादक, संपादन समिती,  
सल्लागार मंडळ तसेच प्रकाशक  
सहमत असतीलच असे नाही.

## अंतरंग

- संपादकीय : गिरीश कार्नाड यांचे निधन : बहुआयामी प्रतिभावंत गेला : डॉ. पुरुषोत्तम काळे । ३

### भाषण

- या संक्रमण काळाचा सामना समर्थपणे करायला हवा! दिलीप माजगावकर । ६

### लेख

- कादंबरीचे अध्यापन । डॉ. दिलीप धोंडगे । १०
- संत कबीर एक परिप्रेक्ष । प्रा. डॉ. भास्कर ढोके । १४
- तीर्थरूप महाराष्ट्र : नवे आकलन । मधु जामकर । २८

### श्रद्धांजली

- डॉ. सु. रा. चुनेकर : व्रतस्थ समीक्षक - संशोधक डॉ. अविनाश सांगोलेकर । २०
- साक्षेपी समीक्षक आणि महर्षी शिंदे यांच्या जीवनकार्याचे अभ्यासक । रणधीर शिंदे । २३

### समीक्षा

- गतकाळाची गाज : स्त्री आत्मकथने आणि समाजदर्शन डॉ. राजा दीक्षित । ३५
- व्यापक इतिहास आणि संपादकीय मानदंडाचे उदाहरण प्रा. डॉ. गणेश राऊत । ३९

### पुस्तक परीक्षण

- ऋतुपर्व : प्रेमाचा उत्कट आविष्कार प्रा. डॉ. उमेश मारुती सिरसट । ४५
- वस्तुनिष्ठ दृष्टिकोनातून संत चरित्रात्मक कादंबरीचे मूल्यमापन करणारा दिशादर्शक ग्रंथ । डॉ. हरीश शेळके । ४८
- 'थट्टा मस्करा'तून समाजभान । प्रा. डॉ. राजाभाऊ भैलुमे । ५०
- देहमनाच्या गुंतागुंतीचा विस्तृत पट । अंजली कुलकर्णी । ५३
- कार्यवृत्त नोंद । प्रकाश पायगुडे । ५६

{ २ } महाराष्ट्र साहित्य-पत्रिका क्र. ३६६



पुस्तक परीक्षण

डॉ. हरेश शेळके

## वस्तुनिष्ठ दृष्टिकोनातून संत चरित्रात्मक कादंबरीचे मूल्यमापन करणारा दिशादर्शक ग्रंथ

**म** हाराष्ट्राला संस्कृती, संप्रदाय, पंथ, लोकसाहित्य, संगीत, चित्रकला, शिल्पकलेच्या वैविध्यपूर्ण परंपरा दीर्घकाळापासून लाभलेल्या आहेत. यांतील काही परंपरा सातत्याने समाजहित जोपासताना समाजाचे प्रबोधन करत आहेत. या परंपरांचे दिशादर्शक असे योगदान आजही आपणास पाहावयास मिळते. या पार्श्वभूमीवर राजेंद्र थोरात यांचा 'वारकरी संत चरित्रात्मक कादंबरी' हा ग्रंथ साहित्यविश्वात प्रकाशित होणे म्हणजे अभ्यासक, संशोधक आणि वाचक यांना एक प्रकारचे दिशादर्शन आहे. या ग्रंथाची दोन ठळक वैशिष्ट्ये सुरुवातीला नोंदवता येतील, जी संशोधन समीक्षेच्या दृष्टिकोनातून मला महत्त्वाची वाटतात. पहिले प्रधान वैशिष्ट्य म्हणजे या ग्रंथातील लेखनात भावनिकता, श्रद्धाळू वृत्तीपेक्षा वस्तुनिष्ठतेवर अधिक भर आहे. दुसरे वैशिष्ट्य म्हणजे संदर्भ अतिशय मोजके; परंतु अचूक दिलेले असल्यामुळे ग्रंथ वाचनीय झाला आहे. विशेष म्हणजे मोजके संदर्भ, प्रसंग, घटना, वर्णने, संरचना, शीर्षक, मुद्दे, उपमुद्दे, विश्लेषण या सर्व घटकांची मांडणी वाचक संशोधकांना नवी दृष्टी देणारी आहे. पीएच.डी. प्रबंधातील काही आशयावर हा ग्रंथ असूनही लेखकाने हा ग्रंथ लिहिताना योग्य आशय व योग्य संदर्भ देऊन संशोधनाला व्यासंगाची जोड दिली आहे.

महाराष्ट्राचे आराध्य दैवत पंढरपूरच्या पांडुरंग चरणी विनम्रतेने राजेंद्र थोरात यांनी हा ग्रंथ अर्पण केला आहे. या अभ्यासपूर्ण ग्रंथाची राजेंद्र थोरात यांनी एकूण पाच प्रकरणांमध्ये विभागणी केली आहे. संत चरित्रात्मक कादंबरीच्या प्रेरणा, वारकरी संत चरित्रात्मक कादंबरीचे स्वरूप, वारकरी संत दर्शन, वारकरी संत चरित्रात्मक कादंबरीतील समाजचित्रण, वारकरी संत चरित्रात्मक कादंबरीची ऐतिहासिकता अशा पाच प्रकरणांतून मांडणी केली आहे. पाचही प्रकरणे वाचनीय व अभ्यासपूर्ण आहेत.

'संत चरित्रात्मक कादंबरीच्या प्रेरणा' या पहिल्या प्रकरणात चरित्र, चरित्रात्मक कादंबरी, चरित्र नायक, संस्कृती, वारकरी संतांची माणूसधर्माची

### वारकरी संत चरित्रात्मक कादंबरी

राजेंद्र थोरात  
संस्कृती प्रकाशन, पुणे  
पृष्ठ-२०८  
किंमत-२५०

शिकवण यांविषयीचे विवेचन सविस्तरपणे आले आहे. वाचकांना संतविषयक समृद्ध अशा चरित्र वाङ्मयाची माहिती या विवेचनातून मिळते. सदर लेखकाने या प्रकरणात चरित्र कादंबरीविषयी सखोल विवेचन केल्यामुळे संशोधक वाचकांच्या दृष्टीने हे प्रकरण उपयुक्त आहे. जाणकार समीक्षकांचे संदर्भ वाचकांच्या व संशोधकांच्या ज्ञानात, आकलनात भर टाकतात. नव अभ्यासक व संशोधकांना संशोधनाचे नवपरिप्रेक्ष अघोरेखित होण्याच्या दृष्टिकोनातून पहिलेच प्रकरण दिशादर्शक आहे.

'वारकरी संत चरित्रात्मक कादंबरीचे स्वरूप' या प्रकरणात संत ज्ञानेश्वर, संत नामदेव, संत एकनाथ, संत तुकाराम इत्यादी संतांच्या जीवनावरील कादंबऱ्यांचे सविस्तर विश्लेषण केले आहे. संत मुक्ताई, संत चोखोबा, संत जनाबाई, संत सेना, संत निळोबा इत्यादी... वारकरी संतांच्या जीवनावरील कादंबऱ्यांचे नेमकेपणाने विश्लेषण केले आहे. या प्रकरणातून वारकरी संतांचा जीवनप्रवास, जीवन संघर्ष, जगण्याचे तत्त्वज्ञान आणि त्यांचे 'अक्षर' साहित्य यांचा एक सात्त्विक आलेख वाचकांच्या डोळ्यासमोर उभा राहतो. संत ज्ञानेश्वर, संत तुकाराम यांच्या जीवनविषयक ऐकीव माहिती खूप ऐकलेली असते. वारकरी संतांचे काही अभंग आपल्याला तोंडपाठ असतात. कथा-कीर्तनातून संतांचे पारंपरिक चरित्र भाविकतेने कथनात्मक स्वरूपात येत आहे व यापुढेही येत राहणार आहे. सदर प्रकरणातून वारकरी संतांच्या जीवनातील अनेक तपशील वाचकांना वाचण्यासाठी मिळतात. संशोधकांना नवे आयाम या प्रकरणातून गवसतात. संतांच्या जीवन चरित्राकडे बघण्याची नवी दृष्टी सापडण्यास मदत होते. संतांच्या जीवनावरील कादंबऱ्यांची माहिती उपलब्ध होते.

'ज्ञान तेच देव' या कादंबरीचे विश्लेषण करताना लेखक लिहितात, 'विठ्ठलपंत ज्ञानदेवाला ओमकार, यजुर्वेद, सामवेद, अथर्ववेद, पुराणग्रंथ, वैज्ञानिक गोष्टी व व्यवहार ज्ञान, स्तोत्रे, उपनिषदातील मंत्र, गीता, वनस्पती शास्त्राचे ज्ञान, महाभारत, रामायण, योग, धर्मविधी, खगोलशास्त्र

{४८} महाराष्ट्र साहित्य-पत्रिका क्र. ३६६

इत्यादींचे ज्ञान देतात.' हा संदर्भ नव अभ्यासक-संशोधकांसाठी नाविन्यपूर्ण व उपयुक्त आहे. संत ज्ञानेश्वरांच्या व्यक्तित्वाची जडणघडण कशा प्रकारे झाली याचे तपशीलवार वर्णन कादंबरीकार रमेश बावकर यांनी स्पष्ट केले आहे. पारंपरिक तुकोबांऐवजी तुकोबांच्या जीवनातील सत्य शोधण्याचा प्रयत्न दि. बा. मोकाशी यांनी कसा केला आहे, याविषयीचे विवेचन राजेंद्र थोरात यांनी केले आहे.

'वारकरी संत दर्शन' या महत्त्वाच्या प्रकरणातून एकूण अकरा संतांचे दर्शन राजेंद्र थोरात यांनी नेमकेपणाने घडविले आहे. संत, कवी, तत्वज्ञ, प्रबोधनकार, संघटक, मानवतावादी संत ज्ञानेश्वरांचे दर्शन 'ताटी उघडा ज्ञानेश्वरा, इंद्रायणीकाठी, मोगरा फुलला, सोन्याचा पिंपळ या कादंबऱ्यांतून कसे घडते याचे वर्णन ओघवत्या शैलीत राजेंद्र थोरात यांनी केले आहे. भागवत धर्माची पताका पंजाबपर्यंत अभिमानाने फडकाविणाऱ्या, श्रीविठ्ठल भक्तीत रममाण असणाऱ्या, संत ज्ञानेश्वरांबरोबर तीर्थयात्रा करणाऱ्या संत नामदेवांचे दर्शन नामा भोळा भाग्यवंत, नामाचा गजर, आम्ही चिरे पायरीचे, घास घेई पांडुरंगा या कादंबऱ्यांतून घडते. शांतिब्रह्म संत एकनाथांचे व्यक्तित्व या प्रकरणातून प्रतीत होते. संतश्रेष्ठ तुकोबांचे अभंग व पारंपरिक चरित्रे आधाराला घेऊन कादंबरीकारांनी आकाशाएवढ्या तुकारामांचे चित्रण कसे केले आहे याचेही वर्णन सदर प्रकरणात आले आहे. विशेष म्हणजे संत मुक्ताई, संत जनाबाई, संत बहिणाबाई या संत कवयित्रींचे दर्शन प्रस्तुत प्रकरणातून घडते. वारकरी संतांची समाजातील प्रबोधनकारांची भूमिका किती सुस्पष्ट होती हेही चित्रित होते. तत्कालीन सामाजिक परिस्थितीमध्ये माणूस म्हणून संतांना करावा लागणारा संघर्षही येथे अधोरेखित झाला आहे. एकूणच काय, तर पारंपरिक चौकट मोडून लेखकाने मोजक्या संदर्भासह वाचकांसमोर विश्लेषण केले आहे. नेमकेपणाने व ओघवत्या शैलीतील 'संतदर्शन' वाचनीय आहे.

'वारकरी संत चरित्रात्मक कादंबरीतील समाज चित्रण' या प्रकरणात यवनी अत्याचारांचे वास्तव चित्रण, वारकरी संतांची नीतिमूल्यांची शिकवण, रूढी-परंपरा, धार्मिकता व वर्णव्यवस्था, दुष्काळाचे भीषण रूप, कुटुंबव्यवस्था, विवाह समारंभ, विविध खेळ इत्यादी घटकांचे सखोल विवेचन राजेंद्र थोरात यांनी केले आहे. संत साहित्याचा अभ्यास करण्यासाठी आपला दृष्टिकोन अधिक व्यापक होण्याच्या शक्यता या प्रकरणातून निर्माण झाल्या आहेत.

'वारकरी संत चरित्रात्मक कादंबरीची ऐतिहासिकता या



प्रकरणात लेखकाने आपली भूमिका अतिशय ठामपणे, वस्तुनिष्ठतेने स्पष्ट केल्यामुळे संत साहित्याचे वाचन कसे करायला हवे, दृष्टिकोन चिकित्सक कसा हवा, संत साहित्याचा अभ्यास करताना भावनिकतेपेक्षा, श्रद्धेपेक्षाही वैचारिक 'मंथन' कसे आवश्यक हे स्पष्ट होते. 'वारकरी संतविषयक कादंबरीकारांनी सांप्रदायिक चरित्रांचा आधार घेऊन कादंबरी लेखन केले आहे. पारंपरिक चरित्रांतील विविध चमत्कार कादंबरीकारांनी काव्यात्मकतेने व नाट्यात्मकतेने रेखाटून चमत्कारांतून संतांचा

गौरव केला आहे. वारकरी संत चरित्रात्मक कादंबरी ऐतिहासिकतेचा वेध घेण्याच्या दृष्टीने कुचकामी ठरलेली आहे. तत्कालीन विविध संप्रदाय, गुरू-शिष्य परंपरा, श्री विठ्ठल व पंढरीची वारी इ. चित्रण कादंबऱ्यांतून येत असले तरी त्यामध्ये ऐतिहासिकदृष्ट्या चिकित्सेऐवजी भावनाशीलताच आढळते'. राजेंद्र थोरात यांच्या वरील विश्लेषणावरून लक्षात येते की, त्यांनी वस्तुनिष्ठ दृष्टिकोन समोर ठेवून वारकरी संत चरित्रात्मक कादंबरीची ऐतिहासिकता स्पष्ट केलेली आहे. मुळामध्ये महाराष्ट्रीय संस्कृतीचे वाङ्मयीन, सामाजिक पर्यावरण जर आपण पाहिले, तर ते परंपराप्रिय असलेले दिसते. ऐतिहासिकदृष्ट्या वस्तुनिष्ठ संशोधन वर्तमानात आवश्यक आहे. सध्या सांप्रदायिक, धार्मिक, सांस्कृतिक दृष्टिकोन अधिकाधिक एकांगी आणि परंपराप्रिय अशा चौकटीत बद्ध होत आहे. अशा वातावरणात संतसाहित्यविषयक लेखन करताना अधिक काळजी घ्यावी लागते. सामाजिक परिस्थिती लक्षात घेऊन लेखकाला लेखन करावे लागते. संत साहित्यविषयक आकलनाचा परिप्रेक्ष्य तयार व्हावा, वारकरी संप्रदायातील प्रबोधनात्मक लेखनाची, विचारांची ओळख व्हावी, वारकरी संप्रदायातील मूल्यात्मक विचार मंथन व्हावे, युवा वर्गाने संत साहित्याकडे वळावे या सर्व पार्श्वभूमीवर योग्य संदर्भाचा खजिना असणारा राजेंद्र थोरात यांचा 'वारकरी संत चरित्रात्मक कादंबरी' हा मौलिक ग्रंथ महत्त्वाचा आहे. सदर ग्रंथ संत साहित्यविषयक अभ्यासाचे नव-नवीन 'परिप्रेक्ष्य' निर्माण करणारा आहे. वारकरी संप्रदायाच्या अभ्यासकांबरोबरच सर्वच वाचक संशोधकांना हा मौलिक ग्रंथ मार्गदर्शक आहे

डॉ. हर्ष शेंळे

मराठी विभाग


न्यू आर्ट्स कॉमर्स अँड सायन्स कॉलेज, पारनेर

संपर्क: ९७६७१७६६५९

एप्रिल-जून २०१९ {४९}

### 33. Impact of Globalisation on The Underclass Characters in Aravind Adiga's Last Man in Tower

3



**Research Journey**  
The Online Journal | ISSN No -2348-7143

Impact Factor – 6.261      ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

**RESEARCH JOURNEY**  
Multidisciplinary International E-Research Journal  
PEER-REFREED & INDEXED JOURNAL

January-2019      Special Issue –95

**Issues in Postcolonial Indian  
English Literature**


**Guest Editor :**      **Dr. R. K. Aher**  
Principal,  
New Arts, Commerce and Science  
College, Parner

**Executive Editor:** **Ashok More**  
Head, Department of English,  
New Arts, Commerce and Science  
College, Parner

**Chief Editor :**      **Dr. Dhanraj T. Dhangar**  
MGV's Arts and Commerce  
College, Yeola

**This Journal is indexed in :-**  
- University Grants Commission (UGC)  
- Scientific Journal Impact Factor (SJIF)  
- Cosmo Impact Factor (CIF)  
- Global Impact Factor (GIF)  
- International Impact Factor Services (IIFS)

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

 **'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 95- Issues in Postcolonial Indian English Literature  
UGC Approved Journal

ISSN :  
2348-7143  
January-2019

Impact Factor - 6.261

ISSN - 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S  
**RESEARCH JOURNEY**

Multidisciplinary International E-research Journal

PEER REFREED & INDEXED JOURNAL

January-2019 Special Issue - 95

**Issues in Postcolonial Indian English Literature**

**Guest Editor :**

Dr. R.K.Aher,  
Principal,  
New Arts Commerce & Science College,  
Parner, Dist. Ahmednagar [M.S.] INDIA

**Executive Editor of the issue:**

Mr. Ashok More,  
Head, Dept. of English,  
New Arts Commerce & Science College,  
Parner, Dist. Ahmednagar [M.S.] INDIA

**Chief Editor :**

Dr. Dhanraj Dhangar (Yeola)

**SWATIDHAN INTERNATIONAL PUBLICATIONS**

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 800/-

1

Website - [www.researchjournev.net](http://www.researchjournev.net)

Email - [researchjournev2014@gmail.com](mailto:researchjournev2014@gmail.com)

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Editorial Board

#### Chief Editor -

Dr. Dhanraj T. Dhangar,  
 Assist. Prof. (Marathi)  
 MGVS Arts & Commerce College,  
 Yeola, Dist - Nashik [M.S.] INDIA

#### Executive Editors :

Prof. Tejesh Beldar, Nashikroad (English)  
 Dr. Gajanan Wankhede, Kinwat (Hindi)  
 Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
 Dr. Rajay Pawar, Goa (Konkani)

#### Co-Editors -

- ❖ Mr. Tufail Ahmed Shaikh - King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Hareesh - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirsath - Nanasahab Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindkheda [M.S.]

#### Advisory Board -

- ❖ Dr. Marianna kotic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tadkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGVS Arts and Commerce College, Yeola, Dist. Nashik.

#### Review Committee -

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopergaon
- ❖ Dr. S. B. Bhambar, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayyed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Kategaonkar - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CJF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Social Realistic Perspective on Naxalism and Terrorism in The Select Indian English Novels	P.R.Bhabad & Anant Netake	11
2	Egalitarianism in Khushwant Singh's Train to Pakistan	Dr. Ashok Chaskar	14
3	Tricontinentalism in V S Naipaul's The Mimiv Men	Dr. Sangita Ghodake	19
4	Diasporic Sensibility in Indian English Literature	Dr. Machhindra Varpe	26
5	Harivansh Batra :A Protagonist in Chaman Nahal's Sunrise in Fiji	Prin. Dr. B. D. Ghodake	29
6	Ethnicizing Nation: A Study in South Asian Ethnic Politics.	Dr. Pandurang Barkale	33
7	The Centrality of Place in Anita Desai's Cry The Peacock and Village By The Sea	Dr. Anil Patil	40
8	Bastardized Capitalism: Amitav Ghosh's Sea of Poppies a Postcolonial View	Dr. Brijesh Tambe	46
9	Features of Literature Dealing With Multiculturalism	Dr. Mangesh Gore	51
10	Issues of Identity in Samina Ali's 'Madras on Rainy Days	Dr.Sanjay Zagade	56
11	Representing the Postcolonial Subaltern: A Study of Aravind Adiga's Last Man in Tower	Mr. Anand Hipparkar	59
12	Post-Colonial Impact of Indian English Literature: A Case Study of Select Novels	Prof. Rameshwar Dusunge	64
13	A Post-Colonial Approach: Environmentalist and Movements	Dr. Mahavir Sankla	68
14	Portrayal of Subaltern Existence of Women in Imtiaz Dharker's Poetry	Dr. Shantilal Ghegade	73
15	'Magic Realism' in Salman Rushdie's 'Midnight Children	Mr. Ananda Pandhare	78
16	Jhumpa Lahiri's The Namesake: A Diasporic Reading	Dr. Sanjay Khilare	82
17	Reflection of Indian Culture And Indian English In Raja Rao's Kanthapura: A Postcolonial Perspective	Dr. K.D.Sonawane	88
18	Indian Writing in English	Dr. Kamalakar Jadhav	91
19	Identity Crisis in V.S. Naipaul's A House for Mr. Biswas	Anil Kale	93
20	The Shifting Identities of Women in Chitra Banerjee Divakaruni's The Mistress of Spices	Dr. Kishorkumar Gaikawad	96
21	Interface Between Science and Fiction In Rimi B. Chatterjee's Signal Red	Dr. Vijaykumar Punekar	100
22	Nationalism To Post Colonialism: A Critical Perspective	Dr. Nandkumar Shinde.	103
23	Indigenous Model of Resistance: Reading Lagan	Dr Ravindra Vaidya	109
24	The Loss of Cultural Inheritance in 'The Inheritance of Loss'	Dr.Ganesh Sonawane	113
25	The Expressives in 'The Princess of Avanti'	Keshav Borkar	116
26	Postcolonial Indian Diasporic Writing is A Forum for Immigrant Experience and It is Also A Search Self-Identity	Prof. Prakash Misal & Prof. Nitin Survase	120
27	Omparing Colonial and Post-Colonial Period With Reference To Nation And Family: A View of Amitav Ghosh	Dr. Sailendra Bansode	124



**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

28	Immigrant Feminine Experience in Indian English Fiction <b>Ms. Deepanjali Borse</b>	128
29	Meeting an Uncertain Fate: Negotiations Between Tradition and Modernity <b>Prof. Hemant Gaikwad</b>	131
30	The Namesake As Diasporic Novel <b>Shivaji Sontakke</b>	134
31	Reflection of Communal Riots in Translated Post- Colonial Hindi Novels <b>Prof. Balasaheb Rohokale</b>	138
32	Communal Violence in Post- Colonial Indian English Novels <b>Prof. Sunil Deokar</b>	141
33	Visual Representation of Communal Riots in Chaman Nahal's Azadi <b>Dr.Varpe Sandip</b>	145
34	Identity Crisis in Kiran Nagarkar's Selected Fiction <b>Pravinkumar Nagawade &amp; Vaishali Ransing</b>	151
35	Chetan Bhagat : As A Postcolonial Writer in Indian English Literature <b>Prof. Mahesh Kumbhar</b>	154
36	Politics At A University Department: A Study of Post-Colonial Perspective on John Maxwell Coetzee's Disgrace <b>Dr. Rameshwaar Rathod</b>	156
37	Impact of Globalisation on The Underclass Characters in Aravind Adiga's Last Man In Tower <b>Ashok More &amp; Vijay Adsure</b>	158
38	Quest For Identity in Jhumpa Lahiri's the Namesake <b>Anil Chindhe &amp; Sandip Sathe</b>	161
39	The Lotus Leaves: Emotional Infidelity <b>Dr. Archana Rohokale</b>	163
40	Multiculturalism in Indian English Literature. <b>Dr. Ansarullah Khan</b>	166
41	Representation of Caste and Gender Politics in Kishor Kale's Against All Odds <b>Jaysing Babar</b>	168
42	Feminism From Post-Colonial Perspective in Shashi Deshpande's Novels <b>Sangharsh Gaikwad</b>	170
43	Torturous Estrangement of Valmiki In Kamala Markandaya's Possession <b>Sanjay Diwekar</b>	173
44	Multiculturalism in Indian English Literature <b>Prof. Sunil Mhankale</b>	178
45	Diasporic Sensibility in Indian English Writing Rohinton Mistry - A Fine Balance <b>Prof. Sandhya Sonawane</b>	182
46	Issues of An Identity Crisis in Joseph Conrad's The Secret Agent. <b>Prof. Rajendra Gaikwad</b>	185
47	Indian Perspective of Post-Colonialism: A Review. <b>Prof. Narendra Gawali</b>	188
48	Feministic Issues In Anita Desai's Novels <b>Mr. Nana Wagaskar</b>	192
49	Diasporic Sensibility in The Poetry of Meena Alexander <b>Mr. Anna Muley</b>	194
50	Post Colonial Indian English Literature : A Brief Survey <b>Sharad Awari</b>	202
51	English in Post-Colonial India <b>Ms. Manisha Kale &amp; Dr Dipak Wayal</b>	105
52	Multiculturalism in Indian English Literature <b>Farjana Tamboli</b>	209
53	Relevance of Gandhian Principles in the Present Time <b>Dr Prashant Lohar</b>	212
54	Anita Nair: A Glance of Cultural Diversity In Indian Subcontinent <b>Dr. Yuvaraj Kathale</b>	215
55	Postcolonial Feminist Reading to Toni Morrison's 'The Bluest Eye.' <b>Prof. Rajendra Ambavane</b>	217
56	Joseph Conrad's 'Heart of Darkness': A Postcolonial Study. <b>Mr. Sachin Bhosale</b>	220

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Impact of Globalisation on The Underclass Characters in Aravind Adiga's *Last Man In Tower*

Ashok More & Vijay Adsure  
 New Arts, Commerce and Science College,  
 Parner, Ahmednagar

#### Abstract:

The paper attempts to study how Globalisation and urbanisation affects every milieu of the post-independent Indian society and its representation in Indian English Literature. Aravind Adiga in his literary works dealt with struggle of the underclass for survival. The underclass characters are victims of globalisation, neocolonialism, imperialism and urbanisation in post independent India. In Aravind Adiga's novels, *Balaram in The White Tiger*, *Mastarji* i.e. retired school teacher in *Last Man in Tower* and the underclass character characters in twelve stories in *Between the Assassinations*. After independence, India led by the cultured elite political leaders who initiate cultural imperialism. Indian state policy formed on linguistic diversity, multicultural, multireligious and multiethnic forces. There is racial discrimination, financial exploitation, subjugated media, oppression and uneven laws which leads sufferings of the subaltern.

**Key words:** Postcolonialism, Subaltern, Colonialism, Cultural Imperialism, Urbanisation

Aravind Adiga was born in Madras in 1974. He is novelist, short story writer and columnist for magazines. Aravind Adiga's novel, *The White Tiger*, won the 2008 Booker Prize. He is the fourth Indian-born author to win Booker Prize, after Salman Rushdie, Arundhati Roy and Kiran Desai. The novel studies the contrast between India's rise as a modern global economy and the lead character, Balram, who comes from crushing rural poverty. Adiga's second collection of 12 stories *Between the Assassinations* was released in India in November 2008 and in the US and UK in mid-2009. The book features twelve interlinked short stories. The third published novel, *Last Man in Tower*, was published in the UK in 2011.

The Indian English Literature emerged as a mirror to the society. The writers of pre-independence era presented the issues such as nationalism, Gandhian ideology, the struggle for independence and social and economic issues such as caste discrimination, poverty and industrial development. However, in the post-independence era, the focus shifted to the colonial period, the re-examination of Imperialism, multiculturalism, the psychoanalysis of identity, cultural hegemony and neo-colonialism. It exposes many serious problems faced by the Indian. Consequently, there is great debate on the problem and its priority. Along with corruption, problems like the negative impacts of globalization, social inequality, religious tension and conflict between social classes also present a case for being the largest hindrance to the progression of India. These vital issues are the prime concerns of the writer and are strongly presented in relation to Indian politics, culture and society. In his literary works, the characters exhibit the corruption and play as the catalyst for virtual plot development. The novels and short stories precisely portray a dark side of everyday India where corruption is common and often necessary for career advancement or societal reputation. It is mainly manifested in the voice of

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
 2348-7143  
 January-2019

the underclass in Last Man in Tower

Instead of cracking down on the voice of the underclass and creating a new political culture in India, the leaders show no desire to move beyond the status quo. The voice of underclass has adverse effect on society. Although most of the events take place between political parties and upper-class businessmen but the middle and lower classes suffer the most. Moreover, the people have no choices but to initiate desperately in corruption in order to survive. It is the recognition of the causes of the voice of underclass that will allow for a viable solution. Due to religious practices, economic insecurities, unenforced laws, a forgiving media and a powerless governments, the study of the voice of class has been able to seed itself so deeply in the Indian culture.

The underclass is the lowest segment in the class hierarchy. The underclass people used to be suppressed and subjugated by the aristocrats, political leaders in power and submissive media in the postcolonial period. Underclass segments are economically oppressed, exploited, socially deprived and marginalized on the basis of class, religion, caste, and gender. It will attempt to present the dominant discourse of underclass people and their presentation in literature. The domination and power subjugate the underclass in society.

In Last Man in Tower, the entire lives were affected in many ways by the projects by Dharmen Shah, a builder. He makes a generous offer to the residents of Vishram, an old building in Mumbai's middle-class neighbourhood, to leave the building so that it can be demolished to make way for a new tower, Shah's dream project. Most of the residents accept the offer and some of them refuse. However, the opposition is overruled and most of them agreed to have a tower. One person, however, refuses to change his mind: Materji, a retired schoolteacher who has fond memories of his wife and daughter in the building who passed away in not so distant a past.

Last Man in Tower deals vanity of redevelopment and sufferings of middle class characters who dwells in Vishram Society, Vakola, Santa Cruz, Mumbai near to airport. The people in society belong to middleclass, hardworking and not ready dishonour and feel proud to preserve their identity and main unaffected by the changes. Yogesh A. Murthy the protagonist in the novel is the victim of modernisation, globalisation and urbanisation. There is conflict between Materji and builder which alineates Materji from the people in Vishram society. There is conflict between self- honour, opportunity, self -interest and self-deception. Adiga portrays the picture of New India in this novel where there is progression due to globalisation. It is study of lower and middle class peoples struggle for survival. It raises the question about national development and survival strategies. Mumbai, cosmopolitan city adapts with capitalist globalisation and promote uncontrolled urbanisation. The slum dwellers suffer due to industrial zones, overurbanisation and ultra-modern culture. There is interrelation between class, caste, gender and environmental conflict. The workers in the society were threatened to lose their work after demolition

Dharmen Shah, the builder being capitalist subjugates the all dwellers of Vishram society. He wants to tear down the old building and a have dream project there. He did generous offer to resident of Vishram Society. Mr. Kothari, the secretay of the society and Mr. Ajwani on behalf of Shah persuaded the members of the society. Besides Yogesh a. Murthy, very few reject and oppose his offer the Pintos, Mrs. Rego and Mr. Kudwa initially later persuaded. Vishram being cooperative society cannot demolish until each and every member signs the agreement.

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

Masterji thought that he will be supported by police, newspaper and his students. His neighbour becomes his enemies and decided to expel from society as he is hindrance in their progress. At last, he was thrown off from rooftop which leads to death considered as suicide. Thus it indicates that the underclass is oppressed by power and supported by subjugated media.

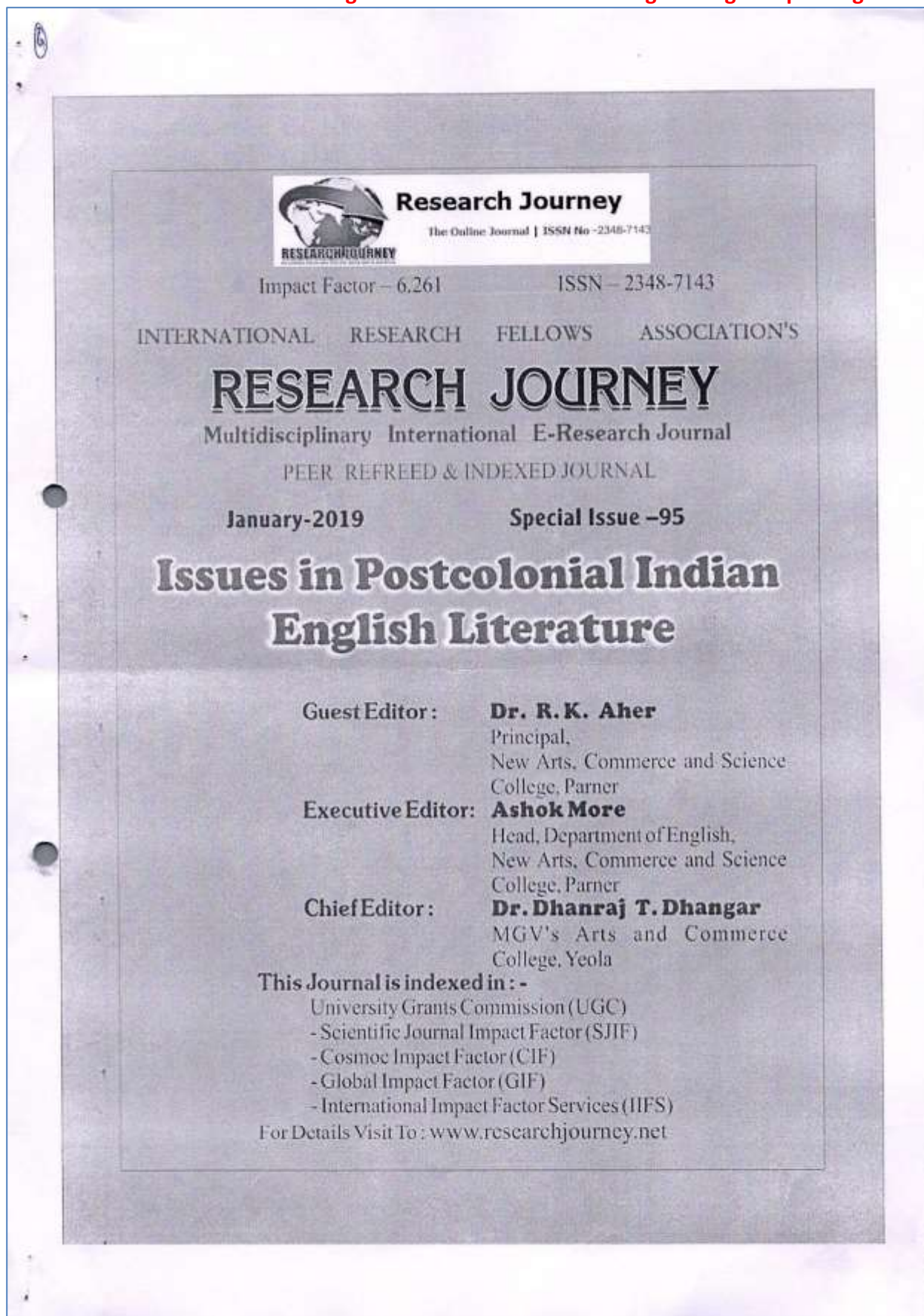
Dharmen shah, real estate agent and developer being rich oppress and oblige too many middle and lower class people to work for him. He also uses his ruthless power to tame the opposition. The subjugated media also supports him and he supported by too many and opposed by very few. Nearly all falls prey of his generous offer except Materji, who suffers a lot.

#### Conclusion:

Globalisation affects considerably the lives of the underclass people in India. Adiga tries to manifest the overall view of 'New India' which leads to crisis between high and lower class people. Dharmen Shah being representative of materialistic high class become the ambassador of New India. Yogesh A. Murthy, the Pintos, Mrs. Rego and others are representatives of the underclass. After decolonisation, Indian scenario changes swiftly tend secure liberty of the individual, cultural inheritance and rights of the common class people. The postcolonial circumstances changes drastically and the underclass has to adapt with it. European masters are replaced by Indian capitalist i.e. builder and businessmen. There is introduction of cultural imperialism and neo-colonialism in India which leads to threat to the underclass.

#### Works Cited

- Adiga, Aravind, *The White Tiger*, Atlantic Books, Ltd (UK), Free Press (US), 2008
- Adiga, Aravind, *Between the assassination*: Picador (IND), 2008
- Adiga, Aravind, *Last Man in Tower*, Fourth Estate (IND), 2011
- Abrams, M.H., *Glossary of Literary Terms*, Banglore, Prism Books, 2005
- Bhabh, K. Homi, *The Location of Culture*. Routledge, London, 1994
- Said, Edward W., *Orientalism*, Pantheon Books, 1978
- Spivak, Gayatri Chakravorty, *Can The Subaltern speak?* Macmillan, 1988

**34. The Problems of Rural Undergraduate Students in Mastering the English Speaking Skills**



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 129 : Improving English Communication Skills of Non-native Users  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

Impact Factor – 6.261

ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

# RESEARCH JOURNEY

International E-Research Journal

PEER REFREED & INDEXED JOURNAL

February-2019 Special Issue – 129

Improving English Communication Skills of Non-native Users

#### Guest Editor

Dr. N. S. Gaikwad  
Principal,  
Annasaheb Awate College, Manchar  
Tal. Ambegaon, Dist. Pune

#### Executive Editors of this issue :

Dr. Shahaji Karande  
Prof. Ganesh Awari  
Prof. Sachin More  
Prof. Jyotsna Kanade  
Prof. Kishor Shitole

#### Chief Editor :

Dr. Dhanraj Dhangar (Yeola)

SWATIDHAN INTERNATIONAL PUBLICATIONS

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 800/-

1

Website – [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 129 : Improving English Communication Skills of Non-native Users  
 ISSN : 2348-7143  
 February-2019  
 UGC Approved Journal

### Editorial Board

#### Chief Editor -

Dr. Dhanraj T. Dhangar,  
 Assist. Prof. (Marathi)  
 MGV'S Arts & Commerce College,  
 Yeola, Dist - Nashik [M.S.] INDIA

#### Executive Editors :

Prof. Tejesh Beldar, Nashikroad (English)  
 Dr. Gajanan Wankhede, Kinwat (Hindi)  
 Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
 Dr. Rajay Pawar, Goa (Konkani)

#### Co-Editors -

- ❖ Mr. Tufail Ahmed Shaikh - King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Hareish - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirsath - Nanasaheb Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindhkheda [M.S.]

#### Advisory Board -

- ❖ Dr. Marianna kosic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tadkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

#### Review Committee -

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopargaon
- ❖ Dr. S. B. Bhambar, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayyed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Kategaonkar - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258

**'RESEARCH JOURNEY' International E- Research Journal** ISSN :  
**Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)** 2348-7143  
**Special Issue 129 : Improving English Communication Skills of Non-native Users** February-2019  
**UGC Approved Journal**

## INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Enriching Vocabulary: A Challenge to Non-Native Speakers	Dr. Sangita Ghodake	07
2	Importance of English Communication Skills	Prof. Dr. Vallabh Karandikar	12
3	Role of Non- Verbal Communication in Human Life	Keshav N. Borkar	15
4	Non Verbal Communication - Life Line of Relations	Mr. Rohokale Balasaheb Ambadas	18
5	Techniques for Enriching College Students Communication Skill	Prof. Sunil S. Deokar	22
6	The Use of Information and Communication Technology in Teaching and Learning English	Vikas Yadav Raskar	24
7	The Use of Computer-Assisted Technologies in Language Learning and Its Barriers	Prof. Bansode Namdeo Changdeo	28
8	Way To Improve Spoken English Skills	Prof. S.K. Joshi	32
9	Vocabulary Enrichment and The Use of Mobile Technology	Dr. Brijesh Tambe	35
10	Improving Writing Skills for Business Correspondence	Prof. Akhade. K.D	39
11	Strategies of Teaching English Language in the Classroom	Dr. Jadhav Sanju P.	42
12	Nature and Scope of Communication Skills	Dr. Karande Shahaji Rajaram	46
13	Influence of Mother Tongue on Indian English Speaker	Dr. Varpe Sandip Dadabhau	49
14	Use of Audio-Visual Aids to Acquire Language Skills	Mr. Suhas A. Shinde	52
15	Need and Importance of Communication Skills	Mr. Kale Ramkrushn Dnyandev	56
16	The Problems of Rural Undergraduate Students in Mastering the English Speaking Skills	Ashok Vitthal More	59
17	Enriching English Communication Skill Through Movies	Dr. Bhushan Vitthal Tagad	62
18	Why Everyone Should Have Effective Communication Skills?	Rajendra Tambile	66
19	An Activity-Based Process to Develop Communication Skills Through the Study of Endgame by Samuel Beckett	Chaitanya Gite	69
20	Improving oral Presentation Skills of Non-Native users of English	Dr. Pallavi B. Malekar	73
21	Contribution of Audio-Visual Aids to Improve Communication Skills	Shaikh Esak Sayyad,	77
22	Crossing A Boundary of Language- Problems of Non-Native English Speakers of India	Ms. Kalyani Shitole	81
23	A Study on Problems of oral Communication While Dealing with Clients: A Case Study of Working Professionals	Vinayak Revji Gandal	84
24	Developing Reading and Writing For Effective Communication Skill	Sharad Vitthalrao Awari	91
25	Strategies for Improving English Speaking Skills of Non- Native Users	Prof. Sachin Mahadeo More	94
26	Problems for Learning English Language as A Non Native Language	Mr. Kathale Yuvaraj S.	98
27	"A Study of Evaluation of Under Graduation Students' Performance in Communication Skills."	Prof. Dr. Kalhapure B.B	100

5

Website – [www.researchjourney.net](http://www.researchjourney.net)Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)



**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 129 : Improving English Communication Skills of Non-native Users  
 UGC Approved Journal

ISSN :  
2348-7143  
February-2019

28	A Study of Barriers of Communication in Classroom and its Solution <b>Dr. Desai V. R., Dr. Lamdade B. B., Gholap K.S.</b>	106
29	Zeal for Enhancing Social Intelligence in English Communication <b>Uday Madhukarrao Kharat</b>	110
30	Importance of Verbal and Non-Verbal Communication <b>Prof. Borude Sharmishtha, B.</b>	113
31	Teaching of English As A Second Language in Indian Context <b>Anil Bhimraj Chindhe &amp; Dr. Pranjali Pandurang Bharate</b>	117
32	"Need and Importance of Communication in English" <b>Prof. Landage Swapnil Shivaji</b>	120
33	Learning English as A First Language in India <b>Shwetambari Shivaji Alhat &amp; Sandeep Sambahji Dhore</b>	124
34	Need And Importance of Communication Skills <b>Dipak P. Ganmote</b>	127
35	Role of Audiovisual Aids in the Learning English Language <b>Mr. Awari Ganesh Kisan</b>	130
36	Communication Skills in Education Process <b>Dr. Lamdade B. B., Gholap K.S., Dr. Desai V. R.</b>	133
37	Strategies for Developing Communication Skills in the Classroom <b>Miss Jyotsna Shivaji Kanade</b>	138
38	Problems of Second Language Learners with Respect to Spoken English <b>Miss. Mukta Dagadu Chitalkar</b>	143
39	Techniques for Developing Speaking Skills in the Classroom <b>Mr.Nana.B.Wagaskar</b>	146
40	Need and Importance of English Language Today <b>Mhaske Pravin Arun</b>	149
41	Need and Importance of Communication Skills <b>Prof. Sanjay Kailas Jadhav</b>	152
42	The Problems of Non-Native Speakers in Using English. <b>Prof. Shitole Kishor Maruti</b>	154
43	Need and Importance of Communication Skills <b>Pradeep Kendre</b>	157
44	'Innovative Methods to Improve English Language Skills for Beginner' <b>Mr. Ramdas Bhaurao Korde</b>	162
45	Listening -An Essential Skill for Improving Communicative English Among Non-Native Users <b>Prof.Shrikrishna R. Sonawane</b>	165
46	Improving English Communication Skills of Non-Native Users <b>Mrs. Salma Mehfuz Shaikh</b>	168
47	Problems of Non-native Speakers in Using English <b>Balu Ganpat Kapse</b>	172
48	Enriching Speaking and Listening Skills <b>Mrs. Sheetal S. Londhe</b>	174
49	Improving Reading Skill of Language <b>Mr. Fulchand Sugriv Shirsat</b>	177
50	Tricks to Communicate in English <b>Dr. Suraj Sawant</b>	180
51	Innovative Ways for Improving English Speaking Skills of Non-native Speakers <b>Prof. Pranjali B.Vidyasagar</b>	184
52	Activities for Improving Communication Skills in English <b>Prof. Sunil Mhankale</b>	187

*Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.*

- Chief & Executive Editor

### The Problems of Rural Undergraduate Students in Mastering the English Speaking Skills

**Ashok Vitthal More**

Assistant Professor in English,  
New Arts, Commerce and Science College,  
Parner

**Abstract:**

*Speaking English is necessary in era of globalization so it becomes inevitable to learn to speak and it becomes a part of curriculum of undergraduate students. The paper highlights the roots causes of problems faced by undergraduate students. The limited exposure to English is the root cause to learn English as second Language. Even sociological, governmental policies and teaching method and environment are hindrance to master the speaking skills in English. Communicative competence can be developed by encouraging and exposure to the English. Language acquisition and language learning are complimentary to each other*

**Key Words:** Language Learning, Second Language, Exposure, Speaking skills, Curriculum, Communicative competence and etc.

The paper attempts to highlight the factors affecting effective learning of English language among undergraduate students and determined the relationship between teacher's role and undergraduate students' effective learning of English language. It also examined relationship between lecturers' English language teaching method and undergraduate students' effective use of English language. These were with a view to improving the quality of teaching and learning of English language among undergraduate students. It is revealed that a non-significant difference existed between the factors in effective learning of English language among undergraduate students. Further, there existed a significant relationship between Teachers' role and undergraduate students' effective learning of English language. Also, there was a significant relationship between lecturers' English language teaching method and undergraduate students' effective use of English language. It was concluded that an awareness campaign of the importance of English language and the role of English lecturers on the part of undergraduate students should be vigorously embarked upon in all college campuses as well as the society at large.

Language acquisition is innate in human and every child acquires his mother tongue naturally. It is never to be taught formally but acquires through attentive listening by understanding the vocabulary and the sentence structure used by the family members and society at enlarge. Every Child is a good grammarian. Every child is blessed with innate ability to understand the native language. Culture and socio-economic environment plays important role in acquiring the language. It's transmitted through cultural environment.

Normally children master the most of the structures of mother tongue by the age of five or six. The children imitate the adults around them and that their speed gradually becomes more accurate as they grown-up.

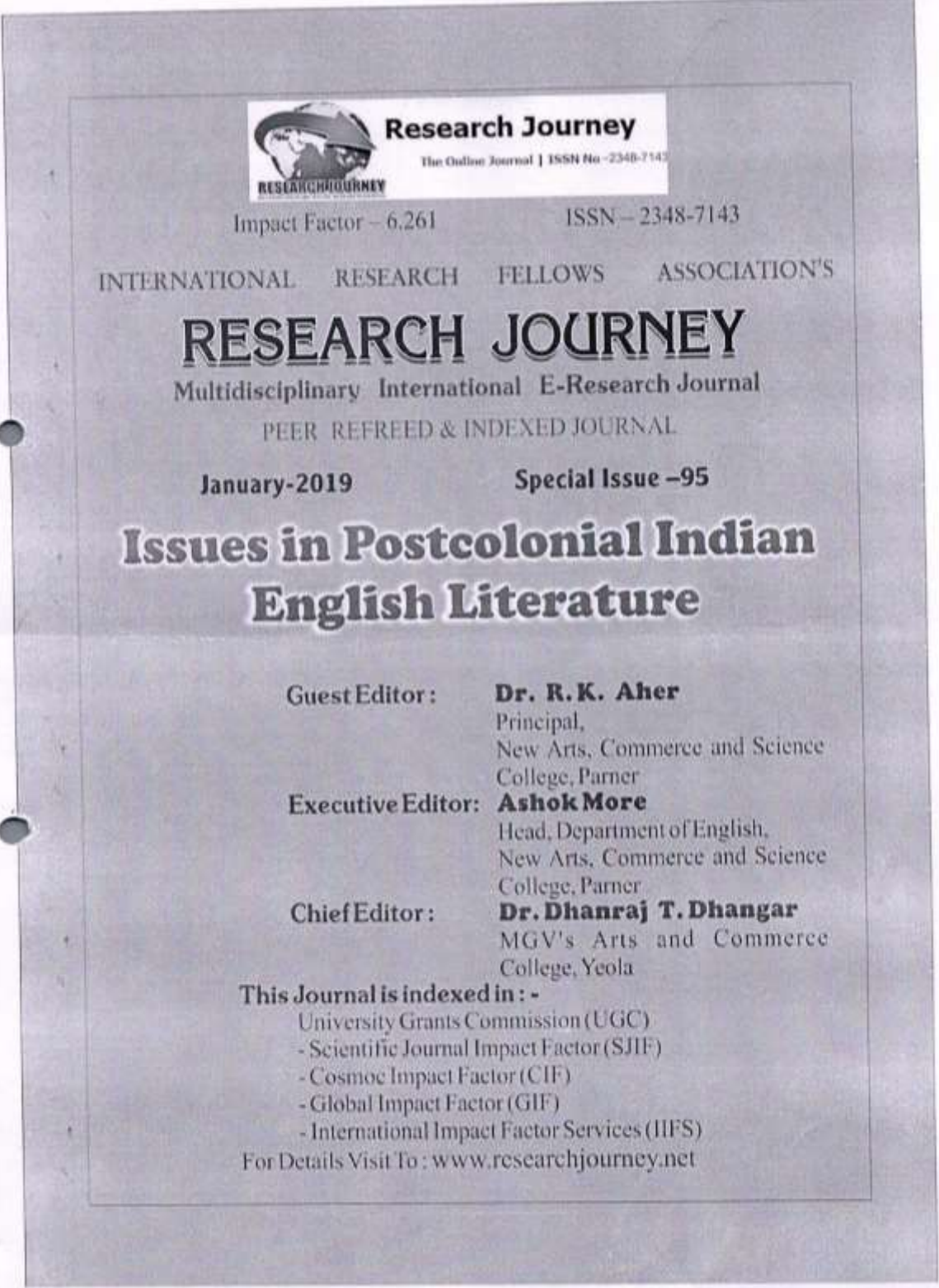
Learning a language is a process of transformation from one stage to other. Language acquisition is the result of spontaneous-response activities. A child learns a language by exposure to it. They form certain structures and modify it. The language learning is deliberate

written material, there is an effective and interesting learning process. It provides the students life-like situations and enriches understanding. We must teach English language through literature.

Today even in Rural Maharashtra, students are taught English from first standard and they get little bit more exposure. The English medium schools started by cooperative institutes encourages the use of English and give an opportunity to use English at secondary school level. The scenario of developing and encouraging use of English is praiseworthy. English language teaching community needs to teach the language with commitment and adapt with new technology. Technically sound teachers can teach English speaking skills more effectively. Technology enabled students found rotten teaching learning process as boredom. So rural students problems can solved by creating computer friendly and healthy learning process.

**Bibliography:**

- Lado, Robert *Language Teaching: Scientific Approach*, Mcgrawhill, New york (1964)  
Mackey, Ray. *Basic Introduction to English Language Teaching*, Oxford London (2015)  
Mohan, Krishna and others, *Developing Communication Skills*, Macmillan, India (2007)  
Turk, Christopher *Effective Speaking*, Spon Press, India (2010)

**35. Quest For Identity in Jhumpa Lahiri's the Namesake**

**Research Journey**  
The Online Journal | ISSN No - 2348-7143

Impact Factor - 6.261      ISSN - 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

**RESEARCH JOURNEY**  
Multidisciplinary International E-Research Journal  
PEER REFREED & INDEXED JOURNAL

January-2019      Special Issue -95

**Issues in Postcolonial Indian  
English Literature**

Guest Editor: **Dr. R. K. Aher**  
Principal,  
New Arts, Commerce and Science  
College, Parner

Executive Editor: **Ashok More**  
Head, Department of English,  
New Arts, Commerce and Science  
College, Parner

Chief Editor: **Dr. Dhanraj T. Dhangar**  
MGV's Arts and Commerce  
College, Yeola

**This Journal is indexed in :-**  
- University Grants Commission (UGC)  
- Scientific Journal Impact Factor (SJIF)  
- Cosmoe Impact Factor (CIF)  
- Global Impact Factor (GIF)  
- International Impact Factor Services (IIFS)

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

### Editorial Board

#### Chief Editor -

Dr. Dhanraj T. Dhangar,  
Assist. Prof. (Marathi)  
MGV'S Arts & Commerce College,  
Yeola, Dist - Nashik [M.S.] INDIA

#### Executive Editors :

Prof. Tejesh Beldar, Nashikroad (English)  
Dr. Gajanan Wankhede, Kinwat (Hindi)  
Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
Dr. Rajay Pawar, Goa (Konkani)

#### Co-Editors -

- ❖ Mr. Tufail Ahmed Shaikh - King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Haresh - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirsath - Nanasaheb Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindhkheda [M.S.]

#### Advisory Board -

- ❖ Dr. Marianna koscic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tatkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

#### Review Committee -

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopergaon
- ❖ Dr. S. B. Bhambar, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayyed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Kategaonkar - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal

Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

## INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Social Realistic Perspective on Naxalism and Terrorism in The Select Indian English Novels	P.R.Bhabad & Anant Netake	11
2	Egalitarianism in Khushwant Singh's Train to Pakistan	Dr. Ashok Chaskar	14
3	Tricontinentalism in V S Naipaul's The Mimiv Men	Dr. Sangita Ghodake	19
4	Diasporic Sensibility in Indian English Literature	Dr. Machhindra Varpe	26
5	Harivansh Batra :A Protagonist in Chaman Nahal's Sunrise in Fiji	Prin. Dr. B. D. Ghodake	29
6	Ethnicizing Nation: A Study in South Asian Ethnic Politics.	Dr. Pandurang Barkale	33
7	The Centrality of Place in Anita Desai's Cry The Peacock and Village By The Sea	Dr. Anil Patil	40
8	Bastardized Capitalism: Amitav Ghosh's Sea of Poppies a Postcolonial View	Dr. Brijesh Tambe	46
9	Features of Literature Dealing With Multiculturalism	Dr. Mangesh Gore	51
10	Issues of Identity in Samina Ali's 'Madras on Rainy Days	Dr.Sanjay Zagade	56
11	Representing the Postcolonial Subaltern: A Study of Aravind Adiga's Last Man in Tower	Mr. Anand Hipparkar	59
12	Post-Colonial Impact of Indian English Literature: A Case Study of Select Novels	Prof. Rameshwar Dusunge	64
13	A Post-Colonial Approach: Environmentalist and Movements	Dr. Mahavir Sankla	68
14	Portrayal of Subaltern Existence of Women in Imtiaz Dharker's Poetry	Dr. Shantilal Ghegade	73
15	'Magic Realism' in Salman Rushdie's 'Midnight Children	Mr. Ananda Pandhare	78
16	Jhumpa Lahiri's 'The Namesake: A Diasporic Reading	Dr. Sanjay Khilare	82
17	Reflection of Indian Culture And Indian English In Raja Rao's Kanthapura: A Postcolonial Perspective	Dr. K.D.Sonawane	88
18	Indian Writing in English	Dr. Kamalakar Jadhav	91
19	Identity Crisis in V.S. Naipaul's 'A House for Mr. Biswas	Anil Kale	93
20	The Shifting Identities of Women in Chitra Banerjee Divakaruni's 'The Mistress of Spices	Dr. Kishorkumar Gaikawad	96
21	Interface Between Science and Fiction In Rimi B. Chatterjee's Signal Red	Dr. Vijaykumar Punekar	100
22	Nationalism To Post Colonialism: A Critical Perspective	Dr. Nandkumar Shinde.	103
23	Indigenous Model of Resistance: Reading Lagan	Dr Ravindra Vaidya	109
24	The Loss of Cultural Inheritance in 'The Inheritance of Loss'	Dr.Ganesh Sonawane	113
25	The Expressives in 'The Princess of Avanti'	Keshav Borkar	116
26	Postcolonial Indian Diasporic Writing is A Forum for Immigrant Experience and It is Also A Search Self-Identity	Prof. Prakash Misal & Prof. Nitin Survase	120
27	Omparing Colonial and Post-Colonial Period With Reference To Nation And Family: A View of Amitav Ghosh	Dr. Saileendra Bansode	124

**'RESEARCH JOURNEY'** *International Multidisciplinary E- Research Journal*  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

28	Immigrant Feminine Experience in Indian English Fiction Ms. Deepanjali Borse	128
29	Meeting an Uncertain Fate: Negotiations Between Tradition and Modernity Prof. Hemant Gaikwad	131
30	The Namesake As Diasporic Novel Shivaji Sontakke	134
31	Reflection of Communal Riots in Translated Post- Colonial Hindi Novels Prof. Balasaheb Rohokale	138
32	Communal Violence in Post- Colonial Indian English Novels Prof. Sunil Deokar	141
33	Visual Representation of Communal Riots in Chaman Nahal's Azadi Dr.Varpe Sandip	145
34	Identity Crisis in Kiran Nagarkar's Selected Fiction Pravinkumar Nagawade & Vaishali Ransing	151
35	Chetan Bhagat : As A Postcolonial Writer in Indian English Literature Prof. Mahesh Kumbhar	154
36	Politics At A University Department: A Study of Post-Colonial Perspective on John Maxwell Coetzee's Disgrace Dr. Rameshwaar Rathod	156
37	Impact of Globalisation on The Underclass Characters in Aravind Adiga's Last Man In Tower Ashok More & Vijay Adsure	158
38	Quest For Identity in Jhumpa Lahiri's the Namesake Anil Chindhe & Sandip Sathe	161
39	The Lotus Leaves: Emotional Infidelity Dr. Archana Rohokale	163
40	Multiculturalism in Indian English Literature. Dr. Ansarullah Khan	166
41	Representation of Caste and Gender Politics in Kishor Kale's Against All Odds Jaysing Babar	168
42	Feminism From Post-Colonial Perspective in Shashi.Deshpande's Novels Sangharsh Gaikwad	170
43	Torturous Estrangement of Valmiki In Kamala Markandaya's Possession Sanjay Diwekar	173
44	Multiculturalism in Indian English Literature Prof. Sunil Mhankale	178
45	Diasporic Sensibility in Indian English Writing Rohinton Mistry – A Fine Balance Prof. Sandhya Sonawane	182
46	Issues of An Identity Crisis in Joseph Conrad's The Secret Agent. Prof. Rajendra Gaikwad	185
47	Indian Perspective of Post-Colonialism: A Review. Prof. Narendra Gawali	188
48	Feministic Issues In Anita Desai's Novels Mr. Nana Wagaskar	192
49	Diasporic Sensibility in The Poetry of Meena Alexander Mr. Anna Muley	194
50	Post Colonial Indian English Literature : A Brief Survey Sharad Awari	202
51	English in Post-Colonial India Ms. Manisha Kale & Dr Dipak Wayal	105
52	Multiculturalism in Indian English Literature Farjana Tamboli	209
53	Relevance of Gandhian Principles in the Present Time Dr Prashant Lohar	212
54	Anita Nair: A Glance of Cultural Diversity In Indian Subcontinent Dr. Yuvaraj Kathale	215
55	Postcolonial Feminist Reading to Toni Morrison's 'The Bluest Eye.' Prof. Rajendra Ambavane	217
56	Joseph Conrad's 'Heart of Darkness': A Postcolonial Study. Mr. Sachin Bhosale	220

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal

Impact Factor - (SJIF) - 6.261 (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 95- Issues in Postcolonial Indian English Literature  
UGC Approved Journal

ISSN :

2348-7143

January-2019

57	Paper Title: Issue of Rani's Identity and Status in Karnad's Naga-Mandal. Dr. Santosh Salunke	223
58	Ecofeminism And Politics of Triple Marginalization in Atwoods 'The Handmaid's Tale' Kallash Atkare	227
59	Indian Women Activist of the Contemporary Era Dr. Dipak Ulemale	232
60	Girish Karnad's Naga-Mandata: A Feministic Approach Mr. Kiran Lomte	234
61	Influences of Modern Western Drama in Satish Aleka's Plays Prof. Vikas Meshram	238
62	Indian English Education: An outcome of Long Planned Imperial Ideology Prof. Rahul Take	243
63	Identity Crisis And Alienation in The Inheritance of Loss Miss. Jyotsna Kanade	245
64	Influences of Modern Western Drama in Satish Alekar's Plays Prof. Swapnil Landage	248
65	Diasporic Disposition And Resulting Despondency Depicted in Jhumpa Lahiri's 'The Namesake' Vaibhav Aldale	252
66	Shiva, the Postcolonial Agent : A Comprehensive Study with Special Reference of Amish Tripathi's The Secret of the Nagas Shiveshwar Muchate	256
67	Globalisation And Post - Colonialism Jyotsna Suryawanshi	260
68	Queer Identity of The Protagonist of Shyam Selvadurai's 'Funny Boy' Prof. Sachin More	263
69	Patriarchy in Manju Kapur's "Difficult Daughters Dr. Shahaji Karande	267
70	Identity, Immigration and Cultural Conflict in Chitra Banerjee's "Clothes" Prof. Ramdas Korde	270
71	Postcolonial Feminism in India S.V. More & A.S.Patekar	273
72	'Old Stone Mansion: An Attempt to Depict Modern Woman in Marathi Theatre' Mr. Bhagvat Dhesale	275
73	Post Colonialism in Salman Rushdie's "Midnight's Children" Dr. Ms. Pranjali Bharate & Dr. Maya Lahare	280
74	Post-Colonial Study in Amitav Ghosh's the Shadow Lines Ms Jayashri Dalavi	284
75	Post Colonial Nationalism or Repugnance: A Study of R.K Narayan's Lawley Road Prof. A. D. Baviskar & Mohammad Ameen Abdul Quadir	288
76	Racism In Nadine Gordimer's The House Gun Mr Gopal Jadhav	291
77	Post Colonial Feminism with Special Reference To Arundhati Roy's the God of Small Things Dr. Abhay Shinde	295
78	Multiculturalism in Indian English Literature Shri Sadguru Deshmukh	297
79	A Study Of Socio-Cultural And Political Dimensions Of Globalization In The Selected Postcolonial Novels Mr.Sandeep Dhore	300
80	Otherness and Identity in Tendulkar's Dramas M.S.Tamboli	304
81	A Study of Struggle and Emancipation of Woman in Mulk Raj Anand's 'Gauri Or The Old Woman and The Cow' Dr.Apeksha Nalawade,Mr. K.S. Aage	306
82	A Historical study of the Term 'Diaspora' Prof. Mhaske Pravin	310
83	Subalternity in Mahasweta Devi's Chuni Kotal Ms.Deepali Barkul & Dr. Anita Mudkanna	312
84	Race, Gender, Ethnicity in Post-Colonial Writing Prof. Ravindra Alhat	314
85	Replication of Somber Issues of Contemporary Indian Society in the Select Plays of Mahesh Dattani Nitin Survase & Prakash Misal	316



**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Quest For Identity in Jhumpa Lahiri's the Namesake

**Anil Chindhe**

Assistant Professor  
Department of English  
New, Arts, Commerce and Science College, Parner

**Sandip Sathe**

Bhigwan College, Bhigwan

#### Abstract:

*"As this paper attempts to study the women characters in The Namesake whose writer is Jhumpa Lahiri who is a diasporic woman. It studies how language and cultures and behavior changes when these women come in contact with the new situation. Here women are often taken in a cultural limbo excited about their new home but to feel sadness about the loss of their country of origin. Here the concept of space is very relevant in the study of diasporic women".*

**Key Words:** Culture, immigrant, migrant, diaspora,

Jhumpa Lahiri, the writer of *The NameSake* was born in England whose parents were educated middle class Bengali Indian and then she went to America. Being an immigrant Lahiri is interested in the large section of new generation people of Indian Americans and their tradition and relationships and the significance of family and how it attached to his homeland. Her novel *The Namesake* has number of interesting women characters. The story shows the conflict between old culture and new culture. It is a perfect reference for Lahiri's story about the strangeness of the Indian immigrant experience in the United States.

In the novel, she focuses on the cultural dislocations of one family, immigrants from Calcutta who settle in Boston to study, work and raise a family. The book opens with Ashima Ganguly who is sad, homesick, spatially and emotionally alienated from her Indian home. Ashima Ganguly was born and became younger in India and married in America. Here she finds it very difficult to be familiar with American culture. For instance her pregnancy was a difficult time for her as there was not anyone close to her in a foreign country. Ashima felt very loneliness and strangeness felling in that time in America. Loneliness and strange surroundings nearly kill such feelings and that's what happened with Ashima. She was the only Indian in the hospital with three other American women in the single room. Ashima "is terrified to raise a child in a country where she is related to no one, where she knows nothing too much. After this incident, she asks her husband to go return India. She feels that living in a America is like a lifelong pregnancy. She kept in her mind a moral and cultural ideology of Bengali Indian. Ashima and her husband try to create a small Bengal clutching to their roots and culture in America far from the land of their birth and struggling for an identity in the land of opportunities and making a rich. At home and with friends they speak in Bengali language and eat only Bengali dishes with their hands. The children Google and Sonia are unknown about the Indian culture, language and places about which they are brought in connection.

The novel moves quietly, and then we see another female character named Moushmi. She is also a Diasporic woman character of the second generation. Though Aashima and Moushmi belong to

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 95- Issues in Postcolonial Indian English Literature  
UGC Approved Journal

ISSN :  
2348-7143  
January-2019

the same culture but their behavior are totally different. For Aashima has everything valuable related to her husband but for Moushmi the things related to her husband are just commodities carrying no importance. Aashima leaves away from all other characters in her commitment towards marriage.

Aashima always reminds the words of her elders who told her "not to eat beef or wear skirts or cut off her hair or forget her family". But the character of second generation goolge and sonaia does not follow these rules and lives their own life. The novel in a way explains the problems of acculturation and assimilation faced by the first as well as the second generation immigrants. Moushmi is a new generation Bengali born woman and becomes young in America's multicultural society and She is a peculiar combination of Indian, American and French identities. Her education at New York University, her frequent visits to countries France and England changed her point of view and her native cultural consciousness. She has little appreciation for India or Indians and is more western in her attitude. She has "privately decided that she had never grown fully dependent on her husband . Their marriage relationship that developed in America's multicultural milieu ends in divorce.

One more woman character from the novel Sonia, belong to second generation immigrant when she visited Calcutta city of india not felt city as her home. Change in place and marginality in Sonia's case however trigger a less sense of alienation and nostalgia in her. She gradually assimilates bits and pieces of the new culture unlike Moushmi has a sense of duty and marries her boyfriend a half Chinese boy Ben. She decides to care her mother after her father's death.

Therefore we come to the end that the women Ashima in The Name Sake gives importance to tradition and traditional values of family and society. She too upholds Indian values, traditions and culture even in America. The first generation immigrants feel proud to their cultural past and did not like to violate their cultural past while the second generation expresses its aberrations and deviations and does not demand it or demonstrate it. The older immigrants are always reminded of the words of their family elders when they left India. So through the existential struggle of Ashima, Lahiri presents the pang of a woman living in an alien land, caused by a sense of isolation.

#### Works Cited:

- Peter Berrey. *Beginning Theory: An Introduction to Literary and Cultural Theory*. Second ed. Channai: T. R. Publication, 2006.
- Batra, Jagdish. *Jumpha Lahiri's The Namesake; A Critical Study* New Delhi: Prestige ed
- Fernandes, Mabes *Immigrant Angst in Transplantation of Culture: Looking at Jumpha lahiri Lahiri World in The Namesake*" *Literature of Diaspora: Cultural Dislocation*, ed.
- Hall, Stuart. "Cultural Identity and Diaspora" *Contemporary Postcolonial Theory*: Lahiri, Jumpha. *The Namesake*. New Delhi: Harper Collins, 2003.


## 36. Teaching of English As A Second Language in Indian Context

INTERNATIONAL RESEARCH JOURNAL

Impact Factor – 6.261 ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S  
**RESEARCH JOURNEY**  
 Multidisciplinary International E-research Journal


PEER REFREED & INDEXED JOURNAL  
 February-2019 Special Issue – 129  
**Improving English Communication Skills  
 of Non-native Users**



**Guest Editor**  
 Dr. N. S. Gaikwad  
 Principal,  
 Annasaheb Awate College, Manchar  
 Tal. Ambegaon, Dist. Pune

**Executive Editors of this issue :**  
 Dr. Shahaji Karande  
 Prof. Ganesh Awari  
 Prof. Sachin More  
 Prof. Jyotsna Kanade  
 Prof. Kishor Shitole


**Chief Editor :**  
 Dr. Dhanraj Dhangar (Yeola)



This Journal is indexed in :

- University Grants Commission (UGC)
- Scientific Journal Impact Factor (SJIF)
- Cosmoc Impact Factor (CIF)
- Global Impact Factor (GIF)
- International Impact Factor Services (IIFS)

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net) **SWATIDHAN PUBLICATIONS**

	<p><b>'RESEARCH JOURNEY'</b> <i>International E- Research Journal</i>          Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)          Special Issue 129 : Improving English Communication Skills of Non-native Users          UGC Approved Journal</p>	<p>ISSN :          2348-7143          February-2019</p>
<p><b>Impact Factor – 6.261</b></p>		<p><b>ISSN – 2348-7143</b></p>
<p>INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S</p>		
<p><b>RESEARCH JOURNEY</b></p>		
<p>International E-Research Journal</p>		
<p>PEER REFREED &amp; INDEXED JOURNAL</p>		
<p>February-2019 Special Issue - 129</p>		
<p><b>Improving English Communication Skills of Non-native Users</b></p>		
<p><b>Guest Editor</b></p>		
<p>Dr. N. S. Gaikwad          Principal,          Annasaheb Awate College, Manchar          Tal. Ambegaon, Dist. Pune</p>		
<p><b>Executive Editors of this issue :</b></p>		
<p>Dr. Shahaji Karande          Prof. Ganesh Awari          Prof. Sachin More          Prof. Jyotsna Kanade          Prof. Kishor Shitole</p>		
<p><b>Chief Editor :</b></p>		
<p>Dr. Dhanraj Dhangar (Yeola)</p>		
<p><b>SWATIDHAN INTERNATIONAL PUBLICATIONS</b></p>		
<p>For Details Visit To : <a href="http://www.researchjourney.net">www.researchjourney.net</a></p>		
<p>© All rights reserved with the authors &amp; publisher</p>		<p>Price : Rs. 800/-</p>
<p>1</p>	<p>Website – <a href="http://www.researchjournev.net">www.researchjournev.net</a></p>	<p>Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a></p>



'RESEARCH JOURNEY' International E- Research Journal

Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 129 : Improving English Communication Skills of Non-native Users  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

### Editorial Board

#### **Chief Editor -**

Dr. Dhanraj T. Dhangar,  
Assist. Prof. (Marathi)  
MGV'S Arts & Commerce College,  
Yeola, Dist - Nashik [M.S.] INDIA

#### **Executive Editors :**

Prof. Tejesh Beldar, Nashikroad (English)  
Dr. Gajanan Wankhede, Kinwat (Hindi)  
Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
Dr. Rajay Pawar, Goa (Konkani)

#### **Co-Editors -**

- ❖ Mr. Tufail Ahmed Shaikh - King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Hareesh - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirasath - Nanasahab Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindhkheda [M.S.]

#### **Advisory Board -**

- ❖ Dr. Marianna kotic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tadkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

#### **Review Committee -**

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopergaon
- ❖ Dr. S. B. Bhambar, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Katgaonkar - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### **Published by -**

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 129 : Improving English Communication Skills of Non-native Users  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

## INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Enriching Vocabulary: A Challenge to Non-Native Speakers	Dr. Sangita Ghodake	07
2	Importance of English Communication Skills	Prof. Dr. Vallabh Karandikar	12
3	Role of Non- Verbal Communication in Human Life	Keshav N. Borkar	15
4	Non Verbal Communication - Life Line of Relations	Mr. Rohokale Balasaheb Ambadas	18
5	Techniques for Enriching College Students Communication Skill	Prof. Sunil S. Deokar	22
6	The Use of Information and Communication Technology in Teaching and Learning English	Vikas Yadav Raskar	24
7	The Use of Computer-Assisted Technologies in Language Learning and Its Barriers	Prof. Bansode Namdeo Changdeo	28
8	Way To Improve Spoken English Skills	Prof. S.K. Joshi	32
9	Vocabulary Enrichment and The Use of Mobile Technology	Dr. Brijesh Tambe	35
10	Improving Writing Skills for Business Correspondence	Prof. Akhade. K.D	39
11	Strategies of Teaching English Language in the Classroom	Dr. Jadhav Sanju P.	42
12	Nature and Scope of Communication Skills	Dr. Karande Shahaji Rajaram	46
13	Influence of Mother Tongue on Indian English Speaker	Dr. Varpe Sandip Dadabhau	49
14	Use of Audio-Visual Aids to Acquire Language Skills	Mr. Suhas A. Shinde	52
15	Need and Importance of Communication Skills	Mr. Kale Ramkrushn Dnyandev	56
16	The Problems of Rural Undergraduate Students in Mastering the English Speaking Skills	Ashok Vitthal More	59
17	Enriching English Communication Skill Through Movies	Dr. Bhushan Vitthal Tagad	62
18	Why Everyone Should Have Effective Communication Skills?	Rajendra Tambile	66
19	An Activity-Based Process to Develop Communication Skills Through the Study of Endgame by Samuel Beckett	Chaitanya Gite	69
20	Improving oral Presentation Skills of Non-Native users of English	Dr. Pallavi B. Malekar	73
21	Contribution of Audio-Visual Aids to Improve Communication Skills	Shaikh Esak Sayyad,	77
22	Crossing A Boundary of Language- Problems of Non-Native English Speakers of India	Ms. Kalyani Shitole	81
23	A Study on Problems of oral Communication While Dealing with Clients: A Case Study of Working Professionals	Vinayak Revji Gandal	84
24	Developing Reading and Writing For Effective Communication Skill	Sharad Vitthalrao Awari	91
25	Strategies for Improving English Speaking Skills of Non- Native Users	Prof. Sachin Mahadeo More	94
26	Problems for Learning English Language as A Non Native Language	Mr. Kathale Yuvaraj S.	98
27	"A Study of Evaluation of Under Graduation Students' Performance in Communication Skills."	Prof. Dr. Kalhapure B.B	100

5

Website - [www.researchjourney.net](http://www.researchjourney.net)Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

**'RESEARCH JOURNEY' International E- Research Journal** ISSN :  
 Impact Factor - (SJIF) – 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013) 2348-7143  
 Special Issue 129 : Improving English Communication Skills of Non-native Users February-2019  
 UGC Approved Journal

28	A Study of Barriers of Communication in Classroom and its Solution <b>Dr. Desai V. R., Dr. Lamdade B. B., Gholap K.S.</b>	106
29	Zeal for Enhancing Social Intelligence in English Communication <b>Uday Madhukarrao Kharat</b>	110
30	Importance of Verbal and Non-Verbal Communication <b>Prof. Borude Sharmishtha, B.</b>	113
31	Teaching of English As A Second Language in Indian Context <b>Anil Bhimraj Chindhe &amp; Dr. Pranjali Pandurang Bharate</b>	117
32	"Need and Importance of Communication in English" <b>Prof. Landage Swapnil Shivaji</b>	120
33	Learning English as A First Language in India <b>Shwetambari Shivaji Alhat &amp; Sandeep Sambhaji Dhore</b>	124
34	Need And Importance of Communication Skills <b>Dipak P. Ganmote</b>	127
35	Role of Audiovisual Aids in the Learning English Language <b>Mr. Awari Ganesh Kisan</b>	130
36	Communication Skills in Education Process <b>Dr. Lamdade B. B., Gholap K.S., Dr. Desai V. R.</b>	133
37	Strategies for Developing Communication Skills in the Classroom <b>Miss Jyotsna Shivaji Kanade</b>	138
38	Problems of Second Language Learners with Respect to Spoken English <b>Miss. Mukta Dagadu Chitalkar</b>	143
39	Techniques for Developing Speaking Skills in the Classroom <b>Mr.Nana.B.Wagaskar</b>	146
40	Need and Importance of English Language Today <b>Mhaske Pravin Arun</b>	149
41	Need and Importance of Communication Skills <b>Prof. Sanjay Kailas Jadhav</b>	152
42	The Problems of Non-Native Speakers in Using English. <b>Prof. Shitole Kishor Maruti</b>	154
43	Need and Importance of Communication Skills <b>Pradeep Kendre</b>	157
44	'Innovative Methods to Improve English Language Skills for Beginner' <b>Mr. Ramdas Bhaurao Korde</b>	162
45	Listening -An Essential Skill for Improving Communicative English Among Non-Native Users <b>Prof.Shrikrishna R. Sonawane</b>	165
46	Improving English Communication Skills of Non-Native Users <b>Mrs. Salma Mehruz Shaikh</b>	168
47	Problems of Non-native Speakers in Using English <b>Balu Ganpat Kapse</b>	172
48	Enriching Speaking and Listening Skills <b>Mrs. Sheetal S. Londhe</b>	174
49	Improving Reading Skill of Language <b>Mr. Fulchand Sugriv Shirsat</b>	177
50	Tricks to Communicate in English <b>Dr. Suraj Sawant</b>	180
51	Innovative Ways for Improving English Speaking Skills of Non-native Speakers <b>Prof. Pranjali B.Vidyasagar</b>	184
52	Activities for Improving Communication Skills in English <b>Prof. Sunil Mhankale</b>	187

*Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop fictive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.*

*- Chief & Executive Editor*



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 129 : Improving English Communication Skills of Non-native Users  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

## Teaching of English As A Second Language in Indian Context

Anil Bhimraj Chindhe & Dr. Pranjali Pandurang Bharate  
New Arts, Commerce and Science College, Parner

### Abstract

*This paper studies about the present status of English as a second language in India. It discusses about the different problems faced by learners of English and the right way of language acquisition for second language learners in India. Language plays as a medium to express effectively in various communicative situations. However, it is the second language which requires conscious and systematic efforts to acquire it. Learning a second language is really a big challenge for all native speakers of that language who really deal with it. The majority of Indian students, particularly from rural area, from Bihar, U.P. and Maharashtra, consider this seven-letter word as a magical and mystical word. A feeling of uneasiness comes in, the moment they hear something in English. As a result of this, Students of India don't want to listen and understand the English language and teachers finds difficulties in such classes. This paper is an attempt to discuss the nature of second language acquisition and the factors responsible for its slow learning, especially in the rural area of India.*

**Keywords:** Language learning, second language acquisition, slow acquisition, Remedial measures the study of language is the foundation of all other learning. Human being use language for communication. Language is one of the powerful medium of communication. English as a powerful vehicle of communication serves as a link language in a multicultural and multilingual society like India and other country as a linguistic mediator. It holds a place of status in our country, even after seventy years since Britishers left India. However, No other language take the place of English language, either as a medium of communication or as an official language. Over the years, it is used as a language of choice for education, commerce, economic growth and social mobility. Teaching students English has consistently emerged as one of the top expectations of parents from school.

Problems of Teaching English as a Second Language in India In a country like India, classes of mixed ability groups are a feature of every small town or village. In most of the rural parts of India, learning-teaching process is done in the mixed language. On the other hand, most of the competitive examinations require English as medium of instruction. In the school of rural area teacher cannot give individual attention to students because large classes and student teacher ratio is high. Teaching of English needs a drastic change for the benefit of learners in schools and colleges. The students of rural background and semi-urban areas in India face a lot of problems as English is not their mother tongue. English is used third language in India and second language is Hindi. As compared to the learners from urban areas, learners from rural background face more difficulties during the process of language learning. In urban areas parents are mostly educated. Its helps the students from urban areas acquire the language quickly. Students do not get chance to speak or read in English in the rural parts of the country. In villages and small towns students mainly hail from rural areas. Bilingual method is used in language classes or especially in English language classes. This method helps only to slow-learners to some extent. Moreover, this act reduces the real learning process as a whole. If a student does not understand in English, he or she asks for an explanation in 1 English Language



emotion, thoughts. The teachers must ask their students to work in pairs, groups and teams and prepare term papers, projects, etc. Therefore, in spite of being taught English in school and college for several years, students fail to learn the language.

They cannot write in English with accurately and cannot speak fluently. Why does this happen? Does it mean that the English teachers in India cannot teach? The teaching of English in India has been text-oriented since colonial times because the British Government's policy was to create a class of Indians who would act as a medium between the British and the Indians. Therefore, basic knowledge of English was needed for a class of Indians. Objectives of teaching and learning English have changed Still English education in India is text-oriented. The policy regarding the place of English in our education system should be well defined. The English language is very importance in the field of science, technology, social sciences, philosophy, journalism, international trade and diplomacy. Keeping in mind the primary aims of teaching English—the students should enable to acquire four basic skills listening, writing, reading and speaking. The teacher should avoid translation method to teach English. Helping students to enjoy the language activities and of building their confidence they should use English as a medium of communication To motivate the students think through English Create confidence of speaking English in public. English teachers themselves have to use innovative method to make their students' to understand English easily. A teacher's role is very important in the class, teacher should encourage student to be active in the class, and students must be participate in the role-play, question answering activities.


In India, seventy percentage people lives in rural area. The policy makers have to bridge the urban-rural divide in teaching of English. An English teacher teaching in rural schools has to come up with innovative methods in the classrooms. Teachers should be upgraded and trained to meet the problems of the learners.

#### Works Cited:

- Graddol D. The future of English
- Hanumanthrao, C.R. (2011) Teaching English Language: Problems and Remedies Prem Shankar (2003) Teaching of English, New Delhi, APH Publishing Corporation Ram Avtar Tyagi, Effective Methods of Teaching English, New Delhi: Alpha Publications, 2006
- Internet

## 37. Post Colonialism in Salman Rushdie's "Midnight's Children"

18-19

 **Research Journey**  
The Online Journal | ISSN No -2348-7143

Impact Factor – 6.261      ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

**RESEARCH JOURNEY**  
Multidisciplinary International E-Research Journal  
PEER REFREED & INDEXED JOURNAL

January-2019      Special Issue –95

**Issues in Postcolonial Indian  
English Literature**

Guest Editor: **Dr. R. K. Aher**  
Principal,  
New Arts, Commerce and Science  
College, Parner

Executive Editor: **Ashok More**  
Head, Department of English,  
New Arts, Commerce and Science  
College, Parner

Chief Editor: **Dr. Dhanraj T. Dhangar**  
MGV's Arts and Commerce  
College, Yeola

**This Journal is indexed in :-**  
University Grants Commission (UGC)  
- Scientific Journal Impact Factor (SJIF)  
- Cosmo Impact Factor (CIF)  
- Global Impact Factor (GIF)  
- International Impact Factor Services (IIFS)

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

Impact Factor – 6.261

ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

## RESEARCH JOURNEY

Multidisciplinary International E-research Journal

PEER REFREED & INDEXED JOURNAL

January-2019 Special Issue – 95

Issues in Postcolonial Indian English Literature

Guest Editor :

Dr. R.K.Aher,

Principal,

New Arts Commerce & Science College,

Parner, Dist. Ahmednagar [M.S.] INDIA

Executive Editor of the issue:

Mr. Ashok More,

Head, Dept. of English,

New Arts Commerce & Science College,

Parner, Dist. Ahmednagar [M.S.] INDIA

Chief Editor :

Dr. Dhanraj Dhangar (Yeola)

SWATIDHAN INTERNATIONAL PUBLICATIONS

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 800/-

1

Website – [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

**'RESEARCH JOURNEY'** *International Multidisciplinary E- Research Journal*  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Editorial Board

#### Chief Editor -

Dr. Dhanraj T. Dhangar,  
Assist. Prof. (Marathi)  
MGV'S Arts & Commerce College,  
Yeola, Dist - Nashik [M.S.] INDIA

#### Executive Editors :

Prof. Tejesh Beldar, Nashikroad (English)  
Dr. Gajanan Wankhede, Kinwat (Hindi)  
Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)  
Dr. Rajay Pawar, Goa (Konkani)

#### Co-Editors -

- ❖ Mr. Tufail Ahmed Shaikh- King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ Dr. Anil Dongre - Head, Dept. of Management, North Maharashtra University, Jalgaon
- ❖ Dr. Shailendra Lende - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ Dr. Dilip Pawar - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ Dr. R. R. Kazi - North Maharashtra University, Jalgaon.
- ❖ Prof. Vinay Madgaonkar - Dept. of Marathi, Goa University, Goa, India
- ❖ Prof. Sushant Naik - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ Dr. G. Haresh - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ Dr. Munaf Shaikh - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ Dr. Samjay Kamble - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ Prof. Vijay Shirsath - Nanasaheb Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ Dr. P. K. Shewale - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ Dr. Ganesh Patil - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ Dr. Hitesh Brijwasi - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ Dr. Sandip Mali - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ Prof. Dipak Patil - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindhkheda [M.S.]

#### Advisory Board -

- ❖ Dr. Marianna koscic - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ Dr. M.S. Pagare - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ Dr. R. P. Singh - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ Dr. S. M. Tatkodkar - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ Dr. Pruthwiraj Taur - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ Dr. N. V. Jayaraman - Director at SNS group of Technical Institutions, Coimbatore
- ❖ Dr. Bajarang Korde - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ Dr. Leena Pandhare - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ Dr. B. V. Game - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

#### Review Committee -

- ❖ Dr. J. S. More - BoS Member (SPPU), Dept. of Hindi, K.J. Somaiyya College, Kopergaon
- ❖ Dr. S. B. Bhambur, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ Dr. Uttam V. Nile - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ Dr. K.T. Khairnar - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ Dr. Vandana Chaudhari KCE's College of Education, Jalgaon
- ❖ Dr. Sayyed Zakir Ali, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ Dr. Sanjay Dhondare - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ Dr. Amol Kategaonkar - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF) - 0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

57	Paper Title: Issue of Rani's Identity and Status in Karnad's Naga-Mandal. Dr. Santosh Salunke	223
58	Ecofeminism And Politics of Triple Marginalization in Atwoods 'The Handmaid's Tale' Kailash Atkare	227
59	Indian Women Activist of the Contemporary Era Dr. Dipak Ulemale	232
60	Girish Karnad's Naga-Mandala: A Feministic Approach Mr. Kiran Lomte	234
61	Influences of Modern Western Drama in Satish Aleka's Plays Prof. Vikas Meshram	238
62	Indian English Education: An outcome of Long Planned Imperial Ideology Prof. Rahul Take	243
63	Identity Crisis And Alienation in The Inheritance of Loss Miss. Jyotsna Kanade	245
64	Influences of Modern Western Drama in Satish Alekar's Plays Prof. Swapnil Landage	248
65	Diasporic Disposition And Resulting Despondency Depicted in Jhumpa Lahiri's 'The Namesake' Vaibhav Aidale	252
66	Shiva, the Postcolonial Agent : A Comprehensive Study with Special Reference of Amish Tripathi's The Secret of the Nagas Shiveshwar Muchate	256
67	Globalisation And Post - Colonialism Jyotsna Suryawanshi	260
68	Queer Identity of The Protagonist of Shyam Selvadurai's 'Funny Boy' Prof. Sachin More	263
69	Patriarchy in Manju Kapur's "Difficult Daughters" Dr. Shahaji Karande	267
70	Identity, Immigration and Cultural Conflict in Chitra Banerjee's "Clothes" Prof. Ramdas Korde	270
71	Postcolonial Feminism in India S.V. More & A.S.Patekar	273
72	'Old Stone Mansion: An Attempt to Depict Modern Woman in Marathi Theatre' Mr. Bhagvat Dhesale	275
73	Post Colonialism in Salman Rushdie's "Midnight's Children" Dr. Ms. Pranjali Bharate & Dr. Maya Lahare	280
74	Post-Colonial Study in Amitav Ghosh's the Shadow Lines Ms Jayashri Dalavi	284
75	Post Colonial Nationalism or Repugnance: A Study of R.K Narayan's Lawley Road Prof. A. D. Baviskar & Mohammad Ameen Abdul Quadir	288
76	Racism In Nadine Gordimer's The House Gun Mr Gopal Jadhav	291
77	Post Colonial Feminism with Special Reference To Arundhati Roy's the God of Small Things Dr. Abhay Shinde	295
78	Multiculturalism in Indian English Literature Shri Sadguru Deshmukh	297
79	A Study Of Socio-Cultural And Political Dimensions Of Globalization In The Selected Postcolonial Novels Mr.Sandeep Dhore	300
80	Otherness and Identity in Tendulkar's Dramas M.S.Tamboli	304
81	A Study of Struggle and Emancipation of Woman in Mulk Raj Ananad's 'Gauri Or The Old Woman and The Cow' Dr.Apelksha Nalawade,Mr. K.S. Aage	306
82	A Historical study of the Term 'Diaspora' Prof. Mhaske Pravin	310
83	Subalternity in Mahasweta Devi's Chumi Kotal Ms.Deepali Barkul & Dr. Anita Mudkanna	312
84	Race, Gender, Ethnicity in Post-Colonial Writing Prof. Ravindra Alhat	314
85	Replication of Somber Issues of Contemporary Indian Society in the Select Plays of Mahesh Dattani Nitin Survase & Prakash Misal	316

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Post Colonialism in Salman Rushdie's "Midnight's Children"

Dr. Ms. Pranjali Bharate & Dr. Maya Lahare  
 New Arts, Commerce and Science College, Parner,  
 PranjaliBharate67206@gmail.com

#### Abstract

Rushdie's *Midnight's Children* was published in 1980. The seminal text is conceiving opinions as to interplay of post-modern and post-colonial theory. The title of the novel has referred to the birth of Saleem Sinai. Saleem is a novel's principal narrator, who is born at midnight August 15th 1947, the precise date of Indian independence. From this remarkable coincidence we are immediately drawn to the conclusion. The novel's concerns are of the new India, and how someone born into this new state of the 'Midnight's child. If you will, interacts with this post-colonial state. The novel as one merely concerned with post-colonial India. Its various machinations, is however a reductive practice. So the novel does at various times deal with what it is to be Indian, both pre and post 1947, it is a much more layered and interesting piece of work. *Midnight's Children's* popularity is such that it was to be voted 25th in a poll conducted by the Guardian, listing the 100 best books of the last century, and was also to receive the Booker Prize in 1981 and the coveted 'Booker of Bookers' in 1993.

Once upon a time India was owned by Britain. Then, on August 15, 1947, it didn't anymore. Saleem Sinai was born at the stroke of midnight on the day when India became independent, and for that reason became a) telepathic b) possessing a giant nose and c) the hero and narrator of *Midnight's Children*. The book traces Saleem's life and the political, social, linguistic, and cultural strife faced the newly independent India.

Many themes in Rushdie's writing weave themselves through his work. The history always played an integral role in establishing the framework of his stories. The history provides Rushdie: with the backdrop to develop motifs exploring the complexities of identity, migration, politics and love.

**Keywords:** magic realism, national identity.

Saleem's telepathy is a way for us to imagine the difficulty of containing multitudes in one body. Saleem sees the isolated facts of history only. They relates to him as an individual. Saleem's sense of the polyglot frenzy points us to modern India. It has teamed diversity in terms of languages and people, and the immense challenge. It has to stay unified in face of all these differences. And then there's that whole bit about *the children of midnight*. These children are all the kids that, like Salaam, were born on the eve of India's independence from Great Britain in midnight and I am of that eve, to be precise. That Saleem eventually finds a way to hear their voices like calling out to like underneath the crazy clamor of all the *other* voices is a sign of hope in a novel. That keeps telling us how Saleem/India is literally splitting apart and dying. It's the hope that, despite all this cacophony of difference. There is the possibility for one, peaceful, whole nation.

There are many complex aspects to *Midnight's Children*. It is clear that Rushdie offers a Postcolonial narrative. Rushdie appropriates many elements of Post colonialism in his work. The first is the lack of a reliable narrator. The Building is off the idea of a lack of totality. It is a part of Post colonialism, Saleem is far from a totalizing narrator. His dates are wrong. Some of

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

his facts are not accurate. He is a participant in his own narrative, leading to issues of bias. These are all deliberate, as Rushdie seeks to make a statement that there can be no definitive notion of history. Any such construction is going to silence voice and that the best we can do is collect as many narratives as possible. This is a Post colonialism response to the condition of imposition that sought to present itself as the truth. These midnight's children share a unique similarity with Saleem. They all have the same potential that comes from the ability to say I: to claim their own identity. And that's huge, especially if you read these kids as the future of an independent India. It's that hope of every kid and every country: the desire for self-determination. And that's something we're betting you can relate to, even if you're not a card-carrying post colonialist.

Post colonialism in *Midnight's Children* is how? It is told from the indigenous point of view. The presence of the British is felt, but the story, itself, is one of Partition and division. Rushdie's use of All India Radio, Bollywood songs, as well appropriating Muslim and Hindu notions of reality help to enhance the Postcolonial understanding of the work. Rushdie does not see a human being as a unified whole but as a fragment distance of his spatio-temporal existence. Saleem is deliberately distanced voice ironically; funny and disillusioned Saleem is a part history. He reduced to this portioned share by the India and Pakistan war of 1965. He is reduced to fragments and almost ruined by this war his family also.

Sheets of flame rose from a Rawalpindi bungalow performed sheets at whose centre hung a mysterious dark hole and one by one the war eliminated my drained hopeless family from the earth.

This family has historical past. They have simply been reduced to his memory. He never sees himself as a complete whole but as splinted bit of his fractured self. He sees himself as first or second person. Being able to relay the basis of Partition as well as the Emergency from an indigenous point of view is also reflective of the Postcolonial elements of *Midnight's Children*. Theoretically, Rushdie wishes to deposit another vision of the narrative into the discourse. That hopes to achieve voice and enhance dialogue. This becomes an element of the Post colonialism in the novel.

Why *Midnight's Children* is interested topic to the reader in post-colonialism. It is possibly due to its strong elements of magic realism, a literary device. That goes hand in hand with post modernism. That's why it is the most notable exponent of magic realism. The literature is the Colombian author Gabriel Garcia Marquez, who's *One Hundred Years of Solitude* written in 1967, came to be seen as the standard bearer for the genre.

Many postcolonial writers have resorted to magic realism as a way of promoting national identity since it embodies practical reality of bygone and contemporary events while simultaneously creating desires to upturn the flow of occurrences. Realism renders nations' appearances astoundingly the same, whereas the unrealistic features of magic realism can render them unique by manifesting yearnings in distinctive ways. With magic realism, postcolonial authors get to challenge what otherwise appears like realistic narrative by experimenting with a non-mainstream literary technique fantasy purposed at presenting an alternative reality in longing subversion of western (read: colonial) ways of constructing reality. To paraphrase Linda Huch eon in "Circling the Downspout of Empire," the postmodern technique of magic realism is linked to post colonialism in that they both deal with the similar oppressive force of colonial history in relation to the past.

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - **6.261**, (CIF) - **3.452(2015)**, (GIF) - **0.676** (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
 2348-7143  
 January-2019

One such postcolonial writer is Salman Rushdie, who used magic realism in *Midnight's Children* extensively. His fusion of fantasy and reality looks typically Indian because the characters strewn in present social and political disorder likewise own the power of epic heroes. As a novelist from a country with a colonial legacy, Rushdie is also concerned and involved with the concept of nation in his magic realist writing, which was motivated by (1) the necessity to cast away what Coleridge called the film of recent past' familiarity through the use of tabulation and (2) the dilemma of presenting impossible events.

India of his past was the driving force behind Rushdie's decision to write *Midnight's Children* – the novel was born when Rushdie realized how much he wanted to restore his past identity to himself. *Midnight's Children* was his first literary attempt to recapture India. The novel explores the ways in which history. It is given meaning through the retelling of individual experience. History is seen subjectively through the eyes of the protagonist Saleem Sinai, therefore the retelling of history is fragmented and, at times, erroneous. Rushdie is relating Saleem's generation of midnight's children to the generation of Indians with whom. He was born and raised. He is product of postcolonial India; Saleem pieces together the multifarious fragments of his identity. As India is begins a new in rebuilding her identity in the wake of colonialism. Saleem's story represents the plural identities of India. The fragments search for self through memory. Magic realism, is an inherent part of the novel, from the grandfather's tears of diamond and ruby nosebleed through Ahmed's vanishing skin to Narlikar's luminous ashes, shows the significance with which the ordinary context gets blurred by miraculous events. First, it permits the plausibility in which characters like Saleem portray epic roles in Indian history. Second, it met aphorizes the cultural amalgam in everyday Indian society. Third, the fantastic events in Indian history actually happened, notwithstanding if Saleem himself admits that these occurrences are too marvellous to be believed. Necessarily, the fantasy becomes a tool with which to relate and remark on Indian history, politics and culture. Finally, magic realism helps define the identity of the Indian people with its offering of an alternative story: A counter Memory.

The magic realism in *Midnight's Children* stresses the sustained struggle to come at peace with identity within the postcolonial scheme. Not only are the midnight's children magical beings. Also the children of the times the last throw of everything. The true hope of freedom is an acknowledgment of their midnight nativity. So Saleem's generation did not succeed in realizing the possibilities built within the dynamics of independence. A possibility is present in every generation of midnight children to construct a complete identity and despite the increasing difficulty of formulating so in the contemporary context. In the ambiguous final sentence of the novel which says, *it is the privilege of midnight's children to be both master and victims of their times, to forsake privacy and be sucked into the annihilating whirlpool of the multitudes, and be unable to live or die in peace, a similar thread weaves not only the marvellous with the real, but also the colonial with the self-asserting postcolonial individual.* The reflection of political and historical problem in magic realism renders. It is as a legitimate critique of colonialism and its attendant ideologies. In upholding the identity of the other in the novel, the postcolonial challenges the imperialistic this movement that champions centrality despite the simultaneous recognition of the power of the centre in the privileging of the margin. A rising society's necessity to renew its self-description and to erode constructed Orientalism by the West may be responded. The inscription of the marginalized magic realism and the celebration of identity in



**'RESEARCH JOURNEY'** *International Multidisciplinary E- Research Journal*  
 Impact Factor - (SJIF) - **6.261**, (CIF) - **3.452(2015)**, (GIF)-**0.676 (2013)**  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
 2348-7143  
 January-2019

post colonialism are means through which said centrality and, by extension, universality, may be questioned.

Midnight's Children is a typical example of a postcolonial novel that integrates the elements of magic realism into it. The author's intentional use of magic realism helps in bringing out the surreal and unreal dimensions of the Indian subcontinent and thereby making it a postcolonial work. By synchronizing the national history and the personal history, Rushdie narrates India's colonial past and postcolonial present. His narration of the nation is subjective and therefore history in the text is fragmented and, at times, erroneous.

Rushdie assumes magic realism as an effective tool to solve the problems of post colonialism. So, by connecting and combining historical events, mythological stories and fictional narratives, Rushdie tries to create and convey a true picture of Indian post colonialism. While the colonizers categorized India and Indians as a monolithic place and people, the novel illustrates India's multiplicity and diversity, in an attempt to overturn the colonial image of India. Midnight's Children is therefore an attempt to recapture India. All these attempts would have been impossible without the inclusion of magic realism.

#### References:

- Salman Rushdie. *Midnight Children's*. 15 August 1947. Faber and Faber Pub. 1947.  
 Rushdie, Salman. *Midnight Children's*. Landon: J. Cape 1981.  
 Benerjee, Ashutosh. Narrative Technique in *Midnight Children*, *The Commonwealth Review* . Vol.1 AND no.2 1990  
 M. H. Abrahm. *A Handbook of Literary Terms*. 2009  
 Rushdie, Salman. *East West*. Landon : J Cape 1994.  
*Imagery Homeland*. Landon : Granta Books in Association with Penguin, 1991.  
 M.A.R. Habib. *Modern Literary Criticism and Theory*. Atlantic 2010.  
 www.enotes.com  
 www.bittlegapanese.blogspot.in  
 https://christysavvy.files.wordpress.com


## 38. Teaching of English as a Second Language in Indian Context

INTERNATIONAL RESEARCH JOURNAL FOR SCIENTISTS

Impact Factor – 6.261 ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S  
**RESEARCH JOURNEY**  
 Multidisciplinary International E-research Journal


PEER REFREED & INDEXED JOURNAL  
 February-2019 Special Issue – 129  
**Improving English Communication Skills  
 of Non-native Users**



**Guest Editor**  
 Dr. N. S. Gaikwad  
 Principal,  
 Annasaheb Awate College, Manchar  
 Tal. Ambegaon, Dist. Pune

**Executive Editors of this issue :**  
 Dr. Shahaji Karande  
 Prof. Ganesh Awari  
 Prof. Sachin More  
 Prof. Jyotsna Kanade  
 Prof. Kishor Shitole


**Chief Editor :**  
 Dr. Dhanraj Dhangar (Yeola)



This Journal is indexed in :

- University Grants Commission (UGC)
- Scientific Journal Impact Factor (SJIF)
- Cosmoc Impact Factor (CIF)
- Global Impact Factor (GIF)
- International Impact Factor Services (IIFS)

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net) **SWATIDHAN PUBLICATIONS**

	<b>'RESEARCH JOURNEY' International E- Research Journal</b> Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013) Special Issue 129 : Improving English Communication Skills of Non-native Users UGC Approved Journal	ISSN : 2348-7143 February-2019
<b>Impact Factor - 6.261</b>	<b>ISSN - 2348-7143</b>	
<b>INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S</b>		
<b>RESEARCH JOURNEY</b>		
<b>International E-Research Journal</b>		
<b>PEER REFREED &amp; INDEXED JOURNAL</b>		
<b>February-2019 Special Issue - 129</b>		
<b>Improving English Communication Skills of Non-native Users</b>		
<b>Guest Editor</b> Dr. N. S. Gaikwad Principal, Annasaheb Awate College, Manchar Tal. Ambegaon, Dist. Pune		
<b>Executive Editors of this issue :</b> Dr. Shahaji Karande Prof. Ganesh Awari Prof. Sachin More Prof. Jyotsna Kanade Prof. Kishor Shitole		
<b>Chief Editor :</b> Dr. Dhanraj Dhangar (Yeola)		
<b>SWATIDHAN INTERNATIONAL PUBLICATIONS</b> For Details Visit To : <a href="http://www.researchjourney.net">www.researchjourney.net</a>		
© All rights reserved with the authors & publisher		Price : Rs. 800/-
<b>1</b>	Website - <a href="http://www.researchjournev.net">www.researchjournev.net</a>	Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>

**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) - **6.261** (CIF) - **3.452(2015)**, (GIF)-**0.676** (2013)  
 Special Issue 129 : Improving English Communication Skills of Non-native Users  
 UGC Approved Journal

ISSN :  
 2348-7143  
 February-2019

### Editorial Board

#### **Chief Editor -**

**Dr. Dhanraj T. Dhangar,**  
 Assist. Prof. (Marathi)  
 MGVS Arts & Commerce College,  
 Yeola, Dist - Nashik [M.S.] INDIA

#### **Executive Editors :**

**Prof. Tejesh Beldar, Nashikroad (English)**  
**Dr. Gajanan Wankhede, Kinwat (Hindi)**  
**Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)**  
**Dr. Rajay Pawar, Goa (Konkani)**

#### **Co-Editors -**

- ❖ **Mr. Tufail Ahmed Shaikh**- King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ **Dr. Anil Dongre** - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ **Dr. Shailendra Lende** - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ **Dr. Dilip Pawar** - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ **Dr. R. R. Kazi** - North Maharashtra University, Jalgaon.
- ❖ **Prof. Vinay Madgaonkar** - Dept. of Marathi, Goa University, Goa, India
- ❖ **Prof. Sushant Naik** - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ **Dr. G. Haresh** - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ **Dr. Munaf Shaikh** - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ **Dr. Samjay Kamble** -BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ **Prof. Vijay Shirsath** - Nanasahab Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ **Dr. P. K. Shewale** - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ **Dr. Ganesh Patil** - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ **Dr. Hitesh Brijwasi** - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ **Dr. Sandip Mali** - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ **Prof. Dipak Patil** - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindkheda [M.S.]

#### **Advisory Board -**

- ❖ **Dr. Marianna kosc** - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ **Dr. M.S. Pagare** - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ **Dr. R. P. Singh** -HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ **Dr. S. M. Tatkodkar** - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ **Dr. Pruthwiraj Taur** - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ **Dr. N. V. Jayaraman** - Director at SNS group of Technical Institutions, Coimbatore
- ❖ **Dr. Bajarang Korde** - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ **Dr. Leena Pandhare** - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ **Dr. B. V. Game** - Act. Principal, MGVS Arts and Commerce College, Yeola, Dist. Nashik.

#### **Review Committee -**


- ❖ **Dr. J. S. More** - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopergaon
- ❖ **Dr. S. B. Bhambar**, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ **Dr. Uttam V. Nile** - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ **Dr. K.T. Khairnar**- BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ **Dr. Vandana Chaudhari** KCE's College of Education, Jalgaon
- ❖ **Dr. Sayyed Zakir Ali** , HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ **Dr. Sanjay Dhondare** - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ **Dr. Amol Kategaonkar** - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

#### **Published by -**

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : [swatidhanrajs@gmail.com](mailto:swatidhanrajs@gmail.com) Website : [www.researchjourney.net](http://www.researchjourney.net) Mobile : 9665398258

### INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Enriching Vocabulary: A Challenge to Non-Native Speakers	Dr. Sangita Ghodake	07
2	Importance of English Communication Skills	Prof. Dr. Vallabh Karandikar	12
3	Role of Non- Verbal Communication in Human Life	Keshav N. Borkar	15
4	Non Verbal Communication - Life Line of Relations	Mr. Rohokale Balasaheb Ambadas	18
5	Techniques for Enriching College Students Communication Skill	Prof. Sunil S. Deokar	22
6	The Use of Information and Communication Technology in Teaching and Learning English	Vikas Yadav Raskar	24
7	The Use of Computer-Assisted Technologies in Language Learning and Its Barriers	Prof. Bansode Namdeo Changdeo	28
8	Way To Improve Spoken English Skills	Prof. S.K. Joshi	32
9	Vocabulary Enrichment and The Use of Mobile Technology	Dr. Brijesh Tambe	35
10	Improving Writing Skills for Business Correspondence	Prof. Akhade. K.D	39
11	Strategies of Teaching English Language in the Classroom	Dr. Jadhav Sanju P.	42
12	Nature and Scope of Communication Skills	Dr. Karande Shahaji Rajaram	46
13	Influence of Mother Tongue on Indian English Speaker	Dr. Varpe Sandip Dadabhau	49
14	Use of Audio-Visual Aids to Acquire Language Skills	Mr. Suhas A. Shinde	52
15	Need and Importance of Communication Skills	Mr. Kale Ramkrushn Dnyandev	56
16	The Problems of Rural Undergraduate Students in Mastering the English Speaking Skills	Ashok Vitthal More	59
17	Enriching English Communication Skill Through Movies	Dr. Bhushan Vitthal Tagad	62
18	Why Everyone Should Have Effective Communication Skills?	Rajendra Tambile	66
19	An Activity-Based Process to Develop Communication Skills Through the Study of Endgame by Samuel Beckett	Chaitanya Gite	69
20	Improving oral Presentation Skills of Non-Native users of English	Dr. Pallavi B. Malekar	73
21	Contribution of Audio-Visual Aids to Improve Communication Skills	Shaikh Esak Sayyad,	77
22	Crossing A Boundary of Language- Problems of Non-Native English Speakers of India	Ms. Kalyani Shitole	81
23	A Study on Problems of oral Communication While Dealing with Clients: A Case Study of Working Professionals	Vinayak Revji Gandal	84
24	Developing Reading and Writing For Effective Communication Skill	Sharad Vitthalrao Awari	91
25	Strategies for Improving English Speaking Skills of Non- Native Users	Prof. Sachin Mahadeo More	94
26	Problems for Learning English Language as A Non Native Language	Mr. Kathale Yuvaraj S.	98
27	"A Study of Evaluation of Under Graduation Students' Performance in Communication Skills."	Prof. Dr. Kalhapure B.B	100

 <b>'RESEARCH JOURNEY' International E- Research Journal</b> Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013) <b>Special Issue 129 : Improving English Communication Skills of Non-native Users</b> <b>UGC Approved Journal</b>		ISSN : 2348-7143 February-2019
28	A Study of Barriers of Communication in Classroom and its Solution <b>Dr. Desai V. R., Dr. Lamdada B. B., Gholap K.S.</b>	106
29	Zeal for Enhancing Social Intelligence in English Communication <b>Uday Madhukarrao Kharat</b>	110
30	Importance of Verbal and Non-Verbal Communication <b>Prof. Borude Sharmishtha, B.</b>	113
31	Teaching of English As A Second Language in Indian Context <b>Anil Bhimraj Chindhe &amp; Dr. Pranjali Pandurang Bharate</b>	117
32	"Need and Importance of Communication in English" <b>Prof. Landage Swapnil Shivaji</b>	120
33	Learning English as A First Language in India <b>Shwetambari Shivaji Alhat &amp; Sandeep Sambhaji Dhore</b>	124
34	Need And Importance of Communication Skills <b>Dipak P. Ganmote</b>	127
35	Role of Audiovisual Aids in the Learning English Language <b>Mr. Awari Ganesh Kisan</b>	130
36	Communication Skills in Education Process <b>Dr. Lamdada B. B., Gholap K.S., Dr. Desai V. R.</b>	133
37	Strategies for Developing Communication Skills in the Classroom <b>Miss Jyotsna Shivaji Kanade</b>	138
38	Problems of Second Language Learners with Respect to Spoken English <b>Miss. Mukta Dagadu Chitalkar</b>	143
39	Techniques for Developing Speaking Skills in the Classroom <b>Mr.Nana.B.Wagaskar</b>	146
40	Need and Importance of English Language Today <b>Mhaske Pravin Arun</b>	149
41	Need and Importance of Communication Skills <b>Prof. Sanjay Kailas Jadhav</b>	152
42	The Problems of Non-Native Speakers in Using English. <b>Prof. Shitole Kishor Maruti</b>	154
43	Need and Importance of Communication Skills <b>Pradeep Kendre</b>	157
44	'Innovative Methods to Improve English Language Skills for Beginner' <b>Mr. Ramdas Bhaurao Korde</b>	162
45	Listening -An Essential Skill for Improving Communicative English Among Non-Native Users <b>Prof.Shrikrishna R. Sonawane</b>	165
46	Improving English Communication Skills of Non-Native Users <b>Mrs. Salma Mehruz Shaikh</b>	168
47	Problems of Non-native Speakers in Using English <b>Balu Ganpat Kapse</b>	172
48	Enriching Speaking and Listening Skills <b>Mrs. Sheetal S. Londhe</b>	174
49	Improving Reading Skill of Language <b>Mr. Fulchand Sugriv Shirsat</b>	177
50	Tricks to Communicate in English <b>Dr. Suraj Sawant</b>	180
51	Innovative Ways for Improving English Speaking Skills of Non-native Speakers <b>Prof. Pranjali B.Vidyasagar</b>	184
52	Activities for Improving Communication Skills in English <b>Prof. Sunil Mhankale</b>	187

*Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.*

*- Chief & Executive Editor*

---

6	Website – <a href="http://www.researchjourney.net">www.researchjourney.net</a>	Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>
---	--	--



'RESEARCH JOURNEY' International E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 129 : Improving English Communication Skills of Non-native Users  
 UGC Approved Journal

ISSN :  
 2348-7143  
 February-2019

## Teaching of English As A Second Language in Indian Context

Anil Bhimraj Chindhe & Dr. Pranjali Pandurang Bharate  
 New Arts, Commerce and Science College, Parner

### Abstract

*This paper studies about the present status of English as a second language in India. It discusses about the different problems faced by learners of English and the right way of language acquisition for second language learners in India. Language plays as a medium to express effectively in various communicative situations. However, it is the second language which requires conscious and systematic efforts to acquire it. Learning a second language is really a big challenge for all native speakers of that language who really deal with it. The majority of Indian students, particularly from rural area, from Bihar, U.P. and Maharashtra, consider this seven-letter word as a magical and mystical word. A feeling of uneasiness comes in, the moment they hear something in English. As a result of this, Students of India don't want to listen and understand the English language and teachers finds difficulties in such classes. This paper is an attempt to discuss the nature of second language acquisition and the factors responsible for its slow learning, especially in the rural area of India.*

**Keywords:** Language learning, second language acquisition, slow acquisition, Remedial measures the study of language is the foundation of all other learning. Human being use language for communication. Language is one of the powerful medium of communication. English as a powerful vehicle of communication serves as a link language in a multicultural and multilingual society like India and other country as a linguistic mediator. It holds a place of status in our country, even after seventy years since Britishers left India. However, No other language take the place of English language, either as a medium of communication or as an official language. Over the years, it is used as a language of choice for education, commerce, economic growth and social mobility. Teaching students English has consistently emerged as one of the top expectations of parents from school.

Problems of Teaching English as a Second Language in India In a country like India, classes of mixed ability groups are a feature of every small town or village. In most of the rural parts of India, learning-teaching process is done in the mixed language. On the other hand, most of the competitive examinations require English as medium of instruction. In the school of rural area teacher cannot give individual attention to students because large classes and student teacher ratio is high. Teaching of English needs a drastic change for the benefit of learners in schools and colleges. The students of rural background and semi-urban areas in India face a lot of problems as English is not their mother tongue. English is used third language in India and second language is Hindi. As compared to the learners from urban areas, learners from rural background face more difficulties during the process of language learning. In urban areas parents are mostly educated. Its helps the students from urban areas acquire the language quickly. Students do not get chance to speak or read in English in the rural parts of the country. In villages and small towns students mainly hail from rural areas. Bilingual method is used in language classes or especially in English language classes. This method helps only to slow-learners to some extent. Moreover, this act reduces the real learning process as a whole. If a student does not understand in English, he or she asks for an explanation in 1 English Language

emotion, thoughts. The teachers must ask their students to work in pairs, groups and teams and prepare term papers, projects, etc. Therefore, in spite of being taught English in school and college for several years, students fail to learn the language.

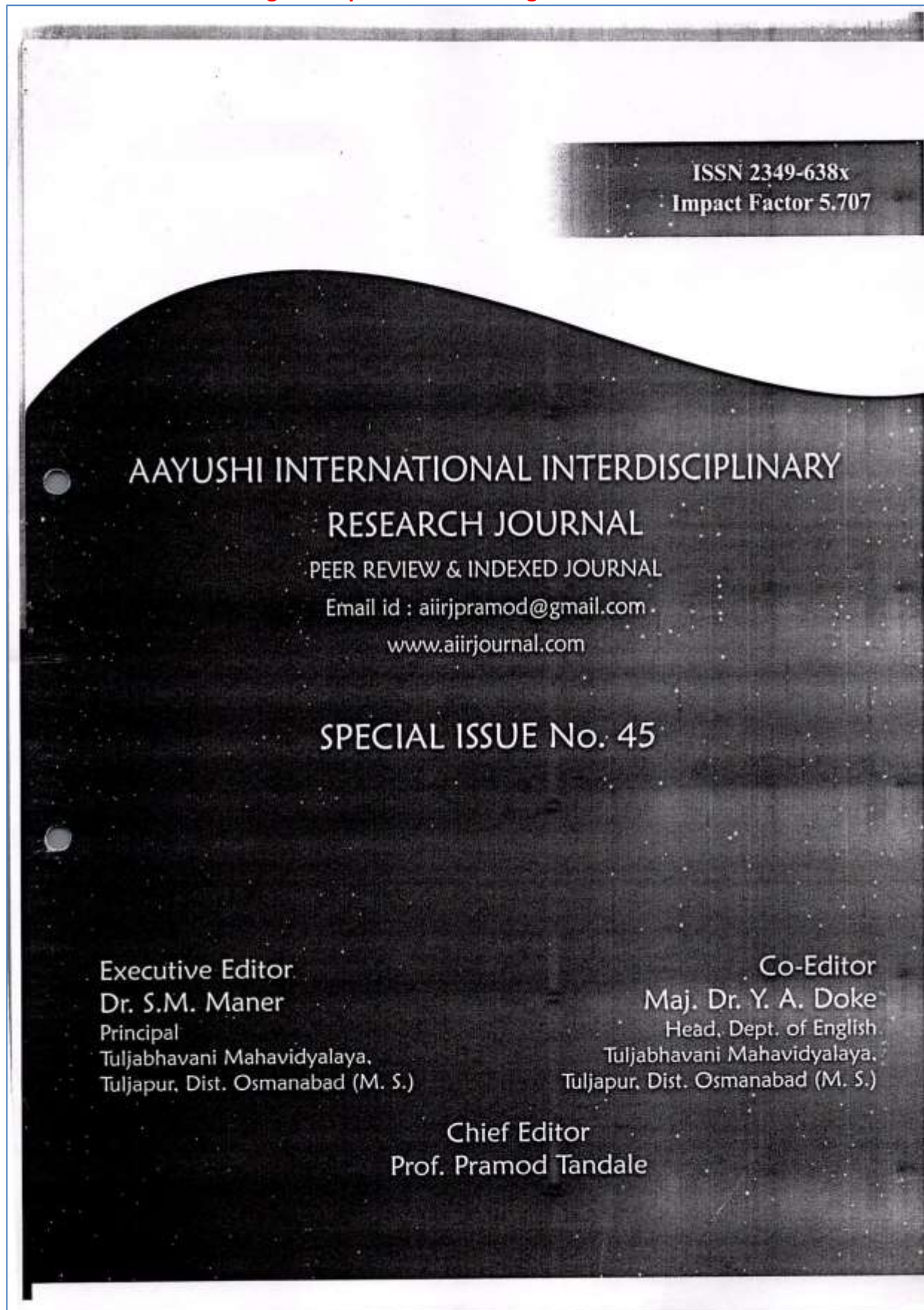
They cannot write in English with accurately and cannot speak fluently. Why does this happen? Does it mean that the English teachers in India cannot teach? The teaching of English in India has been text-oriented since colonial times because the British Government's policy was to create a class of Indians who would act as a medium between the British and the Indians. Therefore, basic knowledge of English was needed for a class of Indians. Objectives of teaching and learning English have changed Still English education in India is text-oriented. The policy regarding the place of English in our education system should be well defined. The English language is very importance in the field of science, technology, social sciences, philosophy, journalism, international trade and diplomacy. Keeping in mind the primary aims of teaching English—the students should enable to acquire four basic skills listening, writing, reading and speaking. The teacher should avoid translation method to teach English. Helping students to enjoy the language activities and of building their confidence they should use English as a medium of communication To motivate the students think through English Create confidence of speaking English in public. English teachers themselves have to use innovative method to make their students' to understand English easily. A teacher's role is very important in the class, teacher should encourage student to be active in the class, and students must be participate in the role-play, question answering activities.

In India, seventy percentage people lives in rural area. The policy makers have to bridge the urban-rural divide in teaching of English. An English teacher teaching in rural schools has to come up with innovative methods in the classrooms. Teachers should be upgraded and trained to meet the problems of the learners.

#### Works Cited:

- Graddol D. The future of English
- Hanumanthrao, C.R. (2011) Teaching English Language: Problems and Remedies Prem Shankar (2003) Teaching of English, New Delhi, APH Publishing Corporation Ram Avtar Tyagi, Effective Methods of Teaching English, New Delhi: Alpha Publications, 2006
- Internet



**39. Meaning and Explanation in Transgender Discrimination**

Impact Factor-5.707

ISSN-2349-638x

**Aayushi**  
**International Interdisciplinary**  
**Research Journal (AIIRJ)**

PEER REVIEWED &amp; INDEXED JOURNAL

February- 2019

**Executive Editor****Dr. S. M. Maner**

Principal

Tuljabhavani Mahavidyalaya, Tuljapur,

Dist. Osmanabad (M. S.) India

**Chief Editor****Pramod P. Tandale****Co-Editor****Prof. V. H. Chavan**

Dept. of Hindi

**Maj. Dr. Y. A. Doke**

Head, Dept. of English

Tuljabhavani Mahavidyalaya, Tuljapur, Dist. Osmanabad (M. S.) India

**Impact Factor****SJIF 5.707**

For details Visit to:

[www.aiirjournal.com](http://www.aiirjournal.com)

**Aayushi International Interdisciplinary Research Journal (AIIRJ)**  
Impact factor -5.707

**Special Issue Editorial Board**

**Co-Editors**

- Dr. C. R. Dapke** : Dept. of English, Tuljabhavani Mahavidyalaya, Tuljapur  
**Dr. M. R. Ade** : Dept. of Hindi, Tuljabhavani Mahavidyalaya, Tuljapur  
**Smt. Dr. Farjana M. Tamboli** : Dept. of English, Tuljabhavani Mahavidyalaya, Tuljapur

**Advisory Board**

- Prin. Dr. A. A. Karande**, Satara  
**Prin. Dr. Anil Patil**, AKMM, Ichalkaranji  
**Prin. Dr. Babasaheb Dudhale**, Dr. Patangrao Kadam Mahavidyalaya, Pen  
**Prin. Dr. Milind Hujare**, Dattajirao Kadam Mahavidyalaya, Ichalkaranji  
**Prin. Dr. Shaikh Samad**, Ex-Principal, Vasantnao Naik College, Aurangabad  
**Prin. Dr. S.Y. Hongekar**, Vivekanand College, Kolhapur  
**Prin. Dr. R. R. Kumbhar**, Vasantnaodada Patil Mahavidyalaya, Tasgaon  
**Prin. Dr. S. B. Kurane**, Samajbhushan Ganpatrao Kalbhore Mahavidyalaya, Lonikalbhore  
**Dr. Shruti Joshi**, Dept. of English, Vivekanand College, Kolhapur  
**Dr. U. B. Ambure**, Head, Department English, Dr. B. A. M. U. Aurangabad

**Review Committee**

- Dr. T. L. Barbole**, Head, Dept. of Economics,  
**Maj. Dr. Y. A. Doke**, Head, Dept. of English,  
**Dr. C. R. Dapke**, Det. Of English,  
**Prof. V. H. Chavan** Dept. Hindi  
**Prof. N. B. Kale** Dept. of commerce  
**Prof. B J Kukade** Head Dept. of Sociology  
**Dr. B W Gund** Head Dept. of Political Science  
**Smt. Dr. F.M. Tamboli** Dept. of English

**Published by:** Pramod Tandale, Aayushi International Interdisciplinary Research Journal  
Peer Review Journal, Latur  
Email: aiirjpramod@gmail.com Website: www.aiirjpramod.com

Aayushi International Interdisciplinary Research Journal ( AIIRJ )		Special Issue No. 45	ISSN 2349-638x
Sr.No.	Author Name	Title of Article / Research Paper	Page No.
1.	Dr. N. B. Pawar	Globalization and Indian Society	1
2.	Dr. Uttam Ambhore Ratnamala R. Pagare	Struggles of Minority: A Study of Carlos Bulosan's America Is In The Heart: A Personal History	4
3.	Dr. Uttam Ambhore Priyanka R. Nikam	Maxine Hong Kingston's the Woman Warrior: An Attempt of Constructing Ethnic Identity	8
4.	Dr. Umakanth S. Patil Shashikant U. Patil	Issues & Concerns of Farmers In Indian Politics	11
5.	Dr. Kalpana Girish Gangatirkar	The Reflections of Patriarchal Predomination in Shashi Deshpande's <i>The Dark Holds No Terrors</i>	13
6.	Dr. Swaleha M. Attar	Mother-Daughter Relationship in Select Novels of Young Adult Fiction	17
7.	Dr. Anupama Prakash Pol	Effects Of Globalization On Indian Women And Indian Literature	20
8.	Dr.F.A.Siddiqui Mr. Ibrahim Abdu Mohammed Maslamani	Problem of Minority in Mulk Raj Anand's Untouchable	22
9.	Dr. Sunil V. Pawar	The Shepherd's Hut: A Teenager's Tale	24
10.	Dr. Yashwant A. Doke Arun Govindrao Mitrottri	Parent-Children Relationship in the Present Scenario	26
11.	Dr. Anita Mudkanna	Complexity of Human Relationship in Anita Desai's Novel " <i>Cry the Peacock</i> "	28
12.	Deepak G. Todkari	A Tragic Trauma: Reflection of Womanhood as a Minority in the work of Kamala Das	30
13.	Dr. Urmila. G. Dharashive	The Frontier In American Literature And Culture	32
14.	Mr. Madhav D. Shrimangale	Chitra Banerjee Divakaruni's Arranged Marriage: A Global Perspective	35
15.	Dr. Prashant Subhash Mothe	Communication Gap And Cultural Crash In Jhumpa Lahiri's Interpreter Of Maladies	38
16.	Dr. Abul Hasib Siddiqui	Struggle for Identity in Githa Hariharan's The Thousand Faces of Night	42
17.	Dr.Panchappa Ramchandra Waghmare	Impact Of Globalisation In Arvind Adiga's <i>The White Tiger</i>	44
18.	Dr. Vaibhav Ramdas Zakde	Dalit Autobiographies: Quest for Identity	47
19.	Miss. Vidya Vasant Bhosale	Rise of Transgender and Gender Discrimination Hijras :One of India's Most Misunderstood Community	50
20.	Dr. Prashant Janardhanrao Gaikwad	Impact of Freudian Psychology on D. H. Lawrence's Sons and Lovers	53
www.aiirjournal.com		Impact Factor 5.707	Peer Reviewed Journal
		Mob.No. 8999250451	A

### Meaning And Explanation of Gender Discrimination

**Dr. Pranjali Pandurang Bharate**

New Arts Commerce and Science College Parner, Ahmednagar.

#### Abstract

*Gender discrimination refers to the practice of granting or denying rights or privileges to a person based on their gender. In some societies, this practice is longstanding and acceptable to both genders. Certain religious groups embrace gender discrimination as part of their dogma. However, in most industrialized nations, it is either illegal or generally considered inappropriate.*

*Attitudes toward gender discrimination can normally be traced back to the roots of certain segments of society. Much of the discrimination is attributed to stories such as a woman being made from man's rib and societal practices such as dowries paid to fathers by prospective husbands to purchase their daughters to be wives. Countless literary fiction references are made to females being the fairer, weaker sex and males being the strong, invincible hunters of the world. The combined power of these societal and religious beliefs left little room for equitable thinking for centuries.*

*Keynote: Gender Study, Social Problem, Transgender Community*

Although gender discrimination is traditionally viewed as a problem normally encountered by females, it has significantly affected males as well. Jobs customarily and historically held mainly by women were often denied to men based on social stigmas. Some of the more common jobs that fell into this category were nurses, childcare providers and flight attendants. In the past few decades, gender discrimination has gained respect as a serious affront. It is frequently given as much credence as racial discrimination. Some countries and societies mete out relatively harsh punishments to those convicted of gender discrimination.

In countries where it's considered an affront, gender discrimination is also often difficult to prove. It is normally not as overtly evident as racial discrimination since the offender can claim other reasons a person was denied equal consideration. For instance, if male claims he was not hired as a nurse based on his gender, the employer can simply maintain his qualifications were substandard or his personality was not a good fit with the rest of the staff. Such ambiguities frequently make it hard to prove gender discrimination. In cases where the discriminatory act is repeated, legal action is customarily taken. These incidents commonly revolve around persons of a certain gender being summarily passed over for promotions by the same company. Another common scenario involves a gender-defined group being paid less for performing exactly the same job as the other gender.

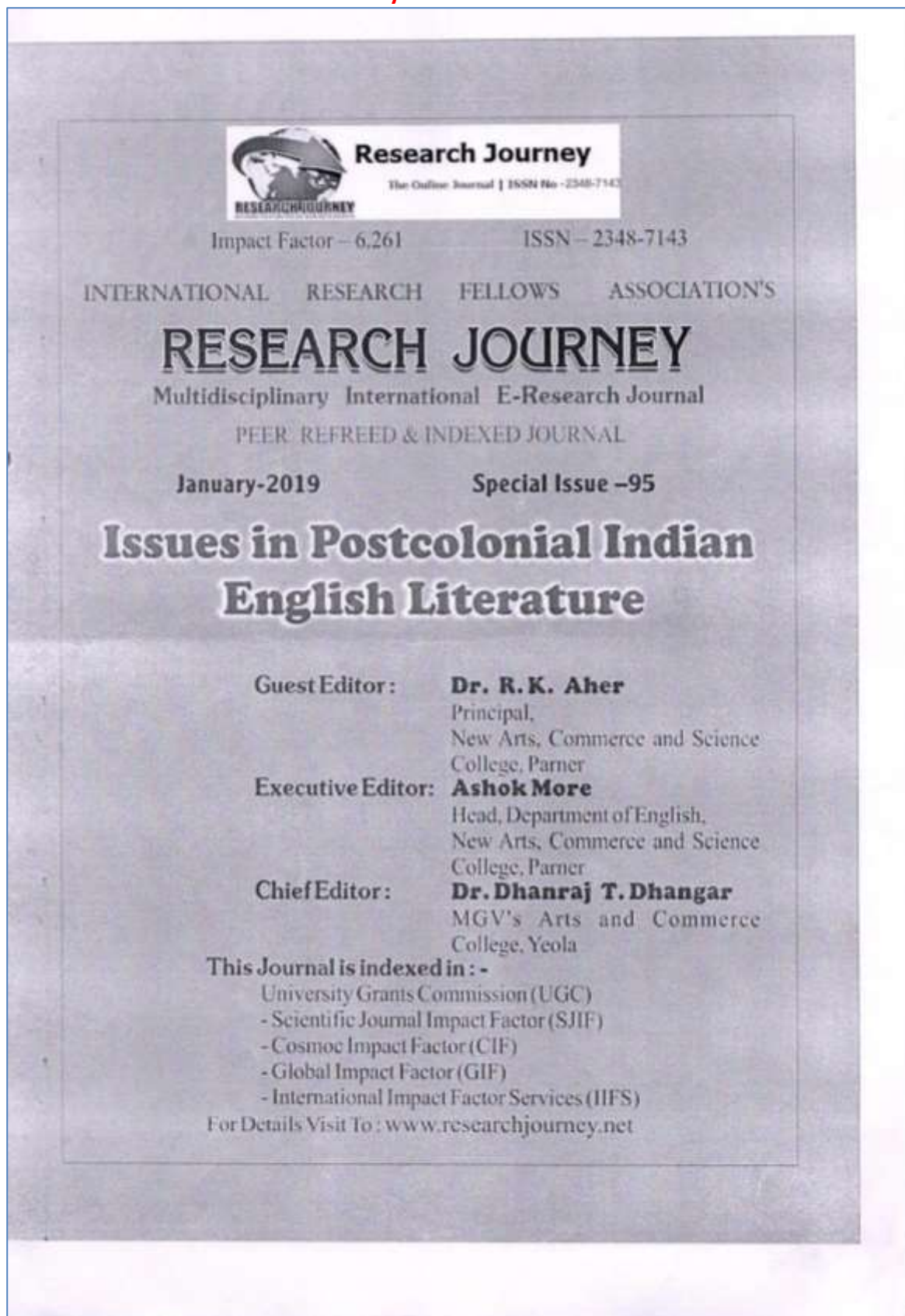
Educational institutions and lending institutions were some of the first segments accused of this type of discrimination. Grants, loans and scholarships promoted as non-gender specific sometimes heavily favoured one gender for reasons that were often more traditional than malicious. Bankers were once commonly instructed by their superiors to deny females loans and mortgages based on their gender and regardless of their assets or credit histories.

Society is changing today; the community is growing, people are becoming more accepting, and the world is opening its hearts to the people who are different. Not everyone in this society gives acceptance, however, for there is still unnecessary sex and racial discrimination--especially by the transgender community. Transgender and gender nonconforming citizens are faced with more bias and discrimination than the rest of the general population. Rights and legal legislation is needed to protect transgender and gender nonconforming people from social injustices. There are many ways you can support transgender or gender nonconforming people you know or that are around you. Such as, you can educate yourself about transgender issues by reading books, attending conferences, and consulting with transgender experts (Thompson 20).

Learning about transgender issues and concerns allows someone to progress in a developing relationship with people who are transgender or don't conform to society's gender normative. With today's growing acceptances and differences, this is just the first step in helping people in the fight for transgender freedom. Be aware of your attitudes concerning people with gender-nonconforming appearance or behaviour (Thompson 20). Being careful about attitudes towards transgender people with different appearances/behaviours is important in the support of a transgender friend or loved one, and can help you as well as them grow and develop in today's society. Remember that there is no universal way to look or be transgender, and that many transgender people have membership with different identity groups, such as race, social class, religion, age, and disability (Thompson 20).

Most people don't have to think about which bathroom to use. They use the one labelled men's or the one labelled women's. It's a simple decision. For transgender individuals, however, it is not that easy. The transgender rights movement has gained a lot of attention in recent years and with that attention brings many issues and questions. One of the issues that have popped up is which bathroom transgender people should use. Some think that people should only use the bathroom of the sex that they were assigned at birth while others

## 40. Post-Colonial Study in Amitav Ghosh's the Shadow Lines



'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

Impact Factor - 6.261

ISSN - 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

## RESEARCH JOURNEY

Multidisciplinary International E-research Journal

PEER REFREED & INDEXED JOURNAL

January-2019 Special Issue - 95

Issues in Postcolonial Indian English Literature

Guest Editor :

Dr. R.K.Aher,

Principal,

New Arts Commerce & Science College,

Parner, Dist. Ahmednagar [M.S.] INDIA

Executive Editor of the issue:

Mr. Ashok More,

Head, Dept. of English,

New Arts Commerce & Science College,

Parner, Dist. Ahmednagar [M.S.] INDIA

Chief Editor :

Dr. Dhanraj Dhangar (Yeola)

SWATIDHAN INTERNATIONAL PUBLICATIONS

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 800/-

1

Website - [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

**'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal**  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### Editorial Board

**Chief Editor -**  
**Dr. Dhanraj T. Dhangar,**  
**Assist. Prof. (Marathi)**  
**MGV'S Arts & Commerce College,**  
**Yeola, Dist - Nashik [M.S.] INDIA**

**Executive Editors :**  
**Prof. Tejesh Beldar, Nashikroad (English)**  
**Dr. Gajanan Wankhede, Kinwat (Hindi)**  
**Mrs. Bharati Sonawane-Nile, Bhusawal (Marathi)**  
**Dr. Rajay Pawar, Goa (Konkani)**

### Co-Editors -

- ❖ **Mr. Tufail Ahmed Shaikh** - King Abdul Aziz City for Science & Technology, Riyadh, Saudi Arabia.
- ❖ **Dr. Anil Dongre** - Head, Deptt. of Management, North Maharashtra University, Jalgaon
- ❖ **Dr. Shailendra Lende** - R.T.M. Nagpur University, Nagpur [M.S.] India
- ❖ **Dr. Dilip Pawar** - BoS Member (SPPU), Dept. of Marathi, KTHM College, Nashik.
- ❖ **Dr. R. R. Kazi** - North Maharashtra University, Jalgaon.
- ❖ **Prof. Vinay Madgaonkar** - Dept. of Marathi, Goa University, Goa, India
- ❖ **Prof. Sushant Naik** - Dept. of Konkani, Govt. College, Kepe, Goa, India
- ❖ **Dr. G. Hareesh** - Associate Professor, CSIBER, Kolhapur [M.S.] India
- ❖ **Dr. Munaf Shaikh** - N. M. University, Jalgaon & Visiting Faculty M. J. C. Jalgaon
- ❖ **Dr. Samjay Kamble** - BoS Member Hindi (Ch.SU, Kolhapur), T.K. Kolekar College, Nesari
- ❖ **Prof. Vijay Shirsath** - Nanasaheb Y. N. Chavhan College, Chalisgaon [M.S.]
- ❖ **Dr. P. K. Shewale** - Vice Principal, Arts, Science, Commerce College, Harsul [M.S.]
- ❖ **Dr. Ganesh Patil** - M.V.P.'s, SSSM, ASC College, Saikheda, Dist. Nashik [M.S.]
- ❖ **Dr. Hitesh Brijwasi** - Librarian, K.A.K.P. Com. & Sci. College, Jalgaon [M.S.]
- ❖ **Dr. Sandip Mali** - Sant Muktabai Arts & Commerce College, Muktainagar [M.S.]
- ❖ **Prof. Dipak Patil** - S.S.V.P.S.'s Arts, Sci. and Com. College, Shindkheda [M.S.]

### Advisory Board -

- ❖ **Dr. Marianna koscic** - Scientific-Cultural Institute, Mandala, Trieste, Italy.
- ❖ **Dr. M.S. Pagare** - Director, School of Languages Studies, North Maharashtra University, Jalgaon
- ❖ **Dr. R. P. Singh** - HoD, English & European Languages, University of Lucknow [U.P.] India
- ❖ **Dr. S. M. Tadkodkar** - Rtd. Professor & Head, Dept. of Marathi, Goa University, Goa, India.
- ❖ **Dr. Pruthwiraj Taur** - Chairman, BoS., Marathi, S.R.T. University, Nanded.
- ❖ **Dr. N. V. Jayaraman** - Director at SNS group of Technical Institutions, Coimbatore
- ❖ **Dr. Bajarang Korde** - Savitribai Phule Pune University Pune, [M.S.] India
- ❖ **Dr. Leena Pandhare** - Principal, NSPM's LBRD Arts & Commerce Mahila Mahavidyalaya, Nashik Road
- ❖ **Dr. B. V. Game** - Act. Principal, MGV's Arts and Commerce College, Yeola, Dist. Nashik.

### Review Committee -

- ❖ **Dr. J. S. More** - BoS Member (SPPU), Dept. of Hindi, K.J.Somaiyya College, Kopergaon
- ❖ **Dr. S. B. Bhambar**, BoS Member Ch.SU, Kolhapur, T.K. Kolekar College, Nesari
- ❖ **Dr. Uttam V. Nile** - BoS Member (NMU, Jalgaon) P.S.G.V.P. Mandals ACS College, Shahada
- ❖ **Dr. K.T. Khairnar** - BoS Member (SPPU), Dept. of Commerce, L.V.H. College, Panchavati
- ❖ **Dr. Vandana Chaudhari** KCE's College of Education, Jalgaon
- ❖ **Dr. Sayyed Zakir Ali**, HOD, Urdu & Arabic Languages, H. J. Thim College, Jalgaon
- ❖ **Dr. Sanjay Dhondare** - Dept. of Hindi, Abhay Womens College, Dhule
- ❖ **Dr. Amol Kategoanekar** - M.V.P.S.'s G.M.D. Arts, B.W. Commerce & Science College, Sinnar.

### Published by -

© Mrs. Swati Dhanraj Sonawane, Director, Swatidhan International Publication, Yeola, Nashik  
 Email : swatidhanrajs@gmail.com Website : www.researchjourney.net Mobile : 9665398258



**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

### INDEX

No.	Title of the Paper	Author's Name	Page No.
1	Social Realistic Perspective on Naxalism and Terrorism in The Select Indian English Novels	P.R.Bhabad & Anant Netake	11
2	Egalitarianism in Khushwant Singh's Train to Pakistan	Dr. Ashok Chaskar	14
3	Tricontinentalism in V S Naipaul's The Mimiv Men	Dr. Sangita Ghodake	19
4	Diasporic Sensibility in Indian English Literature	Dr. Machindra Varpe	26
5	Harivansh Butra :A Protagonist in Chaman Nahal's Sunrise in Fiji	Prin. Dr. B. D. Ghodake	29
6	Ethnicizing Nation: A Study in South Asian Ethnic Politics.	Dr. Pandurang Barkale	33
7	The Centrality of Place in Anita Desai's Cry The Peacock and Village By The Sea	Dr. Anil Patil	40
8	Bastardized Capitalism: Amitav Ghosh's Sea of Poppies a Postcolonial View	Dr. Brijesh Tambe	46
9	Features of Literature Dealing With Multiculturalism	Dr. Mangesh Gore	51
10	Issues of Identity in Samina Ali's 'Madras on Rainy Days	Dr.Sanjay Zagade	56
11	Representing the Postcolonial Subaltern: A Study of Aravind Adiga's Last Man in Tower	Mr. Anand Hipparkar	59
12	Post-Colonial Impact of Indian English Literature: A Case Study of Select Novels	Prof. Rameshwar Dusunge	64
13	A Post-Colonial Approach: Environmentalist and Movements	Dr. Mahavir Sankla	68
14	Portrayal of Subaltern Existence of Women in Imtiaz Dharker's Poetry	Dr. Shantilal Ghegade	73
15	Magic Realism' in Salman Rushdie's 'Midnight Children	Mr. Ananda Pandhare	78
16	Jhumpa Lahiri's The Namesake: A Diasporic Reading	Dr. Sanjay Khilare	82
17	Reflection of Indian Culture And Indian English In Raja Rao's Kanthapura: A Postcolonial Perspective	Dr. K.D.Sonawane	88
18	Indian Writing in English	Dr. Kamalakar Jadhav	91
19	Identity Crisis in V.S. Naipaul's A House for Mr. Biswas	Anil Kale	93
20	The Shifting Identities of Women in Chitra Banerjee Divakaruni's The Mistress of Spices	Dr. Kishorkumar Gaikawad	96
21	Interface Between Science and Fiction In Rimi B. Chatterjee's Signal Red	Dr. Vijaykumar Punekar	100
22	Nationalism To Post Colonialism: A Critical Perspective	Dr. Nandkumar Shinde.	103
23	Indigenous Model of Resistance: Reading Lagan	Dr Ravindra Valdyia	109
24	The Loss of Cultural Inheritance in 'The Inheritance of Loss'	Dr.Ganesh Sonawane	113
25	The Expressives in 'The Princess of Avanti'	Keshav Borkar	116
26	Postcolonial Indian Diasporic Writing is A Forum for Immigrant Experience and It is Also A Search Self-Identity	Prof. Prakash Misal & Prof. Nitin Survase	120
27	Omparing Colonial and Post-Colonial Period With Reference To Nation And Family: A View of Amitav Ghosh	Dr. Sallendra Bansode	124

**'RESEARCH JOURNEY'** International Multidisciplinary E- Research Journal  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 95- Issues in Postcolonial Indian English Literature  
 UGC Approved Journal



ISSN :  
2348-7143  
January-2019

28	Immigrant Feminine Experience in Indian English Fiction Ms. Deepanjali Borse	128
29	Meeting an Uncertain Fate: Negotiations Between Tradition and Modernity Prof. Hemant Gaikwad	131
30	The Namesake As Diasporic Novel Shivaji Sontakke	134
31	Reflection of Communal Riots in Translated Post- Colonial Hindi Novels Prof. Balasaheb Rohokale	138
32	Communal Violence in Post- Colonial Indian English Novels Prof. Sunil Deokar	141
33	Visual Representation of Communal Riots in Chaman Nahal's Azadi Dr.Varpe Sandip	145
34	Identity Crisis in Kiran Nagarkar's Selected Fiction Pravinkumar Nagawade & Vaishali Ransing	151
35	Chetan Bhagat : As A Postcolonial Writer in Indian English Literature Prof. Mahesh Kumbhar	154
36	Politics At A University Department: A Study of Post-Colonial Perspective on John Maxwell Coetzee's Disgrace Dr. Rameshwaar Rathod	156
37	Impact of Globalisation on The Underclass Characters in Aravind Adiga's Last Man In Tower Ashok More & Vijay Adsure	158
38	Quest For Identity in Jhumpa Lahiri's the Namesake Anil Chindhe & Sandip Sathe	161
39	The Lotus Leaves: Emotional Infidelity Dr. Archana Rohokale	163
40	Multiculturalism in Indian English Literature. Dr. Ansarullah Khan	166
41	Representation of Caste and Gender Politics in Kishor Kale's Against All Odds Jaysing Babar	168
42	Feminism From Post-Colonial Perspective in Shashi Deshpande's Novels Sangharsh Gaikwad	170
43	Torturous Estrangement of Valmiki In Kamala Markandaya's Possession Sanjay Diwekar	173
44	Multiculturalism in Indian English Literature Prof. Sunil Mhankale	178
45	Diasporic Sensibility in Indian English Writing Rohinton Mistry – A Fine Balance Prof. Sandhya Sonawane	182
46	Issues of An Identity Crisis in Joseph Conrad's The Secret Agent. Prof. Rajendra Gaikwad	185
47	Indian Perspective of Post-Colonialism: A Review. Prof. Narendra Gawali	188
48	Feministic Issues In Anita Desai's Novels Mr. Nana Wagaskar	192
49	Diasporic Sensibility in The Poetry of Meena Alexander Mr. Anna Muley	194
50	Post Colonial Indian English Literature : A Brief Survey Sharad Awari	202
51	English in Post-Colonial India Ms. Manisha Kale & Dr Dipak Wayal	105
52	Multiculturalism in Indian English Literature Farjana Tamboli	209
53	Relevance of Gandhian Principles in the Present Time Dr Prashant Lohar	212
54	Anita Nair: A Glance of Cultural Diversity In Indian Subcontinent Dr. Yuvaraj Kathale	215
55	Postcolonial Feminist Reading to Toni Morrison's "The Bluest Eye." Prof. Rajendra Ambavane	217
56	Joseph Conrad's "Heart of Darkness": A Postcolonial Study. Mr. Sachin Bhosale	220

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

57	Paper Title: Issue of Rani's Identity and Status in Karnad's Naga-Mandal. Dr. Santosh Salunke	223
58	Ecofeminism And Politics of Triple Marginalization in Atwoods 'The Handmaid's Tale' Kailash Atkare	227
59	Indian Women Activist of the Contemporary Era Dr. Dipak Ulemale	232
60	Girish Karnad's Naga-Mandala: A Feministic Approach Mr. Kiran Lomte	234
61	Influences of Modern Western Drama in Satish Aleka's Plays Prof. Vikas Meshram	238
62	Indian English Education: An outcome of Long Planned Imperial Ideology Prof. Rahul Take	243
63	Identity Crisis And Alienation in The Inheritance of Loss Miss. Jyotsna Kanade	245
64	Influences of Modern Western Drama in Satish Alekar's Plays Prof. Swapnil Landage	248
65	Diasporic Disposition And Resulting Despondency Depicted in Jhumpa Lahiri's 'The Namesake' Vaibhav Aidale	252
66	Shiva, the Postcolonial Agent : A Comprehensive Study with Special Reference of Amish Tripathi's The Secret of the Nagas Shiveshwar Muchate	256
67	Globalisation And Post - Colonialism Jyotsna Suryawanshi	260
68	Queer Identity of The Protagonist of Shyam Selvadurai's 'Funny Boy' Prof. Sachin More	263
69	Patriarchy in Manju Kapur's "Difficult Daughters" Dr. Shahaji Karande	267
70	Identity, Immigration and Cultural Conflict in Chitra Banerjee's "Clothes" Prof. Ramdas Korde	270
71	Postcolonial Feminism in India S.V. More & A.S.Patekar	273
72	'Old Stone Mansion: An Attempt to Depict Modern Woman in Marathi Theatre' Mr. Bhagvat Dhesale	275
73	Post Colonialism in Salman Rushdie's 'Midnight's Children' Dr. Ms. Pranjali Bharate & Dr. Maya Lahare	280
74	Post-Colonial Study in Amitav Ghosh's the Shadow Lines Ms Jayashri Dalavi	284
75	Post Colonial Nationalism or Repugnance: A Study of R.K Narayan's Lawley Road Prof. A. D. Baviskar & Mohammad Ameen Abdul Quadir	288
76	Racism In Nadine Gordimer's The House Gun Mr Gopal Jadhav	291
77	Post Colonial Feminism with Special Reference To Arundhati Roy's the God of Small Things Dr. Abhay Shinde	295
78	Multiculturalism in Indian English Literature Shri Sadguru Deshmukh	297
79	A Study Of Socio-Cultural And Political Dimensions Of Globalization In The Selected Postcolonial Novels Mr.Sandeep Dhore	300
80	Otherness and Identity in Tendulkar's Dramas M.S.Tamboli	304
81	A Study of Struggle and Emancipation of Woman in Mulk Raj Ananad's 'Gauri Or The Old Woman and The Cow' Dr.Apeksha Nalawade,Mr. K.S. Aage	306
82	A Historical study of the Term 'Diaspora' Prof. Mhaske Pravin	310
83	Subalternity in Mahasweta Devi's Chuni Kotal Ms.Deepali Barkul & Dr. Anita Mudkanna	312
84	Race, Gender, Ethnicity in Post-Colonial Writing Prof. Ravindra Alhat	314
85	Replication of Somber Issues of Contemporary Indian Society in the Select Plays of Mahesh Dattani Nitin Survase & Prakash Misal	316

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

### Post-Colonial Study in Amitav Ghosh's the Shadow Lines

Ms Dalavi Jayashri D.

Assistant Professor

Department of English

NACS College Parner

dalavijd@gmail.com

#### Abstract –

The present article turns round exploring the element of Post colonialism in one of the Amitav Ghosh's novels "The Shadow Line". He shows an impact of colonialism on the culture and society of Calcutta and Dhaka and also Political and Cultural change. The novel through light on initial awareness of the Social, Psychological and Cultural inferiority enforced by colonizers and display struggle of subaltern people for ethnic, cultural and political autonomy. Throughout of novel writer explicitly and implicitly explore postcolonial principle. The article, therefore, explores the structure of novel through the postcolonial approach and provide examples from the novel regarding the application of some postcolonial element such as hybridity, memory, imagination, identity, freedom, partition boundaries etc.

**Keywords –** Postcolonialism, Amitav Ghosh, The Shadow Line, Hybridity, Calcutta, Dhaka.

#### Introduction –

This book won Sahitya Akadami Award and brought fame to its young Indian-Bengali writer: Amitav Ghosh. The novel focusses one thought that is people bring lines together and they detached from each other. These boundaries kept them far from each other. The novel functions as show physical and mental boundaries, probing memories of people through linking past and present. This novel gives chance to the reader for inventing personal memories and imaginations that project various shades on the same experience.

The novel recollects historical events such as Swadeshi Movement, Second World War, Partition of India and Riots of the 1960s in Dhaka and Calcutta. The main parts of the novel centres around the consequences of drawing lines around ourselves and nations. The novel spans three generations spreading over Calcutta, Dhaka and London. Taking advantage of the element of hybridity, the writer depicts characters from various nationalities, culture and religion to compare and contrast their resemblances and discrepancies in identity, ideology, language, race, ethnicity, space/place and their views regarding boundaries towards the world. The article aims to study a different aspect of the novel, including characters, events and ideas through the framework of postcolonial approach.

#### About Novel –

The novel focusses on the central idea that is people always make lines for from each other that lines some time visible and sometimes invisible. The narrator uses memories and imagination for telling story actually these novel is introducing web of memories. The writer who gives full of the chance to his reader to create one through their own imagination. This novel has multiple meaning and each one reveals different through about some point. The writer uses various character i.e. from culture and religious background in order to reveal various thoughts, ideas and various issues.

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CJF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

Various kind of relationship can be noticed i.e. in the midst of historical, cultural and political condition as the colonizer and colonized relationship. As postcolonial literary work novel turns around self-conscious contemplation of themes as nationality, internationality, cultural and historical self-determination.

#### Elements of Post Colonialism –

Shadow Lines depicts the political, cultural difficulties that de-colonised nation normally faces. Problems as identity, crisis, partition, exploitation are mainly highlighted in the novel. The way in which race, religion, class, gender, sexual orientation, cultural belief and customs combine to form an individual identity in shaping our perceptions of ourselves, others and the world in which we live.

#### Obscurity –

The character in the novel who's named is unknown in the novel. Create interest of the reader and makes an interesting story. His main role and figure his pivotal portrayal throughout the narrative is reminiscent of a coloniser who intentially attempts to remain unseen. He comments on everyone and everything his idea and his description of the emerging memories are considered significant. Behind this kind of narrative technique writers, the intention is only to create obscurity is justified when we noticed that almost anything is described in detailed precision, the exact mailing address of the prices. The brand names of the most object as pennies digestive tablet. Lyon's assorted toffee the despite all these descriptions there is one blank space. We never get to know the narrator's names nor can we see him.

These points can be interpreted and looked differently too, implicitly calming that the narrator symbolizing colonised people is so inferior, unimportant and subordinate that is not seen by colonizers and therefore no definite portrayal of him is presented.

#### Memory, Imagination –

Like Tridib narrate is bestowed the gift of imagination he has a deep desire to travel the world both enjoyed a distinct sense of journey to the location they had not visited at all. These special relationships are so closed and intimated that the narrator can remember everything about the time and place they had been together even after Tridib's murder. It is the space of memory and imagination that link them together emotionally. The deep effect of Tridib and narrator that is unilateral and reminiscent of the coloniser. Colonised relationship scares the grandmother and makes her order for her grandson to avoid Tridib. The narrator considers Tridib as his heroes who can help him to get rid of all kind of restriction for him. Tridib represents openness towards space and place capable to use his memory from the past to connect with the present. The narrator symbolised a colonized nation who is in quest of anything.

Memory function a main role in the novel as it determines one's perception of time and our identity because of the history and advantages of his memory. He is capable to present his viewpoint and Ghosh tries to present one key point that he imparts on his readers' memory as an abstract entity exceeds the bounds, transcends the time scale and moves beyond any kinds of restrictions. Therefore going back and coming forth or mingling between past and present kind of nature attracts readers.

#### Identity –

The problem of identity is deeply felt in the novel not only about the character but also about places and location as well in the narrator opinion identity of a location is normally formed

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

established by means of stories, photograph, map and memories that can be invented by one's imagination. Imagination is psychological process by which one can successfully indulge his or her suppressed fancies because in real life they failed in attain identity potentially involves essentialism and 'othering' two other significant terms in postcolonialism.

Essentialism is the essence of whiteness of something. Regarding race, culture or ethnicity essentialism refers to the practice of different groups in making a decision what is and isn't particular identity in essentialism. All sides involved colonizer or colonized resist their standpoints in this novel despite few character, the majority of character involved tend to retain and preserve their own already held status and seldom dare to welcome changes or even choose among multiple options they may come across so it can be named as an element of defiance resistance and confrontation to achieve. Keep or choose what is believed to be theirs Tridib says "Everyone lives in the story because stories are all there to live in it was just a question of which one you choose".

#### Space / Place –

Above two words have common meanings 'location' plays the fundamental role in the fiction realism of Ghosh and his protagonist who are obsessed by space. Either imagined or remembered. He can make a bridge among people, places, ethnicities and communities to demonstrate the power of overlapping territories in our dairy increasing connected world place in his narrative local or global, seen or unseen are conceived as an important aspect of individual, national, familial and communal transformation.

In the post-colonial text space place and identity plays significant role space represent geographic or abstract locate an empty room or area not being designated for any specific purpose place, on the other hand, refer to scene or occurrence when space is made or owned it potentially include landscape, language, environment, culture.

#### Hybridity –

The important term in postcolonial novel well handled in the novel literally refers to the state of being mixed. It denotes the occurrence of fusion merging and homogenization but in literature, it focusses on the effect of the mixture of identity and culture. Hybridity can be traced in various fundamental entities like a race language place, time, identity etc. for example as narration vacillates between Bengali and English. The narrator holds a hybrid identity as he is born in India and received English education so the whole story moves back and forth between India and England. It is true that the English language is never been the formal language for colonization for India. So the fact that Ghosh writes in English may indicate a kind of alienation from what was once standard of nationalism.

Thamma dislikes this hybridity and believed that strong feeling of Indian Nationalism and Patriotism should be reentered her ideal is homogeneous society. With clear borders, so it seems unacceptable to her to allow Ill to live in London as she believes "she does not belong there" and she has no right to live there. The grand grandmother defined hybridity. She is the example of nationalism i.e. she holds the view that a nation is formed by people who shed their blood for its independence. She claims that "They are a nation because they have drawn their borders with blood... War is the religion" and that is "what it takes to make a country supporting that the same has to be done for India in order to build a homogenous national identity.

Although geographical lines and military border fixed identities and distinct nation. Culture differs from community to community. The history of India and England has been bound

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)

Special Issue 95- Issues in Postcolonial Indian English Literature

UGC Approved Journal

ISSN :

2348-7143

January-2019

up and dependant on each other. The title, therefore "The shadow line" alludes to the point that there are no clear boundaries among people.

#### **Independence / Partition / Freedom –**

The concept of separation and independence both in private life and public affairs is best exemplified in different parts of the story. The grandmother's expectation to see the borderlines between India and East Pakistan as vividly and clearly as they are seen on school atlases reinforces the idea that everything should stand on its own place. The narrator has biological liaisons to her grandmother so he should act and behave according to the moral principle of the family and violates some ethics may lead to anarchy.

Freedom is an important concept dealt in the novel. The novel deals with ideas of Ila's and grandmother's struggle are one of the issues in the novel.

The focus of the novel is the Partition of India and the consequent trauma of the East Bengal's psyche. The narrator of Ghosh's novel is a young boy who grew up in Calcutta and Delhi in post-partition India the trauma of partition continues through three generations.

#### **Conclusion –**

The novel projects the consequences of colonization and the hardships and bewilderment it usually brings for those living in such environments, especially in the period of decolonization. This paper scrutinizes the overall content, message and structure of the narrative through the postcolonial approach and attempts to substantiate the overall content, message and structure of the narrative through the postcolonial approach and attempts to substantiate that Ghosh has adroitly employed elements of postcolonialism to convey his theme. Throughout the novel, the writer explicitly and implicitly emits sparks of postcolonial elements to show his interest in depicting the aftermath of colonization. The article, therefore, explores the overall structure of the novel through the postcolonial approach and its main constituting elements such as obscurity, memory, imagination, identity, space/place, hybridity...etc.

The writer's emphasis on memory and imagination is an implicit reference and encouragement to live independently. Furthermore, it helps the writer move freely in time to link past and present (hybridity). Through the element of hybridity, the novel not only traverses beyond the boundaries of time but also blends diverse characters, memories, nations, locations and history. It fuses fact and fiction, reality and unreality, to magnify the aftermath of colonization: no belonging and the unpleasant experience of those who have witnessed various demarcations and felt delimitation with their own bones and flesh.

#### **References –**

- Post-Colonial Transformations. London: Routledge.  
 M. H. Abram's. A Glossary of Literary Terms. 2009  
 Colonial and Post-Colonial Writing: Migrant Metaphors. Oxford: Oxford University Press.  
 Ghosh, A. (2005). *The Shadow Lines* (11ed.). New Delhi, India: Oxford University Press.  
 Hybridity, Limits, Transformations, Prospects. New York, USA: State University of New York.  
 Magical Realism and the Postcolonial Novel. London, UK: Palgrave Macmillan.

INTERNATIONAL RESEARCH JOURNALS

Impact Factor – 6.261

ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

# RESEARCH JOURNEY

Multidisciplinary International E-research Journal

PEER REFREED & INDEXED JOURNAL

February-2019 Special Issue – 129

Improving English Communication Skills  
of Non-native Users

Master  
Effective Body  
Language Well  
Cross Good  
Business  
Non-verbal  
Listening  
Communication  
Skills

**Guest Editor**

Dr. N. S. Gaikwad  
Principal,  
Annasaheb Awate College, Manchar  
Tal. Ambegaon, Dist. Pune

**Executive Editors of this issue :**

Dr. Shahaji Karande  
Prof. Ganesh Awari  
Prof. Sachin More  
Prof. Jyotsna Kanade  
Prof. Kishor Shitole

**Chief Editor :**

Dr. Dhanraj Dhangar (Yeola)



**This Journal is indexed in :**

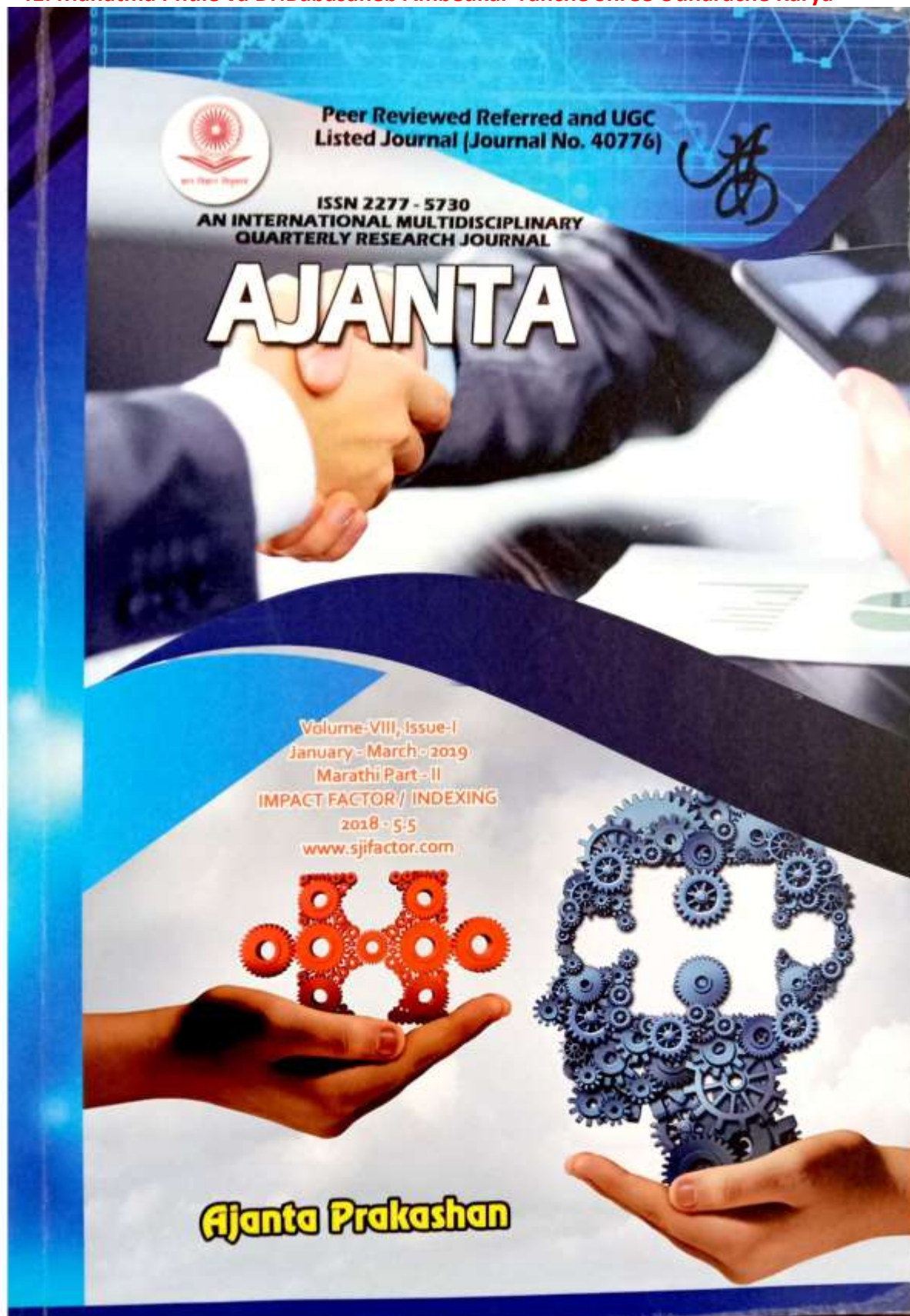
- University Grants Commission (UGC)
- Scientific Journal Impact Factor (SJIF)
- Cosmoc Impact Factor (CIF)
- Global Impact Factor (GIF)
- International Impact Factor Services (IIFS)

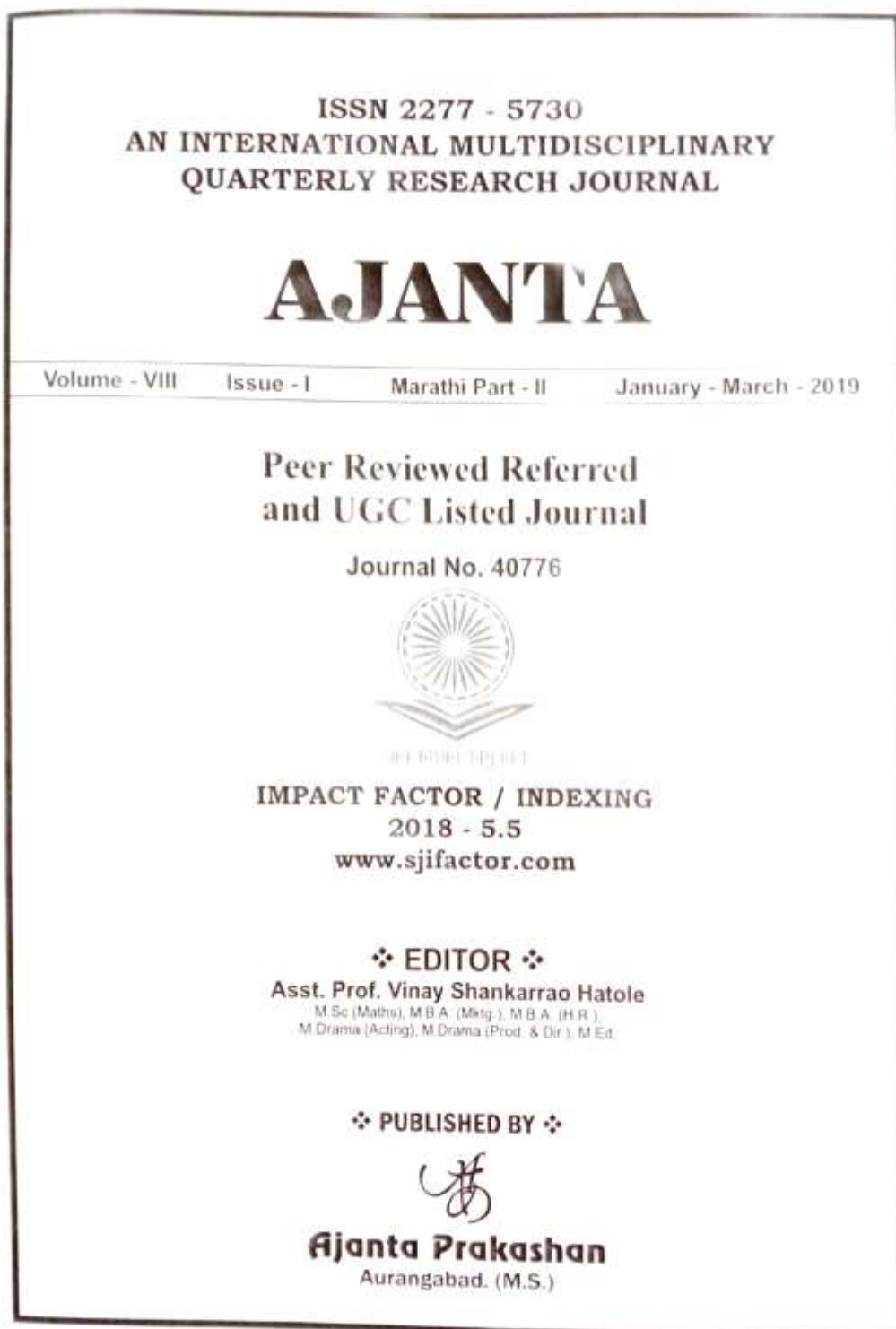
For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

SWATIDHAN PUBLICATIONS



41. Mahatma Phule va Dr.Babasaheb Ambedkar Yanche Shree Udharache Karya





VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## CONTENTS OF MARATHI PART - II

अ.क्र.	लेख आणि लेखकाचे नाव	पृष्ठ क्र.
१४	पंडित रमाबाई यांचे स्त्री सुधारणेविषयीचे विचार: विशेष संदर्भ : द हाय कास्ट हिंदू वृमन प्रा. मालती सानप	७२-७४
१५	१९व्या शतकातील महाराष्ट्रातील शेती उद्योग : बदल आणि परिणाम किरण गणपत कुंभार	७५-७७
१६	शिक्षणाचा सामाजिक विस्तार व बहुजनांच्या शिक्षणाचे प्रयोग एक अभ्यास प्रा. डॉ. कुरुमकर रघुराज एम.	७८-८१
१७	ब्रिटिश वसाहतकालीन महाराष्ट्राच्या शिक्षणात एल्फिन्स्टन चे योगदान लक्ष्मण नथ्युप्रसाद गोरे	८२-८६
१८	महाराष्ट्रातील दलित चळवळीची पार्श्वभूमी प्रा. डॉ. रामभाऊ रा. मुटकुळे प्राचार्य डॉ. बबन पवार	८७-८९
१९	महाराष्ट्रातील कामगार चळवळीचा उदय कु. रेणुका प्रकाशराव हावके प्रा. डॉ. शारदा कदम	९०-९३
२०	वासाहतिक महाराष्ट्रातील धर्मसुधारणा विचार प्रा. अंबादास ओंकार वाकरे	९४-९८
२१	महाराष्ट्रातील शिक्षण आणि आधुनिकीकरण प्रा. महेश वसंत कुलकर्णी	९९-१०१
२२	महाराष्ट्रातील कामगार चळवळीचा उदय व विकास प्रा. मतकर कविता भगिरथ	१०२-१०५
२३	महत्त्वा फुले व डॉ. बाबासाहेब आंबेडकर यांचे स्त्री उद्धारक कार्य प्रा. काकडे बी. जे. प्रा. गंडाळ ए. टी.	१०६-११०
२४	आगरकरांचा व्यक्तीवाद प्रा. डॉ. अरुणा मोरे	१११-११५
२५	प्राशास्य शिक्षणाविरुद्ध राष्ट्रवादी शिक्षणाची चळवळ प्रा. डॉ. सय्यद मुजीब मुसा	११६-११८

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## २३. महात्मा फुले व डॉ. बाबासाहेब आंबेडकर यांचे स्त्री उद्धाराचे कार्य

प्रा. काकडे बी. जे.

न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर.

प्रा. गंडाळ ए. टी.

न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर.

ब्रिटिश कालखंडामध्ये स्त्रियांच्या सबलीकरणाची खरी सुरुवात झाली. ब्रिटिशांनी शिक्षणाच्या सार्वत्रिकरणाने भर दिला. पाश्चात शिक्षणातून स्वातंत्र्य, समता, बंधुता, मानवता, धर्मनिरपेक्षता या उदात्त मूल्यांची भारतीयाना ओळख झाली. तर्कशास्त्र विज्ञान आणि बुद्धीप्रामाण्यवाद यातून वास्तवाचे भान आले. १९ व्या शतकाच्या अखेरीस आणि २० व्या शतकाच्या सुरुवातीला भारतीय सामाजिक विषमता नष्ट करण्यात प्रयत्न केला. राजाराम मोहन रॉय यांनी ब्राम्हो समाजाची स्थापना करून सतीप्रथा बंदी आणि विधवांचा पुनर्विवाहासाठी प्रयत्न केले. दयानंद सरस्वती यांना आर्य समाजाची स्थापना करून पडदा प्रथेला विरोध व स्त्री शिक्षणावर भर दिला. ईश्वरचंद्र विद्यासागर यांना बहुपत्नी प्रथेला विरोध करून विधवा विवाहाचे समर्थन केले. केशवचंद्र सेन यांनी मूलीकरीता विवाहाचे वय १४ वर्षे करावे व एक विवाहाचा पुरस्कार करण्यावर भर दिला. बालविवाह, विभक्त कुटुंबापध्दती या विषयावर लेखन करून स्त्री जागृतीचे कार्य केले. महर्षी धोंडोजी केशव कर्वे यांनी स्त्री शिक्षणावर भर देवून विधवांच्या विवाहाचा प्रश्न भसास लावला. फुले, शाहू महाराज व डॉ. आंबेडकर यांनी स्त्री समाज सुधारकांच्या स्त्री उद्धाराच्या कार्यामुळेच स्त्रियांना त्यांच्या हक्काची व अधिकाराची जाणीव झाली. समाजात सुरक्षित व निर्भिडपणे जीवन जगण्याचे बळ मिळाले.

महात्मा फुले, आणि डॉ. बाबासाहेब आंबेडकर या समाजसुधारकांनी स्त्रियांवर लादण्यात आलेले अनेक निर्बंध दूर करून त्यांना समाजात सन्मान व प्रतिष्ठा मिळवून दिली. स्त्रियांमधील दुर्बल्य नष्ट करून त्यांना स्वावलंबी व सशक्त बनविण्याचा प्रयत्न केला.

### महात्मा फुले

महात्मा फुले यांनी स्त्रियांना सबल किंवा स्वावलंबी बनविण्यासाठी प्रयत्न केले. त्यांचे महिला सबलीकरणातील योगदान पुढीलप्रमाणे आहे. स्त्रियांना शेकडो वर्षे शिक्षणापासून वंचित ठेवण्यात आले होते. स्त्रियांना शिक्षण दिले तर त्या विधवांतील असा गैरसमज समाजात निर्माण करून ठेवला होता. स्त्रियांना शिक्षणाचा अधिकारी नाकारल्यामुळे त्यांच्या सामाजिक, सांस्कृतिक आर्थिक विकास झाला नाही परिणामी त्यांच्या अज्ञानीपणामुळे त्यांना समाजात गुलामाप्रमाणे जीवन जगावे लागले. फुले यांनी स्त्रियांच्या जीवनाची माती करणाऱ्या अनिष्ट रूढी परंपरांवर प्रहार केला. त्या काळी विधवा स्त्रियांना अनेक संकटाना सामोरे जावे लागत होते. त्यांना कोणत्याही धार्मिक कार्यक्रमांमध्ये तीला हिनवले जाई. अशा विधवा स्त्रियांना समाजात प्रतिष्ठा मिळवून देवून त्यांच्या जीवनामध्ये पुनःसुख समृद्धी नांदाची वासाठी त्यांनी विधवा पुनर्विवाहाचा

MARATHI PART - II / Peer Reviewed Refereed and UGC Listed Journal No. - 40776

१०६

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.ajifactor.com)

पुत्रकार केल्या इ.स. १८६४ मध्ये त्यांनी पुण्यामध्ये गोखलेंच्या वागेत यारयत जातीतील एक पुनर्विवाह पडवून आणला. या त्यांच्या प्रयत्नांने विधवांचे प्रसंगी पडणारे वाकडे पाडून मुभाळें व त्यांना समाजाने मानवाने जगण्याचा अधिकार प्राप्त करून दिला.

विधवांचे पुनर्विवाह त्याकाळी प्रतिगामी समाजाच्या पंचनी पडत नव्हते. एखाद्या विधवेचे सुकून वाकडे पाडले पडले तर तिला जननिदिला तोंड द्यावे लागे. पुरुषांच्या पाषाणी तामनापूर्तीला काही भावड्या विधवा स्त्रिया बळी पडत. बालविधवा देहाच्या भुकेसाठी पुरुषांनी शिकार बनत. देहाची भूक भागविण्याच्या त्यांच्या हक्क समाजाने हिरावून घेतल्याने त्यांच्या कामपूर्तीला पापाचा शिकका मारला जाई. प्रसंगी अशा स्त्रियांना बालहत्या व आत्महत्या करावी लागे. महात्मा फुले यांनी विधवांच्या देह सुलभ भावनेला न्याय देण्यासाठी १८६४ मध्ये स्वतःच्या वाड्यामध्ये प्रसूतीगृह व बालहत्या प्रतिबंधगृह स्थापन केले. १९ व्या शतकात बालविवाह सर्वत्र होत होते. त्यांचा निषेध करताना शेतकऱ्यांना उद्देशून फुले म्हणतात. शेतकरी आईबाप आपल्या मला मुलीचे विवाह त्यांच्या संपत्तीशिवाय लहानपणीच करतात. त्यामुळे लग्नाचा जोडीदार आवडला नाही तर त्यांच्या संसारात संपर्ष होवून त्यांचे सांसारिक जीवन उबस्त होते. त्यामुळे आई वडीलांनी आपल्या मुलामुलींचे विवाह त्यांच्या समताने व तरुण वयात करावेत. कोवळ्या वयात मुलीचा साठीच्या घरातील म्हात्यांशी विवाह करणे म्हणजे त्या मुलींच्या आयुष्याची माती करणे होय, असे म फुले म्हणत. त्यांनी बालविवाह आणि जरट कुमारी विवाह फधतीला तीव्र विरोध केला.

पती निधनानंतर विधवा स्त्रियांचे सती जाण्याची प्रथा आपल्या समाजात होती. राजस्थानमध्ये सामुदायिक जोहार यामागील भूमिका वेगळी होती. परंतु तरीही सती प्रथेचे गौरवीकरण आपल्या समाजामध्ये आतापर्यंत केले. अगदी अलीकडे राजस्थान येथील देवगळामध्ये पकुंवर सती गेली. तिचे उत्सव, यात्रा आणि महिरे उभारण्यासाठी प्रचंड आटापिटा केला गेला. सती जाण्याच्या घटनेला गौरविणे म्हणजे स्त्री जातीचे अस्तित्त्वच नाकरण्यासारखे आहे. राजाराम मोहन राय यांच्या पुढाकाराने लॉर्ड विल्यम बेंटिन १८२९ साली सती बंदीचा कायदा केला. पतीच्या मृत्यूनंतर स्त्री सती जावू नये असे फुले यांचे म्हणणे होते. म्हणून ते आपल्या लेखनात म्हणतात, एखादया स्त्रीच्या नवऱ्याच्या ज्यावेळी मृत्यु होतो, त्यावेळेस ती फार दुःखी होते. तिला फार संकटे सोसावी लागतात. साराकाळ वैधव्यात काढवा लागतो. इतकेच नव्हे तर पूर्वी कित्येक सती देखील जात असत. परंतु पुरुषाला तिच्याविषयी दुःख होवून तो कधी सती गेलेला एकला आहे का? अशा प्रकारे महात्मा फुले यांनी सतीची प्रथा अमानवी अन्यायी आणि संपूर्ण मानव जातीला काळीमा फासणारी आहे. म्हणून त्यांनी सती प्रथेला कडाडून विरोध केला. विधवा स्त्रियांनी सती न जाता पुनर्विवाह करून आपले उरलेसुरले आयुष्य आनंदात व सुखात व्यतीत करावेसाठी त्यांनी प्रयत्न केले.

तरुण ब्राम्हण स्त्रियांचे त्यांच्या पती निधनानंतर सक्तीने केशवपन केले जायचे या केशवपन प्रथेच्या संदर्भात महात्मा फुले यांनी अत्यंत कठोर आणि परिवर्तनवादी विचार मांडले. म्हात्यांनी केशवपन केले जायचे या केशवपन प्रथेच्या संदर्भात महात्मा फुले यांनी अत्यंत कठोर आणि परिवर्तनवादी विचार मांडले. म्हात्यांनी केशवपन करण्याचे नाकारले तर स्वाभाविकच या प्रथेला आळा बसेल असे महात्मा फुले यांना

MARATHI PART - II / Peer Reviewed Refereed and UGC Listed Journal No. - 40776

१०३

Scanned with CamScanner

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

वाढत होते. १४ एप्रिल १८९० रोजी मुंबई येथील एल्फिस्टन माध्यमिक शाळेच्या जवळ न्हावी बांधवांनी सभा भरविण्यात आली. त्यामध्ये महात्मा फुले यांनी न्हावी बांधवांनी ब्राम्हण विधवा स्त्रियांचे केशवपन करावयाचे नाही असा निर्धार व्यक्त केला अशा प्रकारे महात्मा फुले यांनी विधवा स्त्रियांना विदुष करणारी व तिला अहोरात्र कामाला जुंभण्याची प्रथा मोडून काढली.

अशा प्रकारे महात्मा फुले यांनी सामाजिक प्रबोधनातून व प्रत्यक्ष ज्ञातीतून स्त्रियांवरील अन्याय दूर करण्याचा प्रयत्न केला. स्त्रियांना समाजात माणूस म्हणून सन्मानाने वागविले पाहिजे असा त्यांचा आग्रह होता.

#### डॉ. बाबासाहेब आंबेडकर

डॉ. बाबासाहेब आंबेडकरांनी उपेक्षित स्त्री वर्गाच्या कल्याणासाठी प्रयत्न केले. शिक्षण हे स्त्रियांच्या विकासाचा मुलभार आहे हे ओळखून डॉ. आंबेडकरांनी स्त्रियांच्या शिक्षणावर भर दिला. १६ जून १९३६ रोजी मुंबई भरलेल्या परिषदेत स्त्रियांच्या उन्नतीच्या दृष्टीने विचार मांडतांना ते म्हणाले. स्त्री जात ही समाजाचा अलंकार आहे. प्रत्येक समाज स्त्रियांच्या चरित्राला अधिक मान देतो आपली गंढिणी उत्तम काळातील असावी, अशी प्रत्येकजण अपेक्षा करतो व तशी भार्या मिळावी म्हणून प्रयत्न करतो. कारण त्याला माहित असते की, आपल्या मुलाबाळांचा आपल्या कुटुंबाचा व कुळाचा नावलौकिक स्वीतार अवलंबून आहे. इतकी घोरवी स्त्री वर्गाला प्राप्त झालेली आहे.

डॉ. बाबासाहेब आंबेडकर स्त्रियांकडे पारंपारिक दृष्टीकोनातून न पाहता त्यांच्या स्वतंत्र व्यक्तिमत्त्वाचा विकास साधण्याचा प्रयत्न केला. आजपर्यंत स्त्रियांच्या मानसिक विकासाकडे दुर्लक्ष झाले, अशी खंत त्यांनी व्यक्त केली. त्यांच्या मते स्त्रियांनी उच्च ध्येय प्राप्तीचा श्यास धरला पाहिजे, ध्येय प्राप्त न होणे हा काही गुन्हा नाही मात्र कमी प्रतिभे ध्येये डोळ्यापुढे ठेवणे हा मात्र मोठा गुन्हा आहे.

डॉ. आंबेडकरांनी दलित, अस्मर्य स्त्रियांच्या मनातील न्यूनगंड व हिनतेची भावना कमी करण्याचा प्रयत्न केला. स्वच्छ रहा व स्वाभिमान संपादन करा असे आवाहन दलित स्त्रियांना त्यांनी केले. डॉ. आंबेडकरांनी स्वतः पुढाकार घेतला स्त्री जातीस अपमानकारक ठरणाऱ्या जीर्ण गोष्टींचा अक्वेर करावयास त्यांनी शिकवले. महाडच्या परिषदेत त्यांनी स्त्रियांना जुन्या चालीरीती सोडून स्वच्छ रहण्याचा आणि कलकित स्थिती नाकरण्याचा उपदेश केला. मनुस्मृतीने स्त्री वर्गातही भेद करून ब्राम्हण स्त्रीला शुद्र अस्मर्य स्त्रीपेक्षा पवित्र मानले म्हणून डॉ. आंबेडकरांनी १६ जून १९३६ रोजी मुंबई येथे मनुस्मृतीचे दहन करून स्त्री स्वातंत्र्याचा पुरस्कार केला. त्यांनी १९४२ मध्ये काईसराय यांच्या मंत्रिमंडळात असताना स्त्रियांच्या नैसर्गिक भावनांचा विचार करून स्त्री मजुरांसाठी विशेष गोष्टी उपलब्ध करून दिल्या. स्वच्छतेने राहायला शिका, सर्व दुरुंगांपासून आलिप्त रहा, आपल्या मुलांना शिक्षण द्या, त्यांच्या महत्त्वाकांक्षा निर्माण करा, ते फार मोठे असल्याची प्रेरणा त्यांच्यात रुजवा, त्यांनी लग्ने लवकर करण्याची धाई करू नका असेही डॉ. आंबेडकरांनी सांगितले आहे. डॉ. आंबेडकरांनी स्त्रियांना शोषणमुक्त व स्वावलंबी प्रयत्न केला. भारतीय संविधानाने त्यांनी समान सुरक्षा व नोकरीमध्ये त्यांना समान संधी देण्याचा प्रयत्न केला. डॉ. आंबेडकरांनी हिंदू स्त्रियांना समान

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

हक्क देण्यात यावेत. यासाठी कायद्यामंजरी असताना हिंदू कोड बीलाचा मसुदा तयार करून लोकसभेत मांडला. या बिलाचा महत्त्वाची कलमे अशी.

१. स्त्रियांना घटस्फोटाचा, पोटगी मागण्याचा अधिकार
२. एक पत्नीत्व
३. मुलीला दत्तक घेण्याचा अधिकार
४. वडिलोपार्जित संपत्तीत हिस्सा मिळण्याचा अधिकार
५. स्त्रियांचा स्वतःच्या मिळकतीवर अधिकार
६. मुलीला वारसा घेण्याचा अधिकार
७. आंतरजातीय विवाहाला परवानगी
८. स्वतःचा वारसा निश्चित करण्याचा अधिकार

तथापि, बिल मंजूर होवू शकले नाही डॉ. आंबेडकर या प्रश्नांवर मंत्रिमंडळाचा राजीनामा दिला. त्यांनी स्त्रियांच्या वारसा हक्कासाठी व त्यांच्यात आत्मबळ निर्माण करण्यासाठी प्रयत्न केले.

अशा प्रकारे डॉ. आंबेडकरांनी परिवर्तनवादी विचार स्त्रियांच्या मनामध्ये निर्माण करण्याचा प्रयत्न केला. स्त्रियांनी प्रतिकूल परिस्थितीतही सन्मानाने राहिले व आपल्या कर्तव्यांना पूर्ण केले पाहिजे असा उपदेश त्यांनी केला. स्त्रियांना कायद्याने व संविधानाने संरक्षण देवून त्यांचा आत्मोद्धार करण्याचा प्रयत्न केला. त्यामुळे आंबेडकरांचे स्त्री विकासातील महत्त्व अन्यथा अशा स्वरूपाचे आहे.

१. ब्रिटिश सत्ताच्या काळात स्त्रियांना विकासाला खरी सुरुवात झाली. ब्रिटिशांनी स्वातंत्र्य समाप्त, बंधुता, मनवता या उदात्त मल्यांबरोबरच स्त्रियांना विकासाच्या संधीची समानता उपलब्ध करून दिल्याने त्या विकासाच्या प्रवाहामध्ये येऊ शकल्या.
२. पश्चात्यांच्या आधुनिक विचारांनी भागवलेल्या अनेक समाजसुधारकांनी स्त्रियांवरील अन्याय दूर करण्यासाठी प्रबोधनाबरोबरच कर्तरील प्रयत्न केले.
३. महात्मा फुले यांनी शिक्षणाचे महत्त्व स्त्रियांना पटवून देवून, त्यांना अनेक अनिष्ट रूढी परंपरांच्या जोखडातून मुक्त करण्याचा प्रयत्न केला.
४. विधवा विवाह प्रतिबंध, बालविवाह, स्त्री बालहत्या, सतीप्रथा, केशवपन, बहुपत्नीत्व इत्यादी स्त्रीसंबंधीच्या अनिष्ट प्रथांचा विपर्यास आणि नास्तिकता त्यांनी स्पष्ट करण्याचा प्रयत्न केला.
५. डॉ. आंबेडकरांनी स्त्री शिक्षणातून त्यांच्यातील अज्ञान दूर करण्याचा प्रयत्न केला. वेगवेगळ्या परिषदांमधून स्त्री जागृतीचे कार्य करून त्यांच्यात स्वावलंबन, कर्तव्याची जाणीव, स्वच्छतेचे महत्त्व स्वाभिमान, उच्च महत्त्वकांक्षा, अन्याय व शोषणाविरुद्ध संघटनात्मक, संघर्ष निर्माण करण्याचा प्रयत्न केला.

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 -IMPACT FACTOR - 5.5 (www.sjifactor.com)

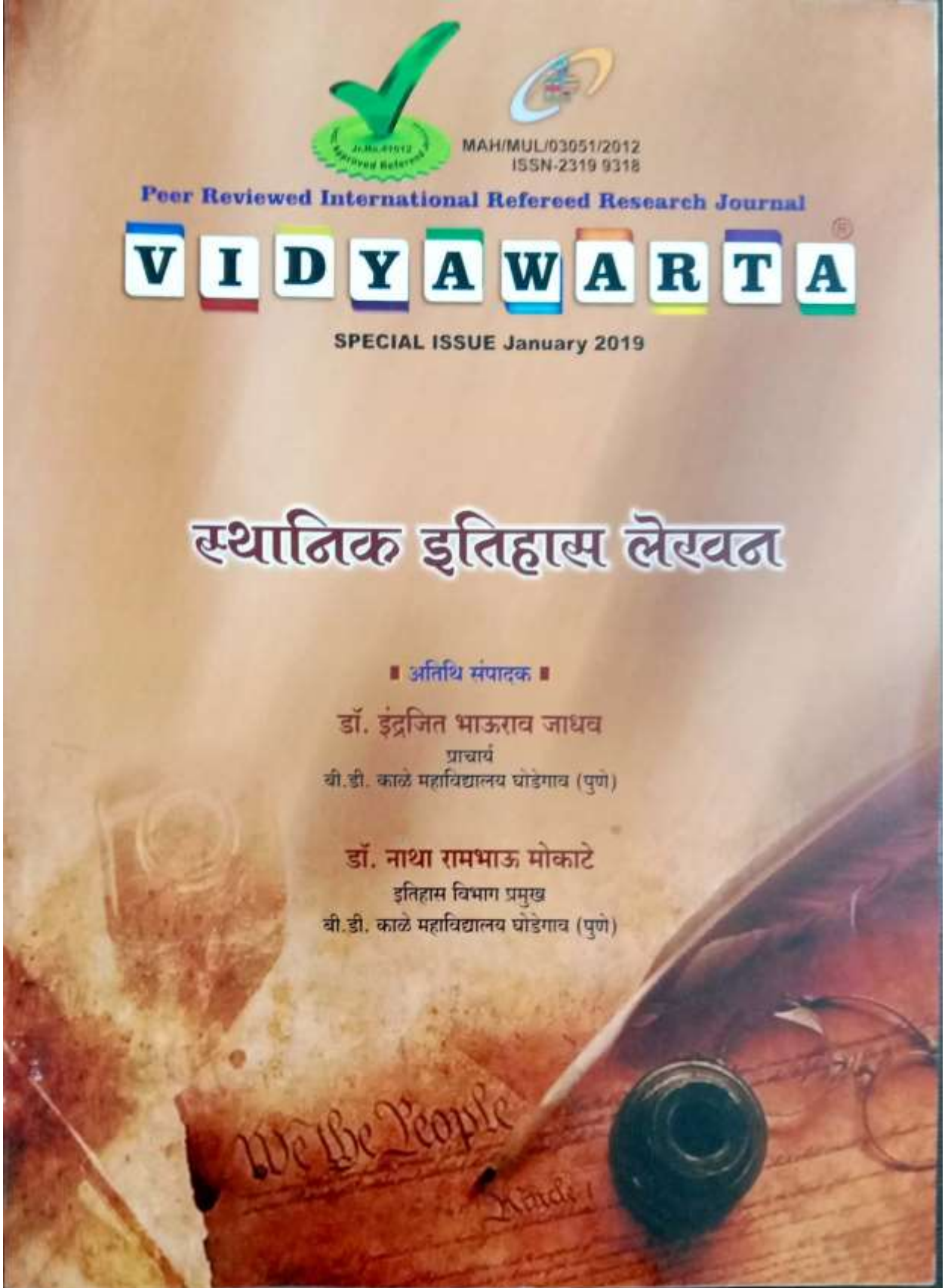
६. डॉ. आवेडकरांनी कायदे आणि संविधानात्मक संरक्षणाद्वारे स्त्रियांना मानवी हक्क व अधिकारी बहाल केले. संसदेमध्ये हिंदू कोड बिल सादर करून त्यांना सांपत्तीक वारसा हक्क मिळवून देण्याचा प्रयत्न स्त्रियांमध्ये स्वावलंबन व सामर्थ्य निर्माण करणारा होता.

**संदर्भ**

१. डॉ. लांजेवार ज्योती, भारतीय समाज आणि स्त्री, सुगावा प्रकाशन, सदाशिव पेठ, पुणे.
२. डॉ. नाडगोंडे गुरुनाथ, सामाजिक आंदोलने, कॉन्टिनेन्टल प्रकाशन पुणे.
३. डॉ. पाटणकर प्रतिभा सु. संपादक आवेडकर चळवळीचा वारसा, प्रकाशन, अनिल महाने, कोल्हापूर.
४. प्रा. डॉ. बोंवडे प्रकाश, भारतीय समाजरचमना पारंपारिक व आधुनिक, श्री मंगेश प्रकाशन, नागपूर.



## 42. Palshi Gavatil wade va Mandire



MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.41012

Vidyawarta®

January 2019  
Special Issue

01

Special Issue January 2019

**vidyawarta™**  
International Multilingual Research Journal

आविगाव तालुका विद्या विकास मंडळ संस्थान  
बी.डी.काळे महाविद्यालय घोडेगाव,  
ता.आविगाव, जि.पुणे

सावित्रीबाई फुले पुणे विद्यापीठाच्या गुणवत्ता सुधार योजनेतर्गत  
'स्थानिक इतिहास लेखन'  
या विषयावर राज्यस्तरीय कार्यशाळा

□ अतिथी संपादक □  
डॉ. इंद्रजित भाऊराव जाधव  
प्रचार्य  
बी.डी.काळे महाविद्यालय, घोडेगाव, ता.आविगाव जि.पुणे

डॉ. नाथा रामभाऊ मोकटे  
इतिहास विभाग प्रमुख  
बी.डी.काळे. महाविद्यालय घोडेगाव,ता.आविगाव, जि.पुणे

Reg.No.U74120 MHQ2013 PTC 251205

**Harshwardhan Publication Pvt.Ltd.**  
At Post Limbaganesh, Tq. Dist. Beed  
Pin-431126 (Maharashtra) Cell:07588057695,09850203295  
harshwardhanpubli@gmail.com, vidyawarta@gmail.com

All Types Educational & Reference Book Publisher & Distributors / www.vidyawarta.com

❖ विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)

MAH/MUL/03051/2012  
ISSN: 2319 9318UGC Approved  
Sr.No.41012

Vidyawarta®

January 2019  
Special Issue

073

22

## पळशी गावातील वाडे व मंदीरे

प्रा. काकडे बी. जे.

इतिहास विभाग प्रमुख

प्रा. गंडाळ ए. जी

न्यू आर्ट्स कॉमर्स, ऑगंड सायन्स कॉलेज, पारनेर

नगर जिल्ह्यातील इतिहासाचा व कडे समृद्ध वारसा जाणवारे गाव म्हणजे पळशी पारनेर तालुक्यातील टाकळी कोकेश्वर गावापासून उल्लेख २० किलोमीटर अंतरावर असणारे गाव, गावच्या भक्कम तटबंदीने व नैसर्गिक सौंदर्याने शोभीत बनवले आहे.

खळखळणारा ओढा व खुलणारा निसर्ग यामुळे पळशीचे आगळे-वेगळे रूप ऐतिहासिक दृष्टिकोनातून महत्त्वाचे आहे. पळशी गाव तसे इतिहास प्रसिद्ध गाव आहे. तसा ऐतिहासिक वारसा पळशीला लाभला आहे. पळशी हे गाव जहागिरीचे गाव पहासनी राज्याच्या जहागिरीची साक्ष मिळते. इ.स. १५२० पासूनचा इतिहास या गावात आपल्याला पाहावयास मिळतो. इ. स. १७०९ ते १७९९ या काळखंडातील तटबंदी येथे चांगल्या अवस्थेत आहेत. तिचा भक्कमपणा आजही जाणवतो. पळशी गाव या तटबंदीच्या आत विखुरलेला आहे. जुने पळशी गाव आज नाही. जुन्या पळशीतल्या पडक्या घराच्या भिंती आढळतात. जुने पळशी गावातील बरीच माणसं स्वातंत्र्यपूर्व काळातील पटकरी (कॉलरा) सोडीने दगावली असल्याची माहिती मिळते. त्यामुळे पळशी गावची लोकसंख्या घटली.

गावाच्या मध्यभागी संपूर्ण दगडी महादेवाचे मंदीर दिसते. या महादेवाच्या मंदीरातील घंटा खणखण वाजते व तिचा आवाज दूरवर पसरतो. म्हणून त्याला खणखणीचं मंदीर असं जुनी जाणती माणसे म्हणतात. या मंदीरात इतरत्र कुठेही न दिसणारे शिवपंचायतन

येथे दिसते. मंदीरातील दगडी नक्षीकाम अग्रिम असून भूमितीय वीजनील नक्षीकाम, शिल्पकाम व जाळीकाम यांचे लक्ष वेधून घेत आहे. महादेव मंदीरात गुनी-भुंगी, शिवघण, नंदी, पार्वती या मुर्ती प्रस्थापीय आहेत.

महादेवाच्या मंदीरासोबतीचे सरुवीर मंदीर आहे. हे गावचे दामदेवत आहे अशा सरु मंदीराची मुर्ती ही सरु, देवुणी व स्यावदार असून वैभवशाली इतिहासाची साक्ष आहे. या मंदिरात पळशी येथे पावडीगची याजा भरते. गावात होळकरांचे दिवाण गमराव अशा पळशीकर यांचा वाडा आहे. या वाड्यात ५८ खांबे आहेत. हा वाडा म्हणजे अधिराजा मंडळीसाठी अपूर्व अशा कलाकृती आहे. या वाडात त्याकडावरील कोरीव काम, शिल्प उत्कृष्ट सौंदर्याचा अजयमर नमुना आहे. त्याकडात कोरलेली विविध प्रकारची कलाकृती नक्षीकाम अग्रिम कलाकृतीचा अचिष्कार आहे. या कलाकृतीतील नमुना म्हणजे त्याकडातील सिताकृत हुबेहुब दिसते.

हा संपूर्ण वाडा सागवानी त्याकडापरसून उभारिलेला आहे. शेजारी दोन वाडे असून एक वाडा वेहारी लोकानी जाळला असल्याची माहिती येथे मिळते. वाड्यातील प्रत्येक खांबे तुळई, छताच्या पुढील भाग नक्षीकामाने कोला आहे.

वाड्यासोबतीचे मजगरीचे मंदीर आहे. हा वाडा अग्रिम असून वाड्याच्या वरच्या मजल्यावर खांबावर कोळीच्या पानांची नक्षी आहे. दुसऱ्या मजल्यावरील दिवाणखाना व जनानखाना यामधील नक्षीकाम कलाकृती वनस्पतीच्या रंगातील आहेत. मजगरीच्या मंदीरात पूर्वी भित्तीचित्रे होती. या मंदीराचे सभा मंडपाचे छत पिरमिडच्या आकाराचे चौकोनी आहे.

पळशी गावात पांडुरंगाचे मंदीर किल्लावाडा मंदीरामारखे आहे. दोन एकर जागेवर असलेले हे मंदीर दगडीकाम, भक्कम तटबंदीसाठी प्रसिद्ध असून या मंदीरात १८ खांबे कोरीव असून १८ खांबावर १८ पुराणे असून तिनही वाजुने नऊ पायऱ्या आहेत. राही विटठल-रुक्मिणी मूर्तीच्या प्रभावलीवर मच्छ, कामर आदी दशावतार कोरलेले आहे. महासनावर

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)

MAH MJL 03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.41012

Vidyawarta

January 2019  
Special Issue

074

वार, पर्व, किन्नर यांच्या मूर्ती कोरलेल्या आहेत. सध्याच्यात ताभ्यांत प्रवेश करणयातुनी जीकुण व गवळणी यांच्या सारक्या कोरलेल्या आहेत. मंदीराचा काळय हा कमलाकुनी आकाराचा आहे. मंदीराच्या बाजुस कोरीव काम प्रेक्षणीय असून मंदीराच्या लीवही बाजुना उल्लस शिल्पाकृती पाहण्यास मिळते. शिल्पाकृती ही वेगवेगळया प्रकारची आहे.

गावच्या पश्चिमेच्या ३ एकर असा पेशवेकालीन तलाव असून चार बाजू चौकोनी आहेत. हा तलाव दोन तीन छोट्या टेकडीच्या बाजुला आहे. डोंगरवरचे पाणी अडविण्याची, जिरविण्याची ही १३ व्या शतकातील योजना होती. हे पुराव्यासह आपणास दिसते.

गावात रामेश्वर मंदीर, गणपती मंदीर, रेणुकामाता मंदीर असून रामराव अणा पळशीकरांच्या २ पैती सखुवाई व पार्वतीवाई या सती गेल्या. म्हणून त्यांची मंदीर (समाधी स्थळे) मंदीराच्या शेजारी आहेत.

पळशी गावाला दोन वेशी असून उल्लेखनील वेशीला दिल्ली दरवाजा असे नाव आहे. पेशवे काळात दिल्ली, इंदौर, नागपूर, चांदवड आदी गावाचा पत्रव्यवहार सापडतो असे अनेक कागदपत्रांवरून दिसून येते.

पळशी गावाविषयी गमायणातील संदर्भात दनकथा येथे ऐकावयास मिळते. राम जेव्हा दंडकारण्यात गेले तेव्हा याच मार्गाने गेले असल्याची माहिती मिळते. सौंदर्याची दृष्टी असलेल्या व भक्तीत गोडवा मानणाऱ्या महान कारागीराने पळशी सारखी अजरामर कलाकृती निर्माण केली आहे.

पळशी गाव तटबंदीच्या आत आहे. पळशी हे ४००० लोकवस्तीचं गाव आहे. आज येथे हायस्कूल, प्राथमिक शाळा, बँक, ग्रामपंचायत यांसारख्या सुविधा आहेत. गावात गागरे, जाधव, मुडके, छाजे, गांधी, पोळ आडनावाचे लोक राहतात.

पळशीची अप्रतिम सौंदर्य, कलाकृतीमुळे वास्तूपुरूप या मगडी चित्रपटाचे शूटींग येथे झाले.

परंतु गावाला पर्यटन अगर तीर्थक्षेत्राचा दर्जा मिळावा

सुरख वेस तेथे आहे. चिरेबंद बरूज आणि भक्कम

❖ विद्यावार्ता : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)

वास्तवी गावच्या इच्छुक आहेत. ऐतिहासिक व धार्मिक दृष्टिकोनातून महत्त्वाचा वास्तव जगला जाय ही गाववालाची इच्छा आहे. प्रशासनाचे मात्र साकडे फारसे लक्ष नाही.

पळशी, इतिहास याचा सुरुवात वास्तव पळशी गावाला लाभला आहे. हे जपणे सर्वांचे कर्तव्य आहे. अशाप्रकारे पळशी ऐतिहासिक व धार्मिक त्याचबरोबर सुंदर कलाकृतीचा देवा आहे जो देवा जपला पाहिजे, अशा गावकऱ्यांची नीच इच्छा आहे.

**सुंदर व कोरीव वास्तू शिल्पांची वस्ती: पळशी**  
एखादा नवरत्याचा डार अत्यानक तुलावा अर्थात त्यातील एखादे रत्न ओपळून नजरच्या उण्याआर खावे. मादी कोपऱ्यात दडलेल्या त्या रत्नाकडे कृपाचे लक्ष जाऊ नये तशी अवस्था आज पळशी या ऐतिहासिक वास्तूची झाली आहे. दुष्काळी नगर जिल्हयाच्या अंतर्गत पठारी प्रदेशात पारनेर तालुक्यातील इतके स्मणीय, आकर्षक आणि वास्तू शिल्पाने श्रीमंत असे ठिकाण असेल अशी कल्पनाही येत नाही. इथली एकेक मूर्ती, काळया कातळ्यातील कोरीव शिल्पे, त्याकडातील कलाकुसर यांची किमत्त आजच्या बाजारभावात केली तर कोटयावधी रूपयाने गणित मांडणारे व्यवहारी मन थक्कून जाईल.

पारनेर तालुक्याच्या हद्दीत असलेल्या या पळशी गावाला दोनशे वर्षापूर्वी गजवैभव लाभलेले होते. नाशिक-पुणे हमरस्त्याला संगमनेरच्या दक्षिणेस सुमारे १५ किलोमीटर साकुर फाटा मिळतो. साकुर हे तसे इतिहास प्रसिध्द गाव पेशवाईत येथे वैभव नांदत होते. साकुरच्या ओढ्याचे पाणी उटावरून पखली भरून इंदौरला स्थायिक झालेल्या संस्थानिकांसाठी पाठविले जाई. इतके ते गोड पाणी होते आणि या गावाला साखरऊर असे नाव पडले. साकुरची मुळी नदी ओलांडून पुढे गेले तर सगळीकडे उधडे माळरान, लहान-मोठ्या उजाड टेकड्या आणि त्यातून कोरडी पडलेली ओढ्याची पात्रे लागतात. एके काळी वैभवाचा बरदहस्त या परिसराला लाभला होता.

भव्य दगडी तटबंदी आणि त्या काळखातील सुरख वेस तेथे आहे. चिरेबंद बरूज आणि भक्कम

MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.41012

Vidyawarta®

January 2019  
Special Issue

075

लाकडी दरवाजातुन अपारोग्यह इत्ती सहज आत जाऊ शकल इतकी तीची भव्यता आहे. वेशीच्या चारही बाजूंना भक्कम दगडी भित गावकुस वेदून उभी आहे. वेशीच्या दोन्ही बाजूंना शिलालेख आहे. नटबंदीला तसे पाच दरवाजे असले तरी त्यापैकी तीन दरवाजे पूर्णपणे बंद आहेत. उरलेकडच्या दिव्ही दरवाजा बंद केला तर गावचे संरक्षण गेली किल्लेक ज्वै होत आहे.

गावात गेल्यावर दगड मार्गाने पाचलेली काती घरे आहेत. मध्यभागी शिवशंकराचे मंदिर आहे. हे विरेबंद दगडी हेमाडपंथी मंदिर म्हणजे तत्कालीन बांधकामाचा उत्कृष्ट नमुना आहे. इथले दगडी कटडे, तसेच आतील संगमरवरी शिव-शाळुका, ऐतवाज नदी हे सारेच प्रेक्षणीय आहे.

#### शिल्पांकित राजप्रसाद

मंदिर बघून बाहेर आल्यावर पुर्वेला थोड्याच अंतरावर दगड विटांचे दोन-तीन मजली भक्कम बांधकाम दिसते. हे गावकुसाचे मर्मस्थान आणि एकेकाळचे सरदारांचे राजविलासी निवासस्थान त्याच्या भक्कम बांधणी वरूनच वाड्याच्या भव्यतेची कल्पना येते. दरवाजाच्या आत पाऊल टाकताच रखवालदारांच्या जुन्या बांधीच्या देवत्या लागतात. त्यांना वळसा घालून डावीकडे जाताच मन आश्चर्याने धक्क होते आणि तेथे पाय थांबकतात.

चहू बाजूंना उभे असणारे लाकडी खंब आपल्या अंगावर अप्रतिम नक्षीचे काष्ठशिल्प घेऊन उभे राहिलेले दिसतात. इथला प्रत्येक खंब स्वतंत्र शैलीचा आहे. मत्स्य, वसुदेव-देवकी, अननसाची उमलती पान, देवाच्या मूर्ती, दिमाखात मिरवणारे गजराज आणि सगळ्यात सरस ठरावी अशी सलग लाकडात कोरलेली व सहजगत्या गद-गद हलविता येण्याजोगी फुलांची परडी खरोखरच कुतूहलजनक आहे. वाड्याचा इतर भाग मात्र मोडीत निघालेल्या जुनाट भांड्यांच्या ढिगा-प्रमाणे वाटतो. माणसाने उभे केलेले वैभव त्यास जपता आले नाही तर त्याची किती विपन्नावस्था होते याचे एक बोलके उदाहरण म्हणजे हा भाग होय. माडीवर जाण्याचे अरुंद जिने काही प्रमाणात शाबूत आहे.

दुसऱ्या मजल्यावरच्या श्रीमंताचा दिवाणखाना भव्य आणि कोरीव असला तरी आज त्याची जपणूक होत नाही. कानाकोपऱ्यात छताशी असलेल्या मीनाकामाकडे लक्ष गेल्याशिवाय राहात नाही. वाड्याच्या बाहेर अनेक वाड्यांचे जुने अवशेष उभे आहेत.

#### संदर्भ ग्रंथ यादी

१. मराठी निवासस्थान-उत्तरार्ध भाग -३- गो. म. गणदेसाई
२. मराठ्यांची बखर- ग्रॅन्ट डफ
३. वाना फडणिसांचे चरित्र-वामुदेव शास्त्री खरे
४. दिवाण पट्टणीकर दफ्तर खंड-१ स.नि. निरगड
५. होळकरांची कौपीयत
६. होळकर घराण्याचा इतिहास
७. पेशवे दफ्तर खंड -१
८. मराठ्यांच्या इतिहासाची साधने प्र.न. देशपांडे
९. मराठ्यांची बखर-सभासद
१०. चंद्रचुड दफ्तर
११. अहमदनगर जिल्हा गॅझेटोअर

□□□

❖ **विद्यावार्ता**: Interdisciplinary Multilingual Refereed Journal **ImpactFactor5.131 (IJIF)**

## 43. Change in Land use pattern in Ahmednagar District: A Geographical Analysis



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499

Impact Factor: 1.3599(GIF), 0.679(IIFS)

**3. Cultivable Waste Land**

Cultivable waste land includes (i) permanent pasture and grazing land (ii) miscellaneous, trees, crops and groves not included in the net sown area (iii) Cultivable waste land. This category land is mainly meant for grazing purposes for livestock. It shows this type of land use has fluctuation during period of investigation. This category of land accounted 4.77 per cent to the total geographical area of district during 2000-01 and 1.98 per cent during 2012-13. During the period of 2001-2015 it has decrease by 2.79 per cent.

**4. Fallow Land**

Fallow lands are divided into two sub types, 1. Current fallow land - means the land fallow during the current years. Which were not sown at the occasion of crop reporting but were sown one or two years of left fallow either in one season or one full year for regenerating fertility of soil and other purposes. 2. Other fallow land means the land kept uncultivated one year to five years due to some problems.

In 2000-01 the fallow land in Ahmednagar district was 7.94 per cent and it was decreased up 7.63 per cent of the total geographical area. Throughout the study period from 2000 to 2013 the fallow land has decreased by 0.31 per cent of the total geographical area.

**5. Net Sown Area**

Net sown area consists of net area sown with crops and orchards excluding the area sown more than once. The net area sown is the actual area under crops counting areas sown more than once in the same years only once. The temporal changes in net sown area from 2000-01 to 2012-13 is shown in table no.1. In 2000-01 the net sown area was 71.24 % of the total geographical area. In 2012-13 it was recorded as 73.67 %. In the study period from 2000 to 2013, it was increased by 2.43 %.

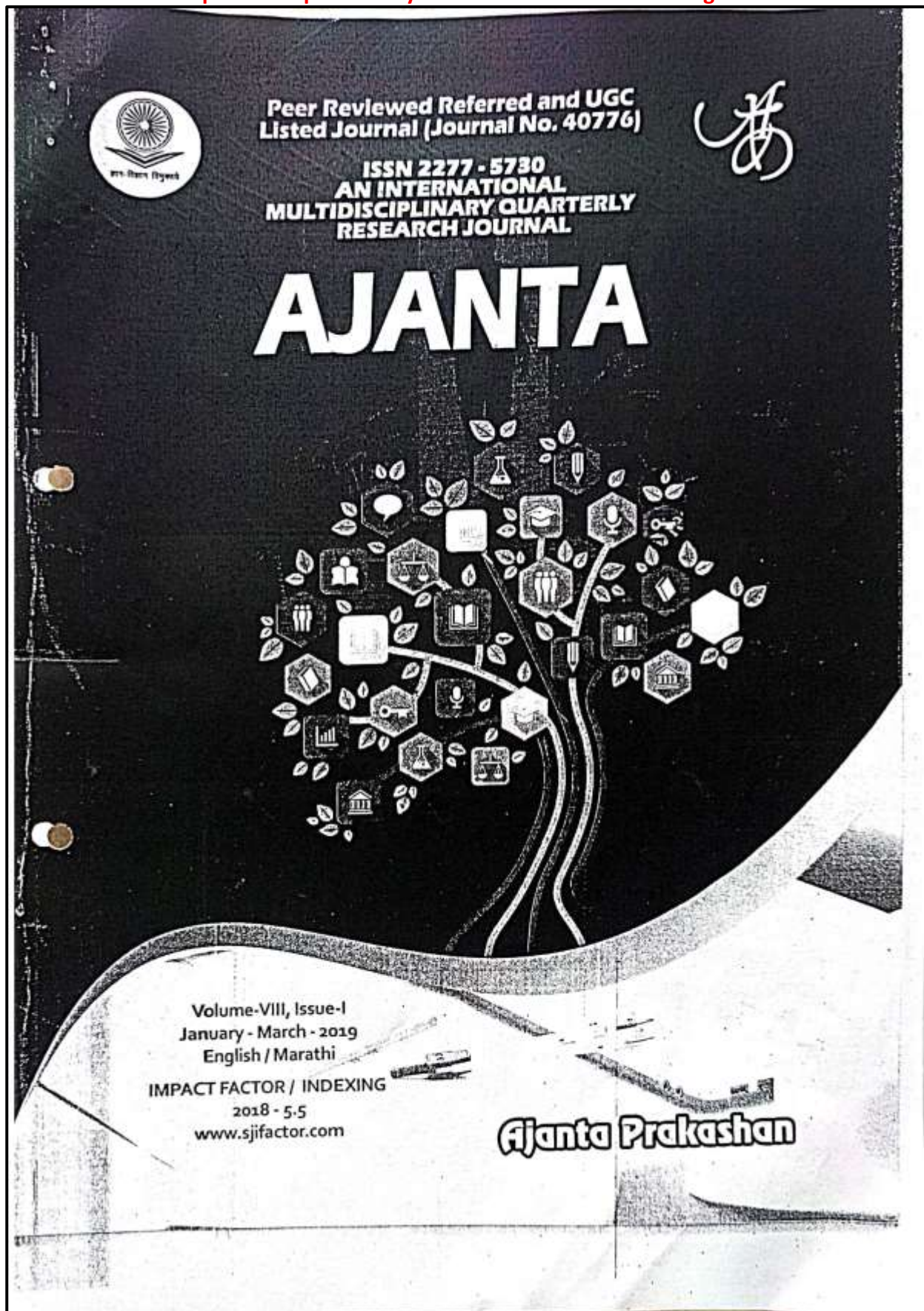
**Conclusion**

Above discussion of general land use of Ahmednagar district clearly indicates that except negative changes in area under forest, there are positive changes for agricultural development. Decrease in other fallow land; increase in net sown area is good indicators for agricultural development.

**References**

1. *Arsud S. S. (2000): "Characterizing Agro Climatic Environment of Bhima Basin", Unpublished Ph.D. Thesis, University of Pune.*
2. *Tripathi R. S. and Vishwakarma J. P. (1988): "Land use Cropping Pattern and Development Levels in Banda District (U. P.)". The Deccan Geographer Vol. 26 No.2-3.*
3. *Symons, Leslie (1978): "Agricultural Geography", G. Bell, London.*
4. *Lille sand T. M. and Kiefer R. W. (1987): "Remote Sensing and Image Interpretation", John Wiley and Sons.*
5. *Kumar J. (1986): "Land use Analysis: A Case Study of Nalanda District", Bihar Inter-India Publication New Delhi.*
6. *Chatterjee (1952): "Land Utilization Survey of Howrah District", Geographical Review of India. vol. 14, No. 13.*
7. *Shaffi M. (1961): "Land Utilization in Western U. P. Published by Aligarh Muslim University.*
8. *Rao P. V. L. S. (1959): "The Role of Geographer in Land use Planning", Bombay Geographical Magazine Vol.7 No.2.*
9. *Jasbir Sing. (1974): "An Agricultural Atlas of Indian- A Geographical Analysis", Vishal Publications, Kurukshetra*
10. *Socio-Economic Abstract of Ahmednagar District (2016).*
11. *Socio-Economic Abstract of Ahmednagar District (2004-05).*

44. Spatio-Temporal Analysis of Farm Pond in Ahmednagar District



VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

CONTENTS OF ENGLISH

S. No.	Title & Author	Page No.
1	Environmental Degradation: Causes and Consequences Prof. Aher Sanjay Sukhdev	1-4
2	The Application of GIS & its Components and Tourism Dr. Sunil P. Cholke Prof. Santosh M. Shinde	5-16
3	Availability of Water Resource and Economic Development of Local People in Dhora River Basin Prof. P. N. Dhage Dr. D. G. Mane	17-19
4	Environment: A Matter of Global Concern Prof. Dr. Narsale D. V.	20-22
5	Geochemistry of Groundwater of Terekhol River Basin, Sindhudurg District, Maharashtra S. P. Gaikwad S. K. Gaikwad D. C. Meshram R. D. Madale	23-32
6	Study of Sea Water Intrusion along the Querim Beach, Goa using Vertical Electrical Sounding (VES) S. K. Gaikwad S. P. Gaikwad D. C. Meshram R. D. Madale	33-42
7 ✓	Spatio-Temporal Analysis of Farm Pond in Ahmednagar District Dattatray Sheshrao Ghungarde Dr. Jyotiram C. More	43-49
8	Socio-Economic Status of Tribal Women in Ahmednagar District (Maharashtra) Dr. Shivaram M. Korade Dr. Vasudev Shivaji Salunke	50-54



VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## 7. Spatio - Temporal Analysis of Farm Pond in Ahmednagar District

**Dattatray Sheshrao Ghungarde**

Assistant Professor & Research Student, New Arts, Commerce & Science College, Parner,  
Dist. - Ahmednagar.

**Dr. Jyotiram C. More**

Research Guide, B.J.S. College, Wagholi, Pune.

Research Center - Agasti Arts, Commerce and Dadasaheb Rupwate Science College, Akole,  
Dist. Ahmednagar.

### Abstract

Land and Water are the two important natural resources in the development of Agriculture of any region. The success of the agriculture mainly depends upon proper and scientific utilisation of land and water resources. The increasing need of water for agriculture may be met by the available amount of water resource. Irrigation in India refers to the supply of water from Indian rivers, tanks, wells, canals and other artificial projects for the purpose of cultivation and agricultural activities. In country such as India, 64% of cultivated land is dependent on monsoons. Rivers, wells and tanks are the major sources of water in Ahmednagar district. The different sources of irrigation in the district are canal, wells, tanks, bore wells, lift irrigation, and other such as farm ponds etc. Development of irrigation by harvesting rain water resource is a crucial input for increasing agricultural production. This paper is an attempt to understand the total construction of the farm pond, total water storage capacity and protective irrigation area through farm ponds in the investigation period. In Ahmednagar district 9798 farm ponds are constructed of different sizes, total potential water storage capacity is 29756.14 T.C.M. and protective irrigation area is 29755 hectares through farm ponds in the investigation period.

**Key Words:** Farm pond, Agricultural, T.C.M., Protective irrigation.

### Introduction

The geographical area of Maharashtra state is 308 lakh hectares and cultivable area is 225 lakh hectares. Out of this 40 % of the area is drought prone. The proportion of gross irrigated area to gross cropped area was 17.09 %. The highly variable rainfall in state ranging from 400 to 6000 mm occurs in a four months period between Jun to September (AFC India 2014). Various

ENGLISH / Peer Reviewed Referred and UGC Listed Journal No. : 40776

43

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

studies have revealed that out of the total cultivated areas of 225 lakh hectares in the state about 42 % can be brought under irrigation from all resources. It is estimated that about three fourth of ultimate potential (63.05 lakh) hectares would be through surface water resources. Maharashtra irrigation commission (Chitale commission) reported in 1999 and estimated that 126 lakh hectares, 55.75% area can be brought under irrigation. Before independence, the main objective was to provide protective irrigation facilities in drought area. After independence the approach changed from protective to productive. During drought situation, irrigation does not serve only for protective measures but achieve maximum productivity. However the Ministry of Agriculture initiated Farm pond program under NHM, NREGS, and RKVY is state plan scheme launched for increasing irrigation facilities. Irrigation is one of the significant inputs in the transformation of agriculture. It encourages the farmers to adopt scientific techniques.

Ahmednagar district is the largest district in the state of Maharashtra. The total geographical area of the district is 17.48 lakh hectares, constituting 5.66 per cent of the state's geographical area. The proportion of gross irrigated area (231142 hectares) to gross cropped area (1367814 hectares) was 16.90 % (2012-13). Being a drought prone area in the state of Maharashtra, the district gets an annual rainfall of over 500 mm. The structure of workforce in Ahmednagar district reveals that 69.70 % of workers are in the agricultural sector. While about 44.34 % are cultivators, 25.3 % are agricultural labourers. The total number of persons in the workforce in Ahmednagar district was 18.57 lakhs (main plus marginal workers). However the contribution of this sector to District Domestic Product is 27 %. It can thus be observed that agriculture is the dominant activity in Ahmednagar district (Census 2011).

#### Study Area

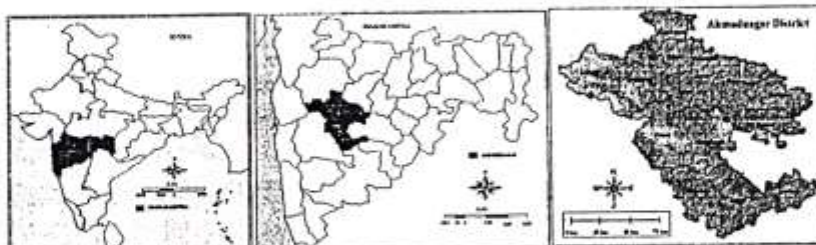
Ahmednagar district is the largest district in the state of Maharashtra according to geographical area. The total geographical area of the district is 17048 Sq. Km, which is 5.66 % of states land. It is divided into 14 tehsil with a total of 1585 villages. The total population of the district is 4543159, out of which 80 % is in rural areas. The district of Ahmednagar is situated in the central part of the state; the Geographical location of the district is  $18^{\circ}.2' N$  to  $19^{\circ}.9' N$  latitude and  $73^{\circ}.9' E$  to  $75^{\circ}.5' E$  longitudes. The western part of the district is Sahyadris off-shoots. This western part is the highest part of the district. The whole district lies on the elevated table land of the Deccan which has a general slope from west to east. The western sub-division of

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

Akola is the highest part of the district. The district receives an average annual rainfall of 566 mm. The minimum and maximum temperature ranges between 14<sup>0</sup>C to 44<sup>0</sup> C.

#### Location Map of Study Area



#### Objectives

The main objectives of the study are -

1. To study the spatio-temporal analysis of the total construction of the farm pond, total water storage capacity and protective irrigation area through farm ponds in the year 2004 to 2015.

#### Data Base and Methodology

The present work is based on secondary source of data which obtained from agricultural department of Ahmednagar district and socio-economic abstract, Census of Ahmednagar district 2011.

In the present study, tehsil is the unit of study. The tehsil-wise construction of the farm pond, total water storage capacity and protective irrigation area through farm ponds in the year 2004 to 2015 are analysed.

#### Discussion

##### Farm Pond

'Farm pond is a dug out structure with definite shape and size having proper inlet and outlet structure for collecting surface Runoff of rain water from the farm area. It is one of the most important rainwater harvesting structure. (Jalsandharan & Krushi Vibhag, Feb. 2003)

Farm pond collect and store water during rains thus providing for protective irrigation during dry spell.

Ahmednagar district is drought prone area which needed irrigation during dry spell, farm pond is most suitable option for protective irrigation in the study area.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

Following table indicates the number of farm pond constructed during 2005-06 to 2014-2015 in Ahmednagar district.

Table no.1.

Sr No	Tehsil	Year										Total
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
1	Akola	89	106	118	115	103	201	24	8	50	71	885
2	Sangamner	59	120	150	116	128	397	11	30	276	107	1394
3	Kopargaoan	1	5	12	9	55	36	2	14	29	52	215
4	Rahta	1	3	12	10	40	51	3	-	106	168	394
5	Shrirampur	-	4	4	5	55	52	1	-	10	7	138
6	Nevasa	-	8	10	2	16	192	2	16	22	38	306
7	Shevgaon	-	5	4	296	64	421	3	9	22	18	842
8	Pathardi	9	13	16	329	63	676	--	11	5	30	1152
9	Nagar	10	23	25	36	131	943	3	10	107	34	1322
10	Rahuri	8	24	39	38	100	81	-	2	12	36	340
11	Parner	36	98	144	127	69	366	-	10	66	76	992
12	Shrigonda	12	26	35	24	58	170	9	57	103	54	548
13	Karjat	21	53	52	85	458	112	4	14	93	94	986
14	Jamkhed	1	6	20	18	122	41	-	-	67	9	284
Total		247	494	641	1210	1462	3739	62	181	968	794	9798

**Source:** Compiled by author, based on secondary data obtained from district agricultural Department A. Nagar.

The total number of farm ponds constructed during 2005 to 2015 and there, tehsil wise distributions in Ahmednagar district is presented in table no.1. As per the information given by Ahmednagar district agricultural department. The total numbers of farm ponds 9798 are constructed under the scheme of RKVY, NHM and MREGS, in the district. The highest number of 1394 farm ponds constructed in Sangamner tehsil and the lowest number of 138 farm ponds constructed in Srirampur tehsil.

In high proportion above 1000 farm pond are constructed in the three tehsil namely Sangamner (1394), Nagar (1322) and Pathardi (1152). Moderate proportion above

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

500 to 1000 farm pond is constructed in the five tehsil namely Parner (992), and Karjat (986), Akola (885), Shevgaon (842), and Shrigonda (548).

The low number of below 500 farm ponds constructed in following six tehsils i.e., Rahta (394), Newasa (306), Rahuri (340), Jamkhed (284), Kopargaon (215), and Shirampur (138).

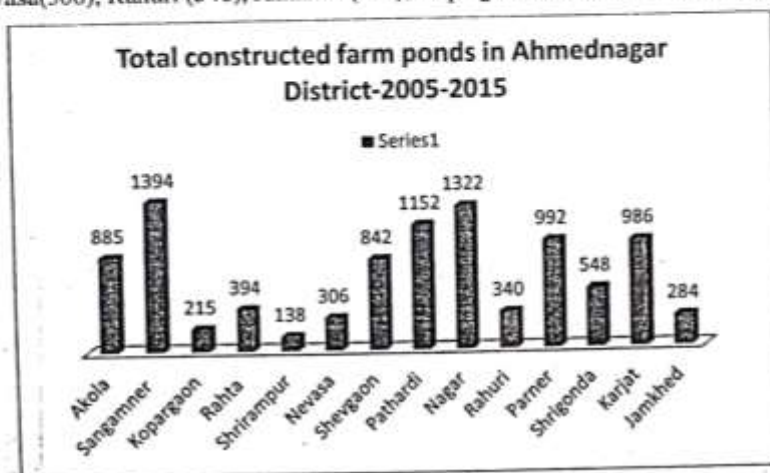


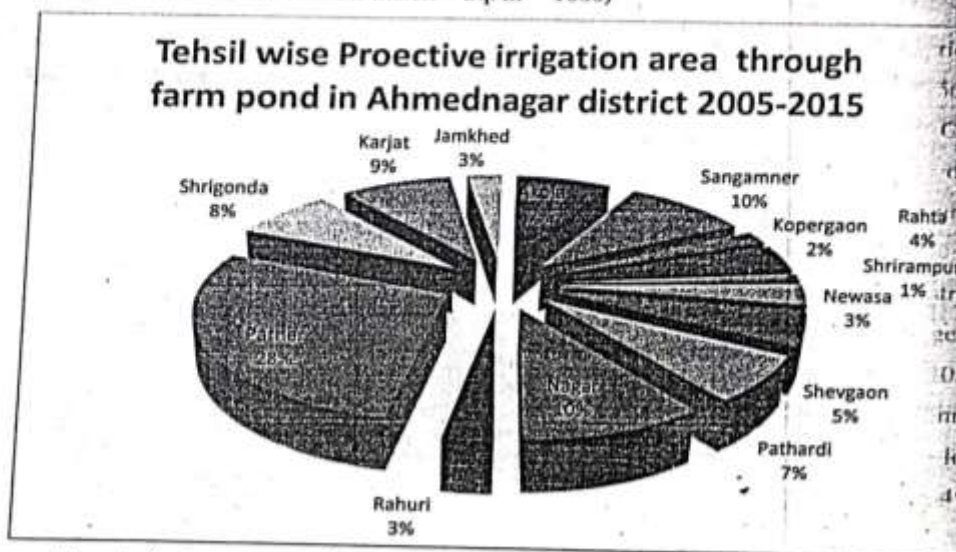
Table No.2 : Tehsil Wise Distribution of Water Storage and Protective Irrigation by Farm Pond ( 2005-2015)

Sr.No	Tehsil	Water storage in T.C.M.	Proactive Irrigation Area In Hectares
1	Akola	2244.51	2245
2	Sangamner	2879.98	2880
3	Kopergaon	0576.19	0576
4	Rahta	1192.43	1192
5	Shirampur	0324.44	0324
6	Newasa	0929.72	0930
7	Shevgaon	1498.06	1498
8	Pathardi	2076.87	2077
9	Nagar	3062.04	3062
10	Rahuri	0852.71	0853
11	Parner	8416.39	8416
12	Shrigonda	2293.08	2293
13	Karjat	2611.49	2611
14	Jamkhed	0798.32	0798
	Total	29756.14	29755

Source: Compiled by author.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

(T.C.M. = Thousand cubic meter. = Sq. m 1000)



The tehsil wise water storage and protective irrigation through farm pond in the district presented table no. 2 The result shows that the total constructed farm pond stored 29756.1 T.C.M water in the district. The highest water stored in Parner tehsil i.e.8416.39 T.C.M Followed in Nagar tehsil, 3062.04 T.C.M. The lowest water stored in Shrirampur tehsil i.e. 324.44 T.C.M.The stored water is utilized for protective irrigation for fruit plantation during summer season.

This stored water providing protective irrigation about 29755 hectare area in the district This is definitely contributed to sustainable production of crops. The tehsil wise percentage of protective irrigated area is observed high above 10 % in Parner i.e. 28% and Nagar i.e. 10 % tehsil. The moderate 5 to 10 % protective irrigated area is observed in six tehsils i.e. Sangamner 10%, Karjat 9%, Shrigonda 8%, Akola 7% Pathardi 7% and Shevgaon 5% tehsils. While low percentage below – 5% protective irrigated area is noted in following six tehsils i.e. Rahta 4%, Newasa 3%, Rahuri 3%, Jamkhed 3%, Kopergaon 2% and Shrirampur only 1%.

**Conclusion**

Demand of water resources has increase day by daydue to the population growth and expansion in urbanization, industrialization and irrigation for agriculture.Rainwater harvesting system is one of the concepts that can be implemented to meet the water shortage

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019

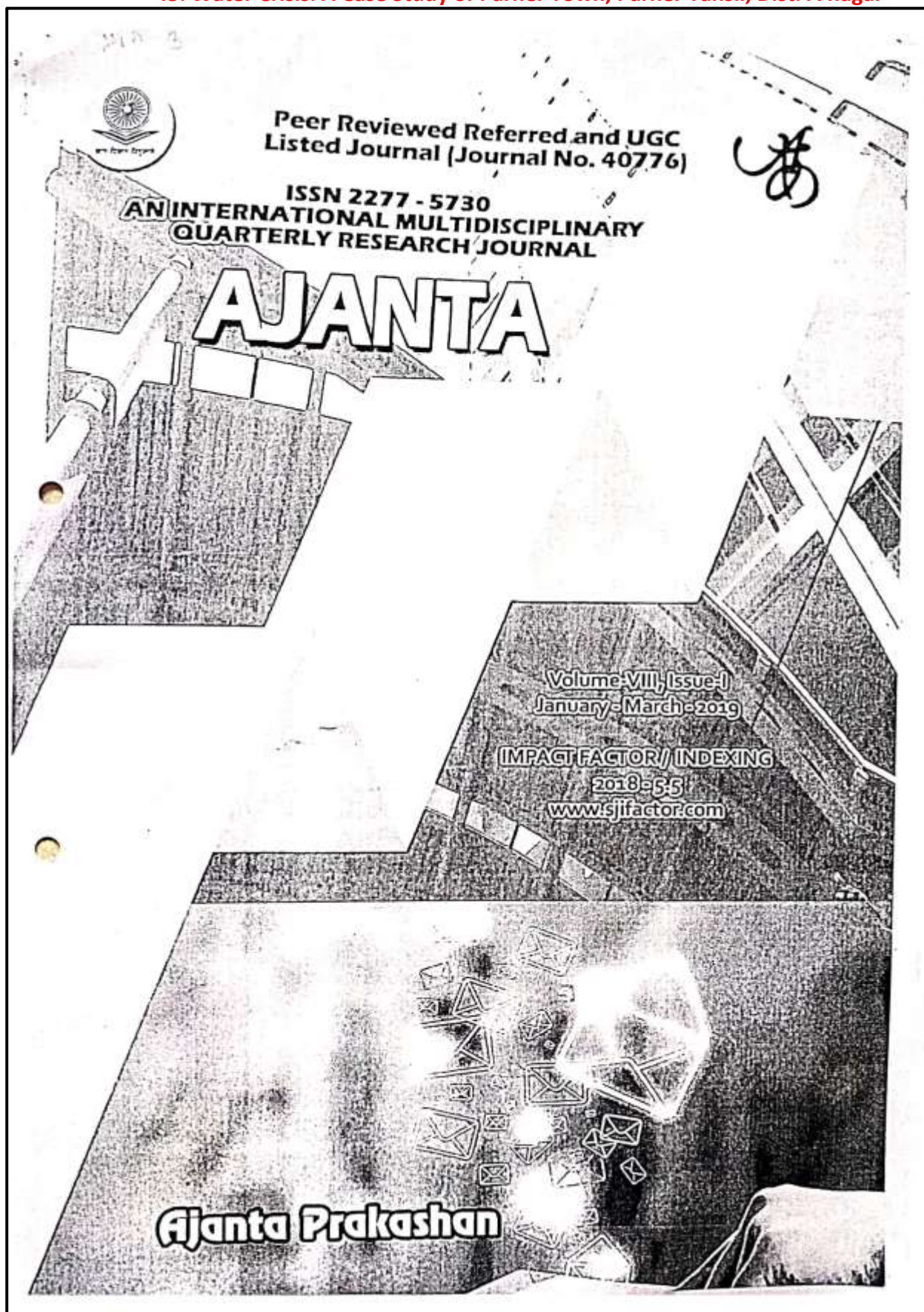
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

problem. Successful implementation of rainwater harvesting system is a great contribution for future rainwater harvesting development and living quality. Government agencies are playing an important role to promote this practice. There are many types of Water harvesting Structures. The implementation of the farm pond program in the district has helped for providing protective irrigation. In Ahmednagar district during 2005 to 2015 the total number of 9798 farm ponds is constructed. The total constructed farm pond stored 29756.14 T.C.M water in the district. This stored water providing protective irrigation about 29755 hectare area in the district. This is definitely contributed to sustainable production of crops.

#### References

- AFC. India Ltd., Mumbai March 2012: Impact assessment study of RKVY farm ponds in twelve Districts of Nashik, Pune, Kolhapur, and Aurangabad Division Pp-No-11)
- Jalsandharan & Krushi Vibhag, Panlokshetra Vikas Margadarshika Feb. 2003 Gov. of Maharashtra Page. No. 245
- Government Of Maharashtra No. Rkv-04 I 5/C.R.38/RKVY Cell Agriculture, Animal Husbandry, Dairy Development & Fisheries Department, Mantralaya, Hutatma Rajguru Chowk, Madam Cama Road, Mumbai - 32. Dated: - 25 June, 2015.
- Ahmednagar district Census Handbook- 2011.
- www.mahagri.nic.in

45. Water Crisis: A Case Study of Parner Town, Parner Tahsil, Dist. A'nagar





VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## CONTENTS

S. No.	Title & Author	Page No.
9	A Geographical Assessment of Tourism Potential in Akole Tahsil of Ahmednagar District (MS) <b>Dr. Anil A. Landge</b>	69-76
10	Potential Tourist Places in Kolhapur District: A Case Study of Barki <b>S. A. Aher</b> <b>Rajendra S. Pawar</b>	77-85
11	Effects of TDS in Drinking Water Quality in Post and Pre-Monsoon Season: A Spatio-temporal Analysis of Rahuri Tahsil <b>Dr. Sopan N. Shingote</b>	86-90
12	Water Crisis: A Case Study of Parner Town, Parner Tahsil, District Ahmednagar. <b>Ashok Vitthal Thokal</b> <b>Jyotsana D. Mhaske</b>	91-97
13	The Role of Tourism in Sustainable Development in India <b>Prof. Chandrakant Bansode</b>	98-104
14	Problems of Shirdi Religious Tourist Centre <b>Dr. Dalimbe S. N.</b>	105-112
15	Environmental Impacts of tourism <b>Prof. Thorat Aruna M.</b> <b>Prof. Zine Santosh B.</b>	113-124
16	Trend of Development of Town in Ahmednagar District with Help of Remote sensing and GIS: A Case Study of Shirdi Town <b>Mr. S. D. Thigale</b> <b>Dr. D. G. Mane</b>	125-130
17	SWOT Analysis of Ujjain, Sanchi and Knha National Park, Madhya Pradesh, India <b>Mr. N. M. Patil</b>	131-135
18	A Study of Rainfall Distribution in the Drought Prone Area of Satara District <b>Mr. P. R. Jadhav</b> <b>Dr. B. D. Ghodke</b>	136-141
19	A Review of National Agricultural Insurance Scheme <b>Mr. P. S. Auti</b>	142-147

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## 12. Water Crisis: A Case Study of Parner Town, Parner Tahsil, District Ahmednagar

Ashok Vitthal Thokal

Assistant Professor, Department of Geography.

Jyotsana D. Mhaske

New Arts, commerce & Science College, Parner Dist. – Ahmednagar.

### Abstract

Today largest cities of the world face the huge problem of the water supply for drinking and domestic especially in developing countries like India. The India's growth of urbanization is tremendous. The Urbanization growth rate for the year 1991-2001 is 31.30%. Increasing urban population creates many problems on civic amenities one of which is water supply system for urban area. Demand of water has been increased. Now Parner village has become developing which includes surrounding villages so demand of water supply is having increased.

Parner village which is surrounded by drought prone area. So, the population of peripheral areas does not have whole year employment from agriculture. Water is one of the most Precious natural resources and a key element in the socio-economic development of a country. A person can live without food for a month, but only for a week without water. Nothing will quench thirst the way water can. Water is the essential part of the modern day life. It is used for drinking, bathing, washing, irrigation, industries and a host of other purposes. 48890500 Billion (TMC) water Total water available. Out of it 3282290(TMC) is useable. Surface water in India is 24357 TMC in useable. Availability of water in India is 39641.9 TMC.

In Maharashtra average availability of water is 5782.8 TMC. Available water for actual use is 4447.8 TMC 55% water in Konkan and remaining in rest of Maharashtra.

Ahmednagar district is a draught prone area which receives scanty rainfall. Parner Tehsil is absolutely drought prone; Parner is town which is also scanty rainfall. Present research paper focus upon domestic supply of water for this town. Increasing population of this town is most prominent problem in future.

**Key Words:** - Drought Prone, Per Capita Allocation, Urbanisation

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

### Introduction

Today largest cities of the world face the huge problem of the water supply for drinking and domestic especially in developing countries like India. The India's growth of urbanization is tremendous. The Urbanization growth rate for the year 1991-2001 is 31.30%. Increasing urban population creates many problems on civic amenities one of which is water supply system for urban area. Demand of water has been increased. Now Parmer village has become developing which includes surrounding villages so demand of water supply is having increased.

Parmer village which is surrounded by drought prone area. So, the population of peripheral areas does not have whole year employment from agriculture. Water is one of the most Precious natural resources and a key element in the socio-economic development of a country .A person can live without food for a month, but only for a week without water. Nothing will quench thirst the way water can. Water is the essential part of the modern day life. It is used for drinking, bathing, washing, irrigation, industries and a host of other purposes. 48890500 Billion (TMC) water Total water available. Out of it 3282290(TMC) is useable. Surface water in India is 24357 TMC in useable. Availability of water in India is 39641.9 TMC.

In Maharashtra average availability of water is 5782.8 TMC. Available water for actual use is 4447.8 TMC 55% water in Konkan and remaining in rest of Maharashtra.

Ahmednagar district is a draught prone area which receives scanty rainfall. Parmer Tehsil is absolutely drought prone; Parmer is town which is also scanty rainfall. Present research paper focus upon domestic supply of water for this town. Increasing population of this town is most prominent problem in future.

### Data base and Methodology

#### 1) Aims & Objective

- 1) To Study the Sources of water.
- 2) To Study water supply system according to population of Parmer.
- 3) To find out the problem about water availability & supply the study is intended to know the performance of the use of water in the selected area. The attempt is made to drinking water. For this, the data are simply analyzed, presented and discussed.

### Sources of Data

The data is collected from primary and secondary sources. The primary data is collected from town Parmer to know the status of water in Parmer village. Secondary data is collected from

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

panchayat samiti, gazetteer, and census 2011. For the supporting the results of the present study. The secondary data figures provide the guideline and insight for planning and implementing work.

**5) Sampling Technique**

From the Parner tehsil Parner town is select as study area. Data are collected directly from field visit and the study is carried out evenly and not concentrated in any one part of the village. The study was carried in a way to insure that whole village is represented in the study.

**Study area**

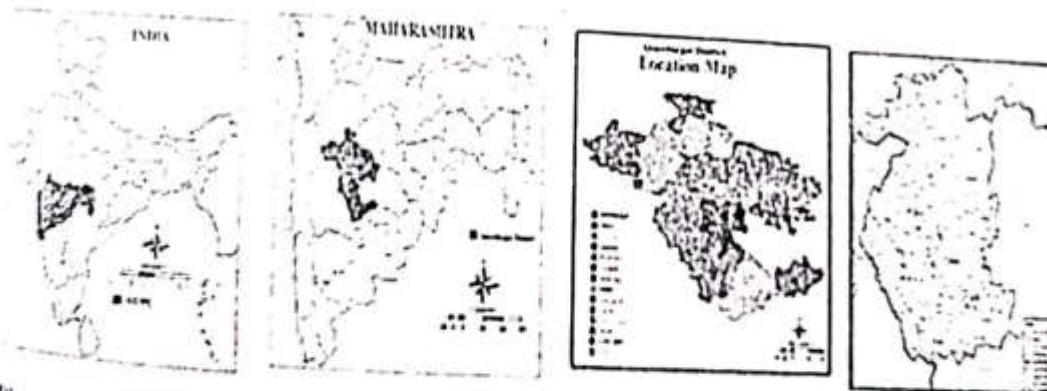
**Geographical location**

Ahmednagar district is largest district of Maharashtra state in area and town Parner is located at coordinates of 180 49' 40" North to 190 21' 34" North Latitude and 710 10' 22" East to 740 38' 34" East Longitude. It is located on the height of 790 Meters. It is the plateau region of Maharashtra. Total part of the Parner is shown in the Toposheets 47J/5 as Parner is situated in Ahmednagar district. Parner is located between 19°00'00"N, 74°26'00"E

**Relative Location**

Parner Tehsil is bordered by the Pune District from the East, Sangamner and Rahuri from the North, Shirur Tehsil from the West, and Shrigonda from the south.

**Location Map**



**Physical Feature**

**Relief.**

Parner town is situated about 790 meter heights. On the north side of village there is one hill which name is "Bhandara Dongar" and its height is near about 900 meter. To the south side of village there is plain area. The village appears in rectangular shape.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

#### Climate

The climate of Parner is moderate, with variations in temperature ranging between 16°C and 35°C. Average annual rainfall is 608 mm.

#### Rainfall

Parner village are rain shadow region hence rainfall is too short in this region has drought prone region. Average annual rainfall is 608 mm.

#### Temperature

The Parner is a plateau region hence climate of this region is arid dry region and hence the temperature of Parner village is ranging between 16°C and 35°C.

#### Soil

The soil of village can be broadly classified into two groups Black and Red. The soil deep rich land are found which is more fertile, further up in the hilly areas to the north side of village on "Bhandara Dongar" soil have been observed red occurring in between the successive flow basalt are exposed in the discontinuous patches

#### Population

The population of Parner in 2001 was 12312 & 2011 was 13119. Composition of population, 52% male & 48% female.

#### Age specific ratio

In Parner village population of children with age 0-6 is 1442 which makes up 10.99 % of total population of village. Average Sex Ratio of Parner village is 958 which are higher than Maharashtra state average of 929. Child Sex Ratio for the Parner as per census is 842, lower than Maharashtra average of 894.

#### Literacy

Parner village has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Parner village was 81.97 % compared to 82.34 % of Maharashtra. In Parner Male literacy stand at 87.71 % while female literacy rate was 76.08 %.

#### Discussion

##### Allocation of water

One person has need 150 litres water per day in urban area. Parner is village assuming per capita /day 75litrs, is half of an urban use of water

Peer Reviewed Refereed and UGC Listed Journal No. : 40776

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

#### No. of Houses

Total no. of houses is 2175 in current year 2010-11. And last two years no. of houses are shown as following-

Year	2008-09	2009-10	2010-11
No. of Houses	1920	2170	2175

#### Types of houses

Year	2008-09	2009-10	2010-11
Kachche ghar	450	430	400
Pakke ghar	1470	1740	1745

#### No. of Families

Year	2008-09	2009-10	2010-11
No. of Families	1920	2170	2175

#### Status & sources of water

##### Status of Water

Parner is a plateau region area and also rain shadow region hence this area is drought prone region and hence this region has less water. And hence Parner is arid dry region.

##### Sources of Water supply

Nagarpanchayat is only one organization for water supply system. The sources for water supply from three wells. Which are not sufficient for whole year supply of water in draught period the Nagarpanchayat borrows water for mula dam pipeline which supplies water for Supa M.I.D.C., Rojgar hami yojana in 1972 built up two Pazar talav. Most of the work has been done to enhancing ground water level likes counter bunding. Ground water table of Parner is about 10-18 meters deep.

Water supply institute:- Parner Nagarpanchayat is whole & sole institute to supply the water to whole village. Elected member from Parner and selected peoples are the members of water supply committee. Two workers are working on the field.

At present water is not sufficient from its own sources, so it borrows from mula dam pipeline which supply water for Supa M.I.D.C. water supplied to dwellers of Parner only three days in a week which provide water to parner by Hanga village and it provides for Parner. There are 4 tanks of water storage which having different storage capacity. Out of them 1 tank has 3,00,000 liters storage capacity, two has 2,00,000 liters each storage capacity and one has 1,00,000 liters capacity. Total storage capacity of the tanks is 9,00,000 liters.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

There are 14 lakes in Parner town which provide water to Parner village as a drinking water. In Parner town there are 3 main wells which provide water to Parner village. The first well is in Hanga village, second in Panoli, and third in Siddheshwar wadi.

**Sources of Water supply**

Types of water supply	2008-09	2009-10	2010-11
Dam	-	-	-
Lake/Ponds	14	14	14
Well	35	35	35
Hand pump	1070	1270	1175
Boar well	100	150	200
Water tank	4	4	4
pipelines	810	900	1000

Parner village get water from many different sources which is like Lake, Well, Hand pump, Boar well, Water tank and Pipeline. In Parner village Hand pump is main source of water and then Pipe line. Hand pump is the major water source of Parner. This pie chart shows the availability of water in Parner

**Water supply system according to population:-**

**Water connection**

According to 2001 data there was nearly about 300 water connection for serve 12312 population of the village. In 2011, there are 1000 water connections for serve 13119 population of the village.

Analysis according to Allocation of water:- According to 2001 population of Parner village was 12312 requires 9, 23,400 liters and in 2001 there are only 2 tanks which have, 50,000 liters capacity. According to allocation of water there were 3, 73,400 liters deficiency of water for registered population of study area.

Now, at present situation population registered in 2011 is 13119 and there are 4 tanks which have 9, 00,000 liter capacity. According allocation of water 9, 83,925 liters deficiency of water for registered population of study area.

If we consider growth of population at same rate the projected population in 2021 it will be nearly about 14,000 which require 10, 50,000 liters water in future.

**Result**

After this survey we get result as like this study area are comes under rain shadow region hence this region has drought prone region. The Parner village is drought prone region hence this

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

village are need of more water supply. The current water status of Parner village is 9, 00,000 liters as available water stock and according allocation of water 9,83,925 liters deficiency of water for registered population of study area. In last 10 year water availability was 5,50,000 liters and consumption of water of Parner village was 9,23,400 liters.

#### Conclusion

Parner is plateau and rain shadow region and hence it is drought prone region and the water sources are too short in Parner village hence it is drought prone region and the water sources are too short in Parner village hence the people need the use the water very carefully. Not only villagers also government responsible to the providing of water to local people of Parner. Parner Grampanchayat responsible to supply of water to Parner villager. Grampanchayat need to build more Water Tanks or make available more ways of sources of water in Parner village because Parner is developing region and use of water is growing rapidly for future Grampanchayat and people both are responsible to shortage of water.

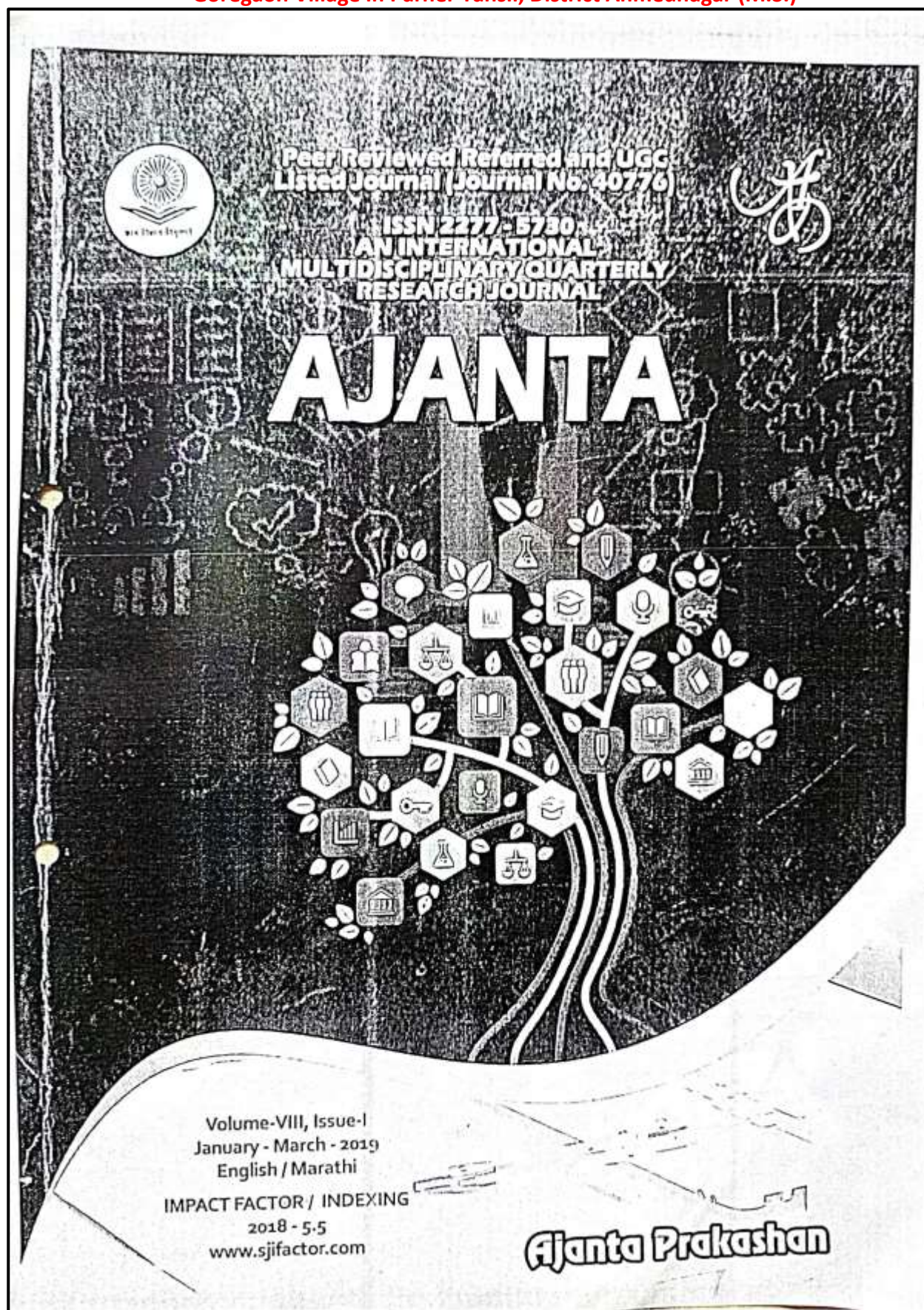
Water is essential for human being. This project attempt to analyses past, present and future water allocation to study area. The sources of water are scanty to fulfill its own requirement .so it needed out sourcing of water at present and future. Makes water harvesting techniques to fulfill the present and future need of water.

#### References

- 1) 1)Panchayat samiti Parner
- 2) Census book
- 3) Prof.A.V.Thokal, Prof.S.B.Pawar-2013, "Study of water Resource, A case Study of Supa Village (M.S)" Proceedings NRMSD ISBN : 978-81-926129-8-0 P.P-55-57
- 4) Sakal News paper 09/march 2013
- 5) Comprehensive Geography of India , D.R.Khullar, Rawat publication, New Dehli.



**46. Role of Micro Irrigation in Agricultural Development: A Case Study of Goregaon Village in Parner Tahsil, District Ahmednagar (M.S.)**



VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## CONTENTS OF ENGLISH

S. No.	Title & Author	Page No.
9	Social Development Pre and Post Watershed Development of Model Watershed Village Hivrebazar in Nagar Tahesil <b>Lagad Santosh Jabaji</b>	55-63
10	Global Warming and its Impact on Agriculture <b>Prof. Parag S. Meshram</b> <b>Dr. Vijay P. Gorde</b>	64-67
11	Geographical Analysis of Religious Population Growth: A Case Study of Ahmednagar District (MS) <b>Dr. Narke Sunil Yuvraj</b>	68-73
12	Identifying Male-Female Literacy Disparity Index: A Case Study of Ahmednagar District <b>Dr. Narke Sunil Yuvraj</b>	74-79
13	Socio - Economic and Environmtal Study of Talegaon Dhamdhare Village in Shirur Taluka of Pune District <b>Dr. Ravindra Sudam Bhagat</b>	80-86
14	Role of Micro Irrigation in Agriculture Development: A Case Study of Goregaon Village in Parner Tahsil, District Ahmednagar (M.S.) <b>Ashok Vitthal Thokal</b> <b>Dr. Ankush B. Aher</b>	87-92
15	Problems of Urbanization in Ahmednagar District with Special Reference to Ahmednagar City (M.S.) <b>Dr. Pandurang Y. Thombare</b> <b>Dr. Shivaraya C. Advitot</b>	93-100

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANFA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## 14. Role of Micro Irrigation in Agriculture Development: A Case Study of Goregaon Village in Parner Tahsil, District Ahmednagar (M.S.)

Ashok Vitthal Thokal

Assistant Professor & Research Student, New Arts, Commerce & Science College, Parner  
Dist. - A'nagar.

Dr. Ankush B. Aher

Research Guide, New Arts, Commerce & Science College, Parner  
Dist. - A'nagar.

### Abstract

Parner Tahsil is a drought prone Tahsil. It receives rainfall during monsoon. The nature of rainfall is uncertain and erratic. The water received from rainfall stored in Lake, Tank, and well. The stored water from these is used for various purpose but most of the water are used for agriculture. The rainfall is not available throughout year it receiver in short span of time so requirement of water for crops is fulfilled by irrigation. The mode of irrigation in the study area is tube well, well off and tanks, farm pond and the methods of irrigations open surface trines channel chari (Groove) method. These methods are traditional method of irrigations. Which are stage more and more water than the requirement of crop. The village Goregaon situated in drought prone Zone. So there is a scarcity of water and prolonging period of drought condition needs more water requirement to the crops. But the availability of stored water in tanks, well, tube well, farm pond is not sufficient to the all crops through traditional methods of irrigations. So there is a need of appropriate method of irrigation to fulfil requirement of the crops. Present paper attempt to analyse the role of drip irrigation in agricultural productivity and development through government scheme. Drip irrigation is the suitable method for the study area.

**Key Word:-** drought, micro irrigation, arable land, kharaba.

### Introduction

Irrigation is essentially the artificial application of water to overcome deficiencies in rainfall for growing crops (Cantor, 1967). Irrigation is a basic determinant of agriculture because its inadequacies are the most powerful constraints on the increase of agricultural production.

VOLUME - VIII. ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

Irrigation is defined as "Artificially supplying & systematically dividing of water for agriculture & horticulture in order to obtain higher or qualitatively better production" (After Eijkelkamp Agrisearch Equipment). Water is essential to plant growth & for millenniums. Successful farmers have used different methods to apply water to their crops. This artificial addition of water is called irrigation. Irrigation is essentially the artificial application of water to overcome deficiencies in rainfall for growing crops (Cantor, 1967). Irrigation is a basic determinant of agriculture because its inadequacies are the most powerful constraints on the increase of agricultural production. In traditional agriculture, irrigation was recognized for its protective role of insurance against the vagaries of rainfall & drought. But now, adoption of high yielding varieties, chemical fertilization.

**Importance of Irrigation:** In the next 35 to 45 years world food production will need to double to meet the demands of increased population. Ninety percent of this increased food production will have to come from existing lands & seventy percent of this increased food production will have to come from irrigated land. Without irrigation farming is very limited & if the rainfall decreases to less than 30cm, agriculture becomes impossible without irrigation (King, 1953). It increases crop yield. It protects from famine. It helps to cultivate superior crops with the water supply as per need of the crops.

Ultimately it helps in economic development. Irrigation water improves water conditions in the soil, increases the water content of plant fibers, dissolves nutrients & makes them available to plants. Irrigation affects temperature conditions by regulating the temperature of the surface layer of the soil & the ground layer of the air & also makes possible control of the growth & development of plants & improvement of the quality of the harvest. In fruit & berry crops that receive optimum quantities of moisture, the sugar content of the fruit increases & in oil crops the fat content in the seeds is greater. For rice & wheat) with supplementary nitrogen feeding), the protein content in the grain increases & for cotton the quality of the fibre is improved.

**Drip Irrigation.** ... The advantage of drip irrigation over sprinklers is that there is little water loss due to evaporation or runoff. It's particularly good for mulched areas because it can directly soak the soil without washing away the mulch.

Geographically Ahmednagar is largest district in the state of Maharashtra. Parner is one of tehsil of Ahmednagar district, and it also a drought prone Tahsil. It receives rainfall during monsoon. The nature of rainfall is uncertain and erratic. The water received from rainfall stored

ENGLISH / Peer Reviewed Referred and UGC Listed Journal No. : 40776

13

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

in Lake, Tank, and well. The stored water from these is used for various purpose but most of the water are used for agriculture. The rainfall is not available throughout year it receiver in short span of time so requirement of water for crops is fulfilled by irrigation. The mode of irrigation in the study area is tube well, well off and tanks, farm pond and the methods of irrigations open surface trines channel chari (Groove) method. These methods are traditional method of irrigations. Which are wastage more and more water than the requirement of crop. The village Goregaon situated in drought prone Zone. So there is a scarcity of water and prolonging period of drought condition needs more water requirement to the crops. But the availability of stored water in tanks, well, tube well, farm pond is not sufficient to the all crops through traditional methods of irrigations. So there is a need of appropriate method of irrigation to fulfil requirement of the crops. Drip irrigation is the suitable method for the study area.

#### Objective

To find out the role of micro irrigation in agricultural development through government scheme of Goregaon Village.

#### Data Base and Methodology

The present research paper based on primary and secondary source of data. Primary data have been collected through field surveys organized in study area

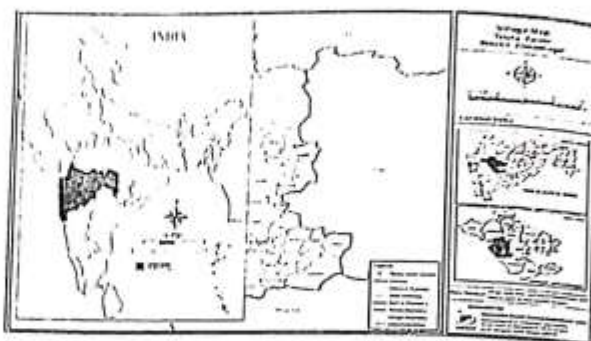
Secondary data have been collected from various agencies like agricultural data have collected from Government Agricultural Department office in Parner. The Toposheet of Survey of India, 1:50000 also used for the interpretation

#### Study Area

Parner town is located to the west of Ahmednagar city while the tahsil of the same name is located in the western part of Ahmednagar district between  $18^{\circ} 49'40''N$  to  $19^{\circ} 21'13''N$ . Latitude and  $74^{\circ} 10'22''E$  to  $74^{\circ}38'34''E$  Longitude. Goregaon village is located north direction of Parner town. Physically the Tahsil forms a part of Deccan Plateau in general and the Balaghat plateau in particular, to the east of the Sahyadris. It occupies the western part of the Balaghat plateau also known as Ahmednagar Plateau, alongwith a narrow strip to the west of plateau rim occupied by the Kukady river basin. It is the largest tahsil with a total area of 1930 sq. k.m. accounting for 11.32% of the district area and a population of 246535 forming 6.10% of the district with the lowest population density among 14 tahsil. Soils over the plateau in many parts of Parner tahsil are not very deep but suited for a number of rabbi crops.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

**Location Map of Village Goregaon**



**Result and Discussion**

Drip irrigation is a type of micro-irrigation that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. ... Drip irrigation systems distribute water through a network of valves, pipes, tubing, and emitters.

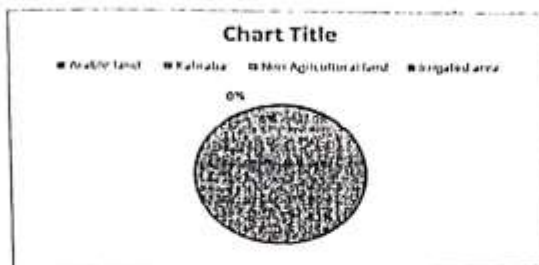
**1 Agricultural land use of Goregaon Village.( Area in Hectare) (Table No.1)**

Total area	Agricultural	Arable land	Kahraba (Land not cultivated)	Non Agricultural land(Barren)	Irrigated area
2141		1883	256	1.37	140.2

Above table shows that only 6% area is irrigated. So the overall agricultural productivity is not sufficient to the total arable land.Total arable area is 83 % i.e.1883 hectare which is a large potential of agricultural productivity but the scarcity of water does not allow the same. So there is need to use micro irrigation to increase the agricultural productivity and income of the farmers.

**2 General Irrigation (Area in Hectare) (Table No.2)**

Total Area	Agricultural	Arable Land	Irrigated	Micro Irrigated	Non irrigated	Barren land
2141		1883	140.2	60	1.37	256



Above diagram shows that micro irrigation is nearly about 50% to the total irrigated area. This shows that there is huge need of micro irrigation in this village. Due to water deficiency and low rainfall this area comes under draught prone zone. To requirement of water needs of the crops, available surface and ground water is not sufficient for open method of irrigation, so there is increasing use of micro irrigation for agricultural crops.

**3. Agricultural Production under Micro Irrigation**

(Drip irrigated) (Table No.3)

Sr.No	Name of crops	Area (Acare)	Production (Metric Ton)	Income (In RS)	Average /acare (Income in RS)
1	Aster	3	15	9 lakh	3 lakh
2	Marigold	6	37	11lakh	1.83 lakh
3	Crynthimum	10	55.7	55.7lakh	5.5 lakh
4	Pomegranate	6	56	33lakh	5.5lakh
5	Cucumber	1	8	1.6lakh	1.6 lakh
6	Karle(Biter Ground)	1	8	2.4lakh	2.4 lakh
7	Tomato	1	10	1 lakh	1 lakh
8	Custard Apple	1	10	5.5 lakh	5.5 lakh

Above table shows the production & income of various crops under micro irrigation.

**4. Agricultural production under Non-Micro irrigation (Table No.4)**

Sr. No.	Name of Crops	Area (In Acare)	Production(in Ton)	Income (In RS)	Average /acare (Income in RS)
1	Bajara	12	9.6	1.44lakh	0.12 lakh
2	Joawar	22	17.6	3.87 lakh	0.17 lakh
3	Wheat	17	17	2.89 lakh	0.17 lakh
4	Onion	18	230	69 lakh	3.83 lakh
5	Gram	5	2.5	1.0lakh	0.2 lakh
6	Green Peace	12	7	2.80 lakh	0.23 lakh

Above table shows the production & income of various crops under micro irrigation.

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
 AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

### Comparison between Micro Irrigated and Non-Micro Irrigated Income as Follows

If we consider the average income of farmer per acre in rupees then above table no.3 & 4 shows the average income. Average income per acre of drip irrigated is more than non-irrigated area, i.e. its more than 1 lakh rupees. Though the expenditure for micro irrigation per acre is low than non-irrigated area but the comparatively income per acre is more i.e. double income per acre

### Conclusion

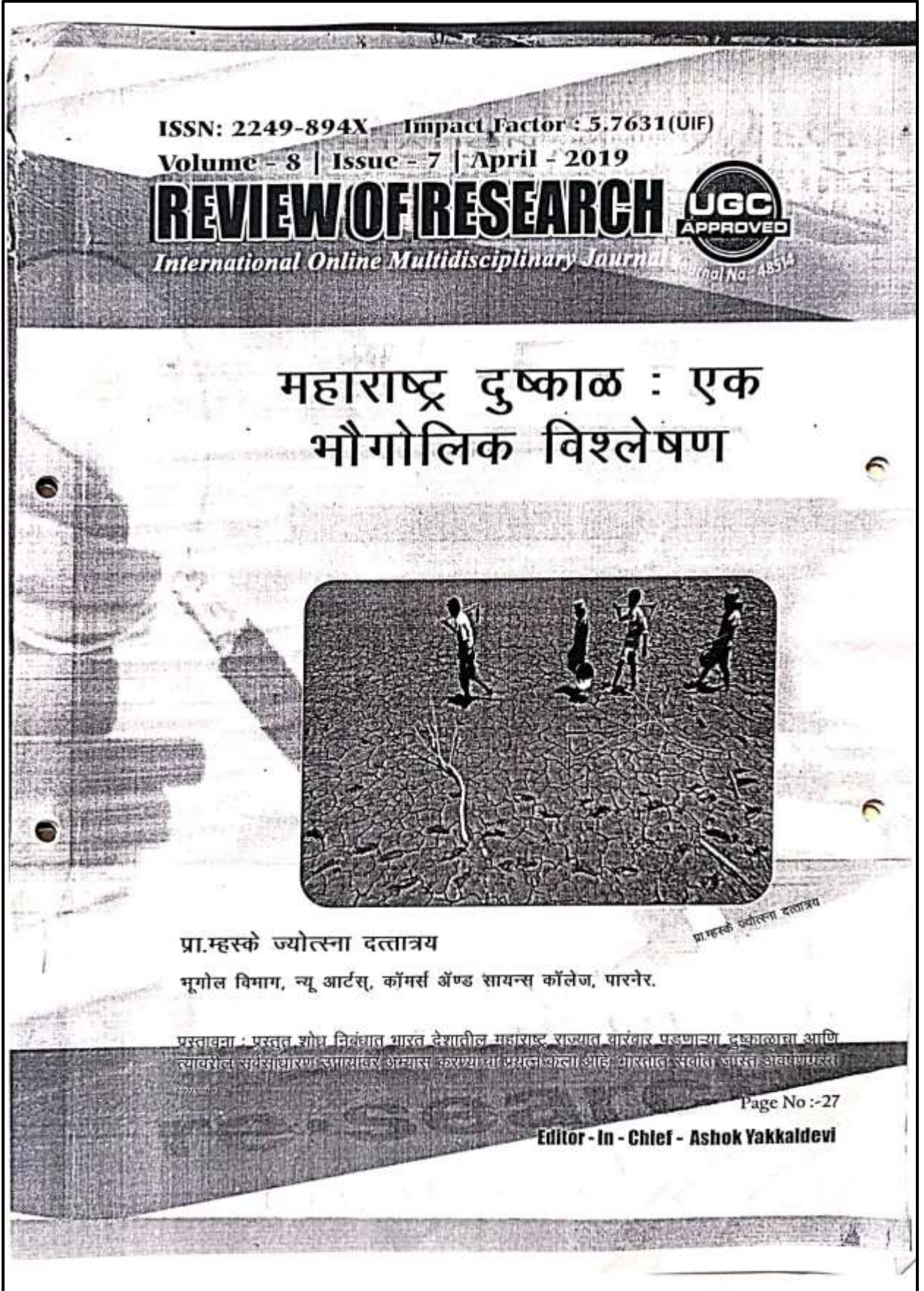
Parner Tahsil is a drought prone Tahsil. It receives rainfall during monsoon. The nature of rainfall is uncertain and erratic. The water received from rainfall stored in Lake, Tank, and well. The stored water from these is used for various purpose but most of the water are for agriculture. The rainfall is not available throughout year it receiver in short span of time so requirement of water for crops is fulfilled by irrigation. The mode of irrigation in the study area is tube well, well off and tanks, farm pond and the methods of irrigations open surface trines channel chari (Groove) method. These methods are traditional method of irrigations. Which are wastage more and more water than the requirement of crop. The village Goregaon situated in drought prone Zone. So there is a scarcity of water and prolonging period of drought condition needs more water requirement to the crops. But the availability of stored water in tanks, well, tube well, farm pond is not sufficient to the all crops through traditional methods of irrigations. So there is a need of appropriate method of irrigation to fulfil requirement of the crops. Drip irrigation is the suitable method for the study area. Result of drip irrigation is very suitable for this study area. It shows very high returns from agriculture. Use of micro irrigation save 30 to 37 % water and provide accurate water to the crops which avoid misuse of water.

### References

1. Panchayat samiti office Parner Tahsil.
2. Taluka krushi vibhag, Parner.
3. www.agricensusnic.in
4. Panlot Kshetra Vikas Margadarshika (Govt. of Maharashtra) Edition - 2003, PP - 246
5. Wikipedia map.
6. Socio economic abstract, Ahmednagar district.
7. Garampanchayat of Goregaon Village.



## 47. महाराष्ट्र दुष्काळ एक भौगोलिक विश्लेषण



E - 7 | APRIL - 2019


**REVIEW OF RESEARCH**

IMPACT FACTOR : 5.7631 (UIF) UGC APPROVED JOURNAL NO. A6514 ISSN: 2249-894X

VOLUME - 8 | ISSUE - 7 | APRIL - 2019

**महाराष्ट्र दुष्काळ : एक भौगोलिक विश्लेषण**

प्रा.म्हस्के ज्योत्स्ना दत्तात्रय  
भूगोल विभाग,  
न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर.



**सारांश :**

प्रस्तुत शोध निबंधात भारत देशातील महाराष्ट्र राज्यात वारंवार पडणाऱ्या दुष्काळाचा आणि त्यावरील सर्वसाधारण उपायांवर अभ्यास करण्याचा प्रयत्न केला आहे. भारतात सर्वात जास्त अवर्षणग्रस्त प्रदेश राजस्थान असून त्याखालोखाल कर्नाटक, आंध्रप्रदेश, महाराष्ट्र आणि गुजरात यांचा क्रमांक लागतो. भारतात एकुण क्षेत्रफळाच्या 33% क्षेत्र अवर्षणग्रस्त असून देशातील 100 जिल्हांच्या त्यात समावेश होतो. महाराष्ट्रातील 9 जिल्हे व 100 तालुक्यांचा अवर्षणात समावेश केला होता. परंतु सन 2018 मध्ये महाराष्ट्रातील 26 जिल्हे आणि 151 दिवसेंदिवस अवर्षण समस्या गंभीर होत आहे. याकडे वेळीच लक्ष देऊन उपायांची अंमल बजावणी केली गेली तरच याची शुष्क प्रदेशात रुपांतरीत व्हायला वेळ लागणार नाही. दिवसेंदिवस वाढणारी लोकसंख्या, नागरिकीकरण, शेतीक्षेत्र, उद्योगधंदे यामुळे पाण्याची गरज वाढत आहे. पाणी हे अत्यावश्यक साधनसंपत्ती असून त्याचे संवर्धन करणे गरजेचे आहे. 4 महिन्यात पडणारे पाऊसाचे पाणी त्यातील 20% पाणीच मानव वापरू शकतो. बाकीचे पाणी वाहून जाते. म्हणून पाण्याचा वापर जपून केला पाहिजे. कमी होणारा जलसाठा याचा भौगोलिक अभ्यास करून त्याचे परिणाम व उपाय सांगण्याचे प्रयत्न केले आहे.

**प्रस्तावना :**

वातावरणातील बदलामुळे तापमान वाढ व पर्जन्यमानात एकदम घट होऊन दुष्काळ पडतात. पाऊस नसेल तर अन्न व पाण्याची गंभीर समस्या निर्माण होते. अशा स्थितीला 'अवर्षण' असे म्हणतात. 1951 ते 2000 या वर्षात महाराष्ट्रात 15 दुष्काळ येऊन गेले दुष्काळाची स्थिती ही किती दिवस पाऊस पडला यापेक्षा तो किती पावसाळी दिवस पडला यावरही अवलंबून असतो. किती प्रमाणात पाऊस पडतो त्याचा दुष्काळाशी संबंध नाही पण त्या त्या प्रदेशातील नेहमीच्या पावसापेक्षा फारच कमी पाऊस झाला तर जी स्थिती निर्माण होते ती अवर्षण स्थिती असते. इस्त्राईल सारख्या देशात सलग 4 वर्ष पाऊस पडला नाही तर दुष्काळ घोषित केला जातो.

महाराष्ट्र गेल्या 5 वर्षांपासून दुष्काळाचा सामना करत आहे. अनियमित पडणारा पर्जन्य तसेच उन्हाळा व थंडी या ऋतूत झालेले बदल म्हणजे महाराष्ट्रात होत असलेले वातावरणीय बदल होय. महाराष्ट्रात 80% खडक हा बेसाल्ट असून पाणी मुरण्याची मर्यादा निर्माण होते. पडलेल्या पावसाचे 8% पाणी मुरुमामध्ये मुरते व 10% पाणी खालच्या स्तरात मुरते जसजशी लोकसंख्या वाढत गेली तसतसे पाणी उपसा प्रमाण वाढत गेले. जमिनीवरील पाण्याच्या वापराबरोबर भूजलाचाही वापर वाढला आणि जमिनी कोरड्या पडू लागल्या. महाराष्ट्रातील मराठवाडा आणि विदर्भातच दुष्काळ पडत असे. परंतु या वर्षी दुष्काळाचा सर्वाधिक फटका पश्चिम महाराष्ट्राला बसला आहे. यासाठी नैसर्गिक कारणे फक्त कारणेभूत नसून मानवनिर्मित कारणेही कारणीभूत ठरत आहेत. आता गरज आहे ती जलपुर्नभरणाची आणि सोबतच पाण्याच्या वापराचे व्यवस्थापन करण्याची.

Journal for all Subjects : [www.lbp.world](http://www.lbp.world)

27

**अभ्यास क्षेत्र :**

सद्य संशोधनासाठी भारत देशातील महाराष्ट्र हे राज्य अभ्यासक्षेत्र म्हणून निवडले आहे. या राज्याचा क्षेत्रीय विस्तार - 16° 41' उत्तर ते 22° 6' उत्तर अक्षांश आणि 72° 36' पूर्व ते 80° 24' पूर्व रेखांश असतो आहे.

भारतीय द्विकल्पाचा एक भाग दख्खन पठार, महाराष्ट्र पठार म्हणून ओळखला जातो. याचा आकार त्रिकोणावृत्ती असून दक्षिणेकडे विचोळ होत गेला आहे. महाराष्ट्राची पश्चिम-पूर्व लांबी सुमारे 800 कि.मी. असून दक्षिणेकडून रुंदी 720 कि.मी. आहे. महाराष्ट्राचे क्षेत्रफळ 3,08,346 चौ.कि.मी. आहे. पश्चिमेकडून अरबी समुद्र, उत्तरेकडून गुजरात, मध्यप्रदेश पूर्वेकडून, दक्षिणेकडून गोवा, कर्नाटक ही राज्ये आडकडकतात. महाराष्ट्राचा भाग सह्याद्रीच्या रांगा व उपशाखा यांनी बनलेला आहे.

**उद्दिष्ट्ये :**

1. महाराष्ट्रातील दुष्काळ नैसर्गिक आणि मानवनिर्मित ही याचा अभ्यास करणे.
2. महाराष्ट्रातील दुष्काळी जिल्हांचा आढावा घेणे.
3. दुष्काळ निवारणाच्या, नियोजनासाठी उपाय सुचविणे.

**संशोधन पध्दती व माहितीचे संकलन :**

प्रस्तुत शोधनिबंधाच्या अभ्यासाकरीता मिळविलेली माहिती ही मुख्यतः स्त्रोतावर आधारित आहे. यासाठी शासकीय अहवाल, क्रमिक पुस्तके, मासिके, वृत्तपत्रे, गुगल व इतर संदर्भ ग्रंथांचा आधार घेतलेला आहे. यरील स्त्रोतांच्या आधारे माहितीचे संकलन करून विश्लेषण केले आहे.

**विषय विवेचन :**

महाराष्ट्र राज्यात 61935 चौ.कि.मी. प्रदेश वनाखाली आहे. महाराष्ट्रात वनाखालील प्रदेशाचे एकूण भूक्षेत्राची प्रमाण 20% आहे. सर्वाधिक जंगल क्षेत्र नागपूर विभागात तर सर्वात कमी जंगल क्षेत्र मराठवाडा येथे आहे. गडचिरोली सर्वाधिक जंगल असणारी जिल्हा आहे.

दख्खनच्या पठाराचा पश्चिमेकडील न खचलेला भाग म्हणजे सह्याद्री होय. यामुळे सह्याद्री पश्चिमेकडून अत्यंत उंच व सरळ भिंतीसारखा दिसतो. सह्याद्रीच्या रांगांमध्ये प्रतिरोध स्वरूपाचा पर्जन्य पडतो आणि सह्याद्रीच्या पूर्व भागात पर्जन्य छायेचा प्रदेश निर्माण होतो. या प्रदेशात कमी पर्जन्य पडते.

या वर्षी महाराष्ट्रात दुष्काळी जिल्हे व तालुके यांची संख्या वाढलेली दिसून येते.

जिल्हा	गन्भीर दुष्काळी तालुका	मध्यम दुष्काळ	एकूण तालुके
26	112	39	151

शासकीय अहवालानुसार 10 जिल्हातील सर्वात जास्त तालुके गन्भीर दुष्काळी परिस्थितीत आहेत. ते पुढीलप्रमाणे पुणे - 7 तालुके, जळगाव - 13, अ.नगर - 11, औरंगाबाद - 9, बीड - 11, जालना - 7, उस्मानाबाद - 7, बुलढाणा - 8, यवतगाळ - 9 इ. दरवर्षी दुष्काळी तालुक्यांची संख्या वाढत असलेली दिसून येते.

**अवर्षणाची / दुष्काळाची कारणे :**

1. नैसर्गिक कारणे -
1. महाराष्ट्रातील भौसमी पर्जन्य अनियमित स्वरूपाचे आहे.
2. जेट प्रवाहाच्या निर्मितीचा परिणाम पर्जन्यावर होतो.
3. एल-निनोची निर्मिती झाल्यावर भारत महाराष्ट्र येथे पर्जन्य कमी पडते.
4. जलचक्रात बिघाड झाल्यामुळे पर्जन्य कमी होतो.
5. जागतिक तापमान वाढीमुळे पर्जन्य क्षेत्रात बदल होत आहे.

**2. मानवनिर्मात कारणे -**

- 1 सागरी भागात अण्वस्त्रांच्या चाघण्या घेतल्यामुळे पावसाचे प्रमाण कमी होते.
  - 2 सदोष सिंचन पध्दतीमुळे नदी, तळी, धरणे भूजल साठे कमी होत आहे.
  - 3 पर्जन्य छायेच्या प्रदेशातही मोठ्या प्रमाणात ऊसाची लागवड होते.
  - 4 महाराष्ट्रातील महानगरांमध्ये पाणी गळतीचे प्रमाण 46% एवढे आहे.
  - 5 वाढते नागरीकीकरण यामुळे पाण्याचा वापर वाढत आहे.
  - 6 शेतीसाठी व वसाहतीसाठी मोठ्या प्रमाणात बोअरवेल खणले जातात त्यामुळे भूजलसाठा कमी होत आहे.
  - 7 मृदेची धूप मोठ्या प्रमाणात झाल्याने पावसाचे पाणी मृदेत न झिरपता वाहून जाते.
  - 8 दरवर्षी धरणातील गाळाचे प्रमाण वाढत असल्याने धरणाची साठवण क्षमता कमी होते.
  - 9 महाराष्ट्रात औद्योगिक पट्टा झपाट्याने विकसित झाल्याने पाण्याचा वापर वाढला.
  - 10 अनेक मानवी गरजा पूर्ण करण्यासाठी मोठ्या प्रमाणात वृक्षतोड केली जात आहे.
  - 11 प्रदुषणामध्ये दिवसेंदिवस वाढ होत असल्याने भूपृष्ठाचे व वातावरणाचे तापमान वाढत आहे.
  - 12 उघड्या/शुष्क डोंगरांमध्ये पाणी झिरपण्याची क्रिया होत नाही.
- अशा अनेक कारणांमुळे महाराष्ट्रातील दुष्काळात वाढ होत असल्याचे दिसून येते.

**अवर्षणाचे परिणाम :****1. पर्यावरणीय परिणाम -**

जलाशय कोरडे पडून शुष्कता निर्माण होते. भूजल पातळी खाली जाणे, मृदा धूप होणे. जलचय संतुलन बिघडो इ.

**2. वनस्पतीवरील परिणाम -**

पाण्याअभावी वनस्पती करपणे, परिसंस्थाचा न्हास, कुरणे नष्ट होतात, वनस्पतीच्या अनेक प्रजाती नष्ट होऊन वनस्पती विविधता नष्ट होते. काटेरी झुडपे वाढू लागतात.

**3. प्राणी जीवनावरील परिणाम -**

पाणवठे नष्ट होणे, प्राण्यांचे स्थलांतर, पाळीव प्राणी विकून टाकले जातात.

**4. शेतीवरील परिणाम -**

अवर्षणामुळे अन्न, धान्य, चारा टंचाई निर्माण होते. कोरडवाहू जमिनीत वाढ होते. शेती व्यवसाय हंगामी स्वरूपाचा होतो.

**5. लोकसंख्येवरील परिणाम -**

तीव्र पाणी टंचाई, कुपोषण, हजारो लोक मृत्युमुखी पडणे, बेकारी, स्थलांतरात वाढ होते. अन्न पाण्याचा अभाव उपजिवीकेचे साधन नष्ट झाल्याने गावे ओस पडणे.

**6. अर्थव्यवस्थेवरील परिणाम -**

राज्याच्या उत्पादनारत घट, पिकांचा दर्जा व उत्पादनात घट, महागाईत वाढ, पिकांवर रोगराई, पर्यटन व्यवसायाचा न्हास जलऊर्जेत घट, आयाती मधे वाढ होते.

**7. सामाजिक परिणाम -**

पाण्यामुळे झगडे निर्माण होतात, लोकांमध्ये असंतोष निर्माण होतो. दारिद्र्यात वाढ, गुन्हेगारीत वाढ होते.

**उपाय योजना व व्यवस्थापन :****1. गावपाळीपासून ते राज्यपातळीपर्यंत नियोजनाची गरज 'काळी पत्रिका' यात सात उपाय सुचविले गेले.**

- 1 वाया जाणारे पाणी वाचविणे.
- 2 स्थानिक लोकप्रतिनीधी, कायकर्ते, अभ्यासक, शेतकरी, उद्योजक यांचा नियोजनात सहभाग घेणे.
- 3 जलसंपदा, जलसंधारण विभाग यांनी किती उद्दीष्टे साध्य केली.
- 4 नदी, धरणे यातील गाळ काढणे हे काम भ्रष्टाचारापूरते मर्यादित नको.
- 5 पाण्याचेसमान वाटप गरजेचे आहे.

6. पशुधनासाठी रोजगार हमीतून सामाजिक वनीकरण निर्माण करणे.
7. दुग्धालात तग धरणाऱी एकमेव वनस्पती ती म्हणजे वेडीबागूळ (प्रोरोपीरा ज्युलिफ्लोरा) यांची लागवड करणे.
2. 'पाणी अडवा, पाणी जिरवा' याचे महत्त्व रावांनी ओळखले पाहिजे.
3. पाणलोट क्षेत्रांचे व्यवस्थापन पध्दतीचा वापर करणे -

1. सलग समतल घर, 2. मॅग्नेयन बंधारा, 3. नालाबंदीग, 4. जैवबांध, 5. के.टी.वियर, 6. वनराई बंधारा, 7. पाझर तलाव, 8. शेततळे, 9. घरणे, 10. बराजेरा इ.

#### 4. इतर -

1. पाण्याचा वापर काटकरीने करणे ही काळाची गरज.
2. अवर्षणग्रस्त प्रदेशात भूमी उपाययोजनात गरजेनुसार बदल करणे.
3. जंगलतोड रोखून वनीकरणाचे कार्यक्रम गावपातळीवर राबविणे.
4. आधुनिक सिंचन पध्दतीचा वापर करणे.
5. सुधारीत गवताच्या जातीची पैदास करणे - डोंगर, भाग, उत्तार, ओसाड क्षेत्र इ. ठिकाणी.
6. अवर्षण प्रवण क्षेत्रात मिश्र शेतीचे प्रयोग यशस्वीपणे राबविणे इ.

#### 5. जलवळण योजना राबविणे -

सह्याद्रीच्या पश्चिमेकडे वाहणाऱ्या नद्या, उपनद्यांना पूर्वेकडे वळविणे गरजेचे आहे. नदी जोड प्रकल्प राबविणे इ.

6. भूजल सर्वेक्षण करून शासनाने व्यवस्थापनासाठी तरुणाईचा सहभाग करून घेणे आवश्यक आहे. यामध्ये कोणत्याही प्रकारचा भ्रष्टाचार होणार नाही याची काळजी घेणे.

#### 7. पाणी फाऊंडेशनचे काम -

आमीर खान व किरण राव यांनी पाणी फाऊंडेशनची स्थापना करून महाराष्ट्रातील दुष्काळी परिस्थिती बदलण्यासाठी 3 वर्षांपासून प्रयत्न केले आहेत. लोकांशी संवाद साधून लोकजागर सुरू केला. महाराष्ट्रात एकुण 355 तालुके आहेत. यामध्ये एकुण 43,665 गावे आहेत. पहिल्या वर्षी 3 तालुके, दुसऱ्या वर्षी 30 तालुके, तिसऱ्या वर्षी 75 तालुके आणि या वर्षी 76 तालुक्यांमधील एकुण 4000 गावांमध्ये पाण्यासाठी ही संस्था काम करत आहे. लोकांनी स्वतःच्या फायद्यासाठी यामध्ये सहभागी होणे गरजेचे आहे.

#### निष्कर्ष :

महाराष्ट्र राज्यातील बराचसा प्रदेश डोंगराळ, पर्जन्य छायेचा, खंडान्तर्गत भाग असल्याने पावसाचे प्रमाण कमी आहे. सततच्या दुष्काळामुळे महाराष्ट्रातील दुष्काळी तालुक्यांची संख्या 151 पर्यंत वाढली आहे. लोकांच्या राहणीमानाचा दर्जा विकसीत होत असताना औद्योगिकरण, शहरीकरण व शेतीसाठी मोठ्या प्रमाणात पाण्याची गरज वाढत आहे. पाणी जमिनीत मुरण्याचे प्रमाण व उपसा यांचे प्रमाण व्यस्त झाले आहे. अभ्यासकांच्या मते ही परिस्थिती अशीच राहिली तर यापेक्षाही गंभीर समस्या महाराष्ट्रात निर्माण होतील व वेगवेगळ्या पर्यावरणीय आपत्तींना सामोरे जावे लागेल. यासाठी जल व्यवस्थापन करणे गरजेचे आहे. राळेगण सिध्दी, हिवरे बाजार या गावांप्रमाणे इतर गावातील तरुणांनी एकत्र येऊन काम करणे गरजेचे आहे. पाणी फाऊंडेशन सारख्या संस्थांचा वापर स्वतःच्या हितासाठी करून घेणे उचित राहिल. आपल्या गावातील भौगोलिक स्थितीचा वापर करून पावसाचे पटणारे पाणी गावातच अडवून जिरवीणे गरजेचे आहे.



## 48. Environmental Degradation: Causes &amp; Consequence

VOLUME - VIII, ISSUE - I - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

## CONTENTS OF ENGLISH

S. No.	Title & Author	Page No.
1	Environmental Degradation: Causes and Consequences Prof. Aher Sanjay Sukhdev	1-4
2	The Application of GIS & its Components and Tourism Dr. Sunil P. Cholke Prof. Santosh M. Shinde	5-16
3	Availability of Water Resource and Economic Development of Local People in Dhora River Basin Prof. P. N. Dhage Dr. D. G. Mane	17-19
4	Environment: A Matter of Global Concern Prof. Dr. Narsale D. V.	20-22
5	Geochemistry of Groundwater of Terekhol River Basin, Sindhudurg District, Maharashtra S. P. Gaikwad S. K. Gaikwad D. C. Meshram R. D. Madale	23-32
6	Study of Sea Water Intrusion along the Querim Beach, Goa using Vertical Electrical Sounding (VES) S. K. Gaikwad S. P. Gaikwad D. C. Meshram R. D. Madale	33-42
7	Spatio-Temporal Analysis of Farm Pond in Ahmednagar District Dattatray Sheshrao Ghungarde Dr. Jyotiram C. More	43-49
8	Socio-Economic Status of Tribal Women in Ahmednagar District (Maharashtra) Dr. Shivaram M. Korade Dr. Vasudev Shivaji Salunke	50-54

1

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

# 1. Environmental Degradation: Causes and Consequences

**Prof. Aher Sanjay Sukhdev**

New Arts, Commerce and Science Collage, Parner, Dist - Ahmednagar (MS) India.

## Abstract

The subject of environmental economics is at the forefront of the green debate: the environment can no longer be viewed as an entity separate from the economy. Environmental degradation is of many types and has many consequences. To address this challenge a number of studies have been conducted in both developing and developed countries applying different methods to capture health benefits from improved environmental quality. Minimizing exposure to environmental risk factors by enhancing air quality and access to improved sources of drinking and bathing water, sanitation and clean energy is found to be associated with significant health benefits and can contribute significantly, enhanced water quality and climate change mitigation.

**Keywords:** Environment degradation; consequences; pollution and climate.

## Introduction

The environment affects our health in a variety of ways. The interaction between human health and the environment has been extensively studied and environmental risks have been proven to significantly impact human health, either directly by exposing people to harmful agents, or indirectly, by disrupting life-sustaining ecosystems. Environmental degradation is the deterioration of the environment through depletion of natural resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. Environmental degradation may be defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Environmental degradation is one of the Ten Threats officially cautioned by the High Level Threat Panel of the United Nations. Environmental changes and as such face decreasing internal stability, their health care systems in crisis. The report also estimates that 24% of the global disease burden (healthy life years lost) and 23% of all deaths (premature mortality) are attributable to environmental factors, with the environmental burden of diseases being 15 times higher in developing countries than in developed countries, due to differences in

ENGLISH / Peer Reviewed Referred and UGC Listed Journal No. : 40776

1



exposure to environmental risks and access to health care. The major cause of the environmental pollution is modern urbanization, industrialization, over-population growth, deforestation etc.

Def

**Air Pollution**

50%

Air pollution is unfortunately the common causes of environmental degradation. Pollution introduces contaminants into the environment that even kill plant and animal species. Industry and automobiles are the primary and secondary contributors to air pollution worldwide (Kay, 1999). Air pollution is a major environmental risk to health and is estimated to sauce approximately two million premature deaths worldwide per year [24]. A reduction of air pollution is expected to reduce the global burden of disease from respiratory infections, heart disease, and lung cancer. As air quality is a major concern for both developed and developing countries, a large number of empirical studies attempting to monetize the benefits to health generated by improved air quality

thru  
 thu  
 gro

sou  
 Str  
 riv  
 Ind

**Water Pollution**

Microbe contamination of groundwater due to sewage outfalls and high concentration of nutrients in marine and coastal waters due to agricultural runoff are among the most serious threats. Contact with unsafe drinking or bathing water can impose serious risks (both acute and delayed) to human health. While tap water is subject to treatment and is required to meet detailed testing and purity standards, it is not always disinfected of diarrhoea inducing microorganisms, as illustrated by waterborne disease outbreaks such as that caused by Cryptosporidium in Milwaukie in 1993, which affected over 400,000people.

of  
 ind  
 of  
 hu  
 IPC  
 1.8

**Toxic Pollutants**

19%

Every year 25 billion pounds of toxic pollutants are added to the environment by factories and mines additionally, 2.2 billion pounds per year of pesticides (eight pounds per citizen) are sprayed on our crops (Natural Resources Defence Council Staff, 1995). Annual world production of synthetic organic chemicals has grown exponentially since the early 20 century. The vast majority of artificial chemicals have never been screened for toxicity. Chemical manufacturers are not required to prove safety; instead the legal burden is on the government to prove that a product is dangerous, and tastings only done after a substance has been impugned. live within 4 miles of one of the 1193 Superfund sites (Pope, 1994). These sites, as well as waste dumps and incinerators, are more common in lower socioeconomic status neighbourhoods, such as the Cancer

exj  
 in :  
 riv  
 fre  
 Dr  
 coi  
 inc  
 Eu  
 lik

VOLUME - VIII, ISSUE - 1 - JANUARY - MARCH - 2019  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 5.5 (www.sjifactor.com)

### **Deforestation**

Tropical forest constitutes seven percent of world land surface area, yet contains over 50% of all plant and animal species. Half of all tropical forests have been destroyed; by 2010, three quarters may be lost. Additionally, 20–50% of global wetlands have been destroyed (54% thus far in the US, with an additional 115,000 acres/year), (Sierra Club Staff, 2000). Loss of old growth forest has recently particularly affected the Pacific Northwest and British Columbia.

### **Solid Waste Pollution**

Trash and garbage is a common sight in urban and rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash. Public places and sidewalks are despoiled with filth and litter, rivers and canals act as garbage dumps. In part, India's garbage crisis is from rising consumption. India's waste problem also points to a stunning failure of governance.

### **Global Warming**

The foremost evidence for worldwide climate change has been global warming." It is one of the important factors contributing to environmental degradation and disasters. Evidence indicates that the Earth's climate system is warming in a way that has no precedent in the history of human civilization. The continuing temperature acceleration might break the balance of a human ecosystem that has been long established at a lower temperature." The latest report of the IPCC estimates a rise in the global average surface temperature from 1990 to 2100 of between 1.8° C and 4° C, although it could possibly be as high as 6.4° C. The sea level has risen between 1993 and 2003 at a rate of 3.1 millimetres per year due to melting polar ice caps and seawater expansion (due to warmer climate); rainfall patterns have been changing with increased droughts in some areas and heavier rain in others; glaciers and snow melting have been increasing water in rivers at certain times; winds are increasing in power and cyclones are shown to be increasing in frequency; and ocean temperatures have been rising.

### **Drought, Desertification, and Water Scarcity**

Drought and water scarcity is the third main climate change impact that may significantly contribute to climate-related migration. Droughts, desertification, and water scarcity are likely to increase because of global warming. These phenomena are projected to affect about one-third of European Researcher, 2014, Vol.(81), № 8-2 1496 the world's current population. Droughts are likely to displace millions of people all over the world, affecting food insecurity and human

livelihoods. Sea level rise will extend areas of salinization of groundwater and estuaries, resulting in a decrease in freshwater availability for humans and ecosystems in coastal areas. Moreover, changing precipitation patterns create pressures on the availability of clean water supplies.

**Overview of Results**

To summarize, the following factors were found to be prominent in the environmental degradation. In a majority of the studies discussed above, we found that activities by the rich and powerful were the primary contributing factors forcing groups living at the margins into environment degradation. Environmental degradation poses a significant threat to human health worldwide. Harmful consequences of this degradation to human health are already being felt and could grow significantly worse over the next 50 years. Because environment and health are so intimately linked, so too should be environmental and health policies. It is an area of research which has had little empirical work done to date and offers the potential for substantial work in the future.

**References**

- "Drowning in a Sea of Garbage". The New York Times. 22 April 2010.
- "Environment Assessment, Country Data: India the World Bank. 2011.
- "Evaluation of Operation and Maintenance of Sewage Treatment Plants In the India-2007".
- Central Pollution Control Board, Ministry of E. "Global Forest Resources Assessment 2010 FAO. 2011.
- "India: Country Strategy paper, 2007-2013".
- European External Action Service, European Union. 2007.
- "ISDR: Terminology". The International Strategy for Disaster Reduction. 2004-03-31. Retrieved 2010-06-09.
- "The Edicts of King Asoka (also, see other translations)". Buddhist Publication Society.

Ab:  
 dev  
 for  
 pov  
 the  
 app  
 wit  
 assi  
 are  
 inv  
 Thi  
 dat  
 To  
 cor  
 Int  
 wit  
 Te  
 em  
 EN

## 49. Bharati Rashtravad


INTERNATIONAL RESEARCH FELLOWS ASSOCIATION

Impact Factor – 6.261 ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S  
**RESEARCH JOURNEY**  
 International E-Research Journal

**PEER REFREED & INDEXED JOURNAL**  
 February-2019    Special Issue – 165 (B)

<p><b>Chief Editor -</b>  <b>Dr. Dhanraj T. Dhangar,</b>          Assist. Prof. (Marathi)          MGV'S Arts &amp; Commerce College,          Yeola, Dist – Nashik [M.S.] INDIA</p>	<p><b>Executive Editors :</b>  <b>Prof. Tejesh Beldar,</b> Nashikroad (English)  <b>Dr. Gajanan Wankhede,</b> Kinwat (Hindi)  <b>Mrs. Bharati Sonawane-Nile,</b> Bhusawal (Marathi)  <b>Dr. Rajay Pawar,</b> Goa (Konkani)</p>
--	--



This Journal is indexed in :

- **University Grants Commission (UGC)**
- **Scientific Journal Impact Factor (SJIF)**
- **Cosmoc Impact Factor (CIF)**
- **Global Impact Factor (GIF)**
- **International Impact Factor Services (IIFS)**

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net) **SWATIDHAN PUBLICATIONS**



'RESEARCH JOURNEY' International E- Research Journal  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 165 (B)- Multidisciplinary Issue  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

## INDEX

No.	Title of the Paper	Author's Name	Page No.
1	निराला और मुक्तिबोध का हिंदी काव्य पर प्रभाव	डॉ. शोभा डाणकीकर	07
2	सामाजिक संघर्ष का दस्तावेज : पाँच तले की दूब	डॉ. एस. एल. यशवंतकर	11
3	सियारामशरण गुप्त के काव्य में पौराणिक व मिथकीय संदर्भ	कंचन शर्मा	14
4	परशुराम शुक्ल की बाल कविताओं में नैतिक मूल्य	संजय कुमार	20
5	'सपनों की होम डिलिवरी' का आधुनिक संदर्भ	डॉ. परविंदर कौर महाजन	24
6	शाश्वत सत्य के उद्घोषक	डॉ. शैलेन्द्र पाल सिंह	28
7	'मैं अपराधी हूँ मैं परित्यक्ता नारी	डॉ. संजय ढोंडे	40
8	अयोध्या सिंह उपाध्याय 'हरिऔध की सीता'	डॉ. सुकेश कुमार	43
9	शैलेश मटियानी के उपन्यासों में मुंबई महानगरीय समस्याएँ	डॉ. रमेश कुरे	48
10	साहित्य और सिनेमा का अंतःसंबंध	डॉ. सुचिता गायकवाड	53
11	'आग-पानी-आकाश' उपन्यास में दलित चेतना	डॉ. सुधीर वाघ	58
12	महिला उपन्यासकारों की राचानाओं में अभिव्यक्त राजनीतिक चेतना	डॉ. राजेश भामरे	61
13	केदारनाथ सिंह की काव्य चेतना	डॉ. अनंत केदारे	64
14	अन्न सुरक्षा कायदा : एक ऐतिहासिक परामर्श	प्रा. ओंकार केने	70
15	नरेश मेहता के मुक्तक काव्य में प्रकृति चित्रण	प्रा. शांताराम डफळ	76
16	'तत्वमसि' : महानगरीय स्त्री - की कथा	डॉ. सन्मुख मुच्छटे	82
17	संजीव के उपन्यासों में चित्रित निम्नवर्गीय शोषण	प्रा. मच्छिंद्र कुंभार	85
18	प्राथमिक विद्यालयों में सी.सी.ई. के तहत व्यक्तिगत एवं सामाजिक गुण सम्बन्धी गतिविधियों का अध्ययन	अशोक कुमार नेगी एवं डॉ. ज्योत्सना खरे	90
19	मणिकर्णिका : एक संघर्ष की गाथा	डॉ. सुलभा शेंडवे	97
20	भारतातील शेती उत्पादकता : मध्यस्थिती, ममस्या व उपाययोजना	डॉ. हनुमंत शिंदे	99
21	उत्तर प्रदेश आणि महाराष्ट्रातील दलित जातसमुहांचे राजकारण	श्री. राजेंद्र आगवाने	111
22	'कुळंबीण' : शेतकरणीच्या धमाचे चित्रण	डॉ. आनंद वारके	116
23	आधुनिक मराठी साहित्यातील सामाजिकतेचे पहिले उद्गाते : म. जोतीराव फुले	दत्तात्रय वेलजाळी	120
24	आर्थिक योजनेतून महिला सशक्तीकरणाकडे	प्रा. मिलिंद पाडेवर	124
25	स्त्रीवादी साहित्याची समाज परिवर्तनातील उपयोगिता	प्रा. विष्णुपंत इंगवले	128
26	शाहकांच्या समस्या व त्या सोडविण्यासाठी शाहक संरक्षण कायदा १९८६ मधील यंत्रणा	प्रा. पी. जी. मगर	132
27	रावेर तालुक्यातील उच्च माध्यमिक विद्यालयातील विद्यार्थ्यांचा भावनिक बुद्धिमत्तेचा अभ्यास	डॉ. प्रतिभा सूर्यवंशी	137
28	फेसाटीसमाजशास्त्रीय समीक्षा (नवनाथ गोरे )	भारती सोनवणे-निळे	141
29	नरेंद्राचे रुक्मिणीस्वयंवर आणि मराठी भाषाभिमान	डॉ. भूषण बंड	146
30	भारतीय कृषी आणि वित्तपुरवठा	परमेश्वर भुस्ते	149
31	वायू प्रदूषण आणि मानवी जीवन : एक अभ्यास	डॉ. रामदास मुकटे	152
32	जालना जिल्ह्यातील धार्मिक स्थळांचा भौगोलिक अभ्यास	डॉ. ए. आय. खान व जिजा लोडे	157



**'RESEARCH JOURNEY' International E- Research Journal**  
Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
Special Issue 165 (B)- Multidisciplinary Issue  
UGC Approved Journal

ISSN :  
2348-7143  
February-2019

33	आदिवासी स्त्रियांची लोकगीते - एक अभ्यास	डॉ. कल्याण राऊ आढाव	162
34	मराठी आणि हिंदी ग्रामीण कादंबऱ्यांमध्ये चित्रित लोकशाही व्यवस्थेचे समाजजीवनावरील परिणाम (१९६० ते १९७५ या कालखंडातील)	प्रा. राहुल पाटील	167
35	'लक्षवेधी सूचना व आ.गणपतराव देशमुख' २००५-२००६	श्री.योगेश माळी व डॉ.बाळासाहेब भोसले	173
36	लैंगिक असमानता आणि विरुद्ध हिंसाचार	प्रा.माधुरी चौधरी	176
37	महाराष्ट्रातील राजकीय पक्षांची वाटचाल व २०१९ ची निवडणूक	प्रा.ए.बी.राऊत	180
38	महात्मा फुले यांचे स्त्रीविषयक कार्य	आरती गायकवाड	185
39	ब्रिटीश काळातील भारतीय हस्त उद्योगधंद्याचा न्हास : एक ऐतिहासिक विवेचन	डॉ.वि.एस.धीरसागर	189
40	राम गणेश गडकरींच्या नाटकातील स्त्री प्रतिमा	डॉ. वर्षा गायकवाड	194
41	उच्च शिक्षण हे सामाजिक परिवर्तनाचे प्रभावी साधन	डॉ.नासीर गिरासे	200
42	प्रमोदकुमार अणेराव ह्यांची कविता : एक आकलन	डॉ.सुरेश खोत्रागडे	204
43	भारत - चीन सीमावाद : पंडित जवाहरलाल नेहरू व झाऊ - एन - लाय यांच्यातील वार्तालाप	डॉ.विष्णू पडवाल	211
44	भाषा - परिवर्तन : अर्थ प्रक्रिया - अर्थपरिवर्तनाचे प्रकार	श्री.एस.आर.साळुंखे	217
45	आद्यकालीन मराठी वाङ्मयातील रसविचार	डॉ.पद्मा खांडस्कर	223
46	दीनमित्रकर मुकुंदराव पाटील यांच्या निवडक अग्रलेखातील जाणीव दर्शन	डॉ.बाळासाहेब शेळके	230
47	साहित्यी तंत्रज्ञान आणि ई-प्रशासन	प्रा.बबन आमले	235
48	आहिल्याबाई होळकर व पंढरपूर	डॉ.शिवाजी वाघमोडे	239
49	मराठी साहित्यातील मानसशास्त्रीय संशोधन	डॉ.आनंद वाघ व डॉ.अनिल गर्जे	242
50	सुरेश भटांची नाट्यगीते	डॉ.राजेश देशपांडे	249
51	साहित्याची सामाजिकता	डॉ.गणपती मोरे	255
52	दलित व ग्रामीण साहित्य : तुलना, स्वरूप, साम्य, भेद	प्रा.श्रीमती मीरा देठे	258
53	'असं घडायचं होतं' : एक समृद्ध कादंबरी	डॉ. संगीता शेळके	262
54	पाली अट्टकथा आणि त्याचे महत्व	डॉ.राजेश व्ही चौरपगार	266
55	आदिवासींचे लोकगीते	डॉ. शरद नागरे	269
56	मुक्त शाळा शिक्षण व ऑनलाईन शिक्षणाला चालना देणारा प्रभावी उपाय	डॉ.दादासाहेब पवार	274
57	बेंगलूर मंदिर संस्कृती : समज आणि वस्तुस्थिती	डी.के.डाके	277
58	मध्य विदर्भातील यवतमाळ जिल्ह्याचा उदय आणि विकास	डॉ.सुनिल चक्रवे	280
59	डॉ.बाबासाहेब आंबेडकरांच्या विचारांची वर्तमानकाळातील प्रासंगिकता	प्रा.गोरख शेवाळे	283
60	मराठी कादंबरीच्या विकासातील विविध टप्पे	प्रा. प्राची जोशी	287
61	सूर्यनमस्काराने खेळाडूंच्या लवचिकतेवर पडणारा प्रभाव	प्रा.नाजुकराम बनकर	297
62	महाविद्यालयीन ग्रंथालयात साहित्याचे साक्षरतेचे महत्व	डॉ. प्रशांत पगडे	300
63	सांस्कृतिक पर्यावरण व मराठी ग्रामीण कविता	डॉ. सुनिल निगडे	303
64	भारतीय राष्ट्रवाद	प्रा.अर्चना फुलारी	309
65	महाराष्ट्रातील नद्या प्रदूषण : कारणे व उपाययोजना	प्रा.जगदीश ससाणे	313



### भारतीय राष्ट्रवाद

प्रा. फुलारी अर्चना सुभाष

न्यू आर्ट्स, कॉमर्स अॅण्ड सायन्स  
 कॉलेज, पारनेर जि. अहमदनगर  
 फोन नं - ९४०४७८२५८५  
 susmitvyavahare@gmail.com

एकोणिसाव्या शतकापासून युरोपच्या इतिहासाला निर्णायक वळण देणारी एक प्रमुख प्रेरणा आणि प्रक्रिया म्हणून राष्ट्रवादाचा उल्लेख केला जातो. राष्ट्रवाद ही आधुनिक विचारप्रणाली आहे. प्राचीन ग्रीसमध्ये राष्ट्रराज्य ही संकल्पना अस्तित्वात होती. आपण स्वतंत्र आहोत व त्याचबरोबर इतरांपेक्षा वेगळे आहोत ही जाणीव प्राचीन ग्रीक नगरराज्यांमध्ये होती. मात्र, या जाणिवेला राष्ट्रवाद म्हणता येत नाही. व्यक्ती-हित व राष्ट्राचे हित वेगवेगळे असत नाही, असा विचार आधुनिक काळात मांडला गेला. राष्ट्रवाद ही एक मनाची अवस्था किंवा भावना आहे; त्यामुळे त्यांचा संबंध मानसशास्त्रीय आहे. राष्ट्रप्रेम, राष्ट्रनिष्ठा, राष्ट्रवादी त्याग, आत्मसमर्पण या भावनांचा त्यामध्ये समावेश आहे. आत्मीयतेच्या जाणिवेची ती एक क"ती आहे. आधुनिक काळात केवळ राष्ट्रप्रेम असा राष्ट्रवादाचा मर्यादित अर्थ घेतला जात नाही; तर ती एक विचारप्रणाली आहे, असे म्हटले जाते. जगातील कोणतीही विचारप्रणाली विशिष्ट काळ व परिस्थितीचे अपत्य असते. राष्ट्रवाद ही विचारप्रणालीदेखील विशिष्ट काळ व परिस्थितीचे अपत्य आहे, असे म्हणता येते.

पाश्चिमात्य देशांमधील प्रबोधनापासून राष्ट्रवाद या विचारप्रणालीचा उदय झाला. व्यक्ती व राष्ट्र यांच्या परस्परंशी संबंधित असलेल्या हितसंबंधाचा विचार प्रबोधन काळात होऊ लागला. राष्ट्रवाद प्रबोधनकाळात स्पष्टपणे मांडला गेला नव्हता. फ्रेंच राज्यक्रांतीने राष्ट्रवादाच्या उदयाला योग्य परिस्थिती निर्माण केली. व्यक्तीच्या इच्छा - अपेक्षा ; राष्ट्राच्या इच्छा - अपेक्षांशी एकरूप करण्याचे महत्त्वपूर्ण कार्य फ्रेंच राज्यक्रांतीने केले. स्वातंत्र्य, समता, बंधुता, न्याय या मूल्यांच्या रक्षणासाठी राष्ट्र असते. या मूल्यांच्या प्रस्थापनेसाठी राजकीय सत्ता जनतेच्या हातामध्ये असली पाहिजे, ती अनियंत्रित राजेशाहीच्या हाती असता कामा नये ; म्हणूनच राष्ट्रवादाला फ्रेंच राज्यक्रांतीचे अपत्य असे म्हटले जाते. राष्ट्रवादाचा विचार विसाव्या शतकामध्ये संपूर्ण जगभर विस्तारलेला दिसतो.

#### भारतीय राष्ट्रवाद -

भारतात विकसित झालेल्या राष्ट्रवादाच्या विचारात साम्राज्यशाहीचा मुकाबला करणाऱ्या मुक्तिदाची प्रवाहाबरोबरच संकुचित, आक्रमक आणि साम्राज्यशाहीशी हातमिळवणी करणाऱ्या राष्ट्रवादाचाही प्रवाह आढळतो. भारतीय राष्ट्रवाद एका बाजूने पाश्चिमात्यांचे अनुकरण करणारा असला तरी त्याचवेळी तो पाश्चिमात्यांना विरोधी करणारा होता. पार्थ चटर्जींनी या अंतर्विरोधाचे स्पष्टीकरण केले आहे. त्यांच्या मते, भारतीयांनी पाश्चात्य राष्ट्रवादी विचारानुसार उचल करताना जाणीवपूर्वक आणि आवश्यकतः निवडक भागच घेतला आहे. १८९५ नंतरच्या काळात भारतीय हिंदू व मुसलमान या दोन्ही समाजात सांस्कृतिक अभिमानाची राष्ट्रवादी वृत्ती जागृत झाली. आपापल्या धर्मातील महापुरुषांनी प्राचीन व मध्ययुगीन काळात केलेल्या



**'RESEARCH JOURNEY' International E- Research Journal**  
**Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)**  
**Special Issue 165 (B)- Multidisciplinary Issue**  
**UGC Approved Journal**

**ISSN :**  
**2348-7143**  
**February-2019**

परकमांपासून त्यांना प्रेरणा मिळाली. आपणही अशोच वैभवशाली संस्कृती उभारू शकू असा आत्मविश्वासही बळवला.

मॅक्स मुल्लरसारख्या जर्मन प्राच्यविद्याविशारदांनी पौराणिक व पाश्चिमात्य संस्कृतींमधील तफावत स्पष्ट केली होती ती भारतीय राष्ट्रवादाच्या प्रवर्तकांच्या पथ्यावर पडली. भारतीय परंपरेचे श्रेष्ठतव प्रस्थापित करणारी मांडणी अरविंद, टिळक, गांधी, आझाद, नेहरू वगैरे भारतीय राष्ट्रसभेच्या नेत्यांनी केली. नेहरूंच्या डिस्कव्हरी ऑफ इंडीया ग्रंथात भारतीय आध्यात्मिकतेचा गौरव करणारी मॅक्स मुल्लरची अनेक विधाने अदभुत केलेली आहेत. भारत विरुद्ध पश्चिम म्हणजेच संस्कृती विरुद्ध राजकारण किंवा स्त्रीत्व विरुद्ध पौरुष अशीही मांडणी आढळते. बंकिमचंद्र चटोपाध्याय यांच्या लेखनातून ती प्रभावीपणे झाली आहे. आध्यात्मिकता म्हणून भारतीय संस्कृतीचा राष्ट्रवादी विचारसरणीत झालेला प्रवेश परिपूर्ण स्वरूपात विवेकानंदांच्या लेखनात व भाषणात आपल्याला आढळतो. लाल-बाल-पाल या जहालमतवादी त्रयीचा राष्ट्रवादही या देशाच्या सर्व अंतर्गत विग्रहाना जोडणाऱ्या सांस्कृतिक एकात्मतेला अधोरेखित करणारा आहे. भारतीय राष्ट्रवादांनी सामाजिक व्यवहारातील अर्थाच व नीतीचे निर्बंध शुभारणाच्या व्यक्तिस्वातंत्र्याला विरोध केला. ब्रिटीश या देशात येण्यापूर्वीच विविध धर्मांच्या भारतीयांची एक समिश्र संस्कृती येथे साकार झाली होती. तीच एकोणिसाव्या शतकामधील समिश्र राष्ट्रवादाची आधारशिळा ठरली. राष्ट्रसभेची स्थापना ही त्या समिश्र राष्ट्रवादाच्या आधारे एकराष्ट्रीयत्व निर्माण करण्याच्या निश्चयाची मूर्त प्रतीक मानले जाते. कोणत्याही संस्कृतीचे श्रेष्ठतव ती आपल्यातील टाकाऊ भाग सोडून टिकाऊ भाग किती जोपासते आणि सामान्य मानवसंस्कृतीत विलीन होऊनच कृतार्थता पावू शकतात याचे भान हिंदू-मुस्लिम-ख्रिस्ती वगैरे सर्वांनी ठेवले तर समिश्र राष्ट्रवादाच्या उभारणीस ते नक्कीच साह्यभूत ठरतील. याउलट आपापल्या धर्मांच्या वृथा व मिथ्या अभिमानास जर लोक बळी पडले तर ते आपल्यासह सर्वांचा विनाश ओढवल्याखेरीज राहणार नाहीत ही जाणीव समिश्र राष्ट्रवादांमार्गे प्रामुख्याने होती. समिश्र राष्ट्रवादाचे समर्थक धर्मांचे अधिष्ठान राष्ट्रनिष्ठेला मिळवे या मताचे होते. समिश्र राष्ट्रवादाची उभारणी ज्या धर्मनिष्ठांवर केली गेली होती ती हिंदू किंवा इस्लामी अशा विशिष्ट धर्मपंथाबाबतची संकुचित निष्ठा नव्हती.

१९२० ते १९२५ हा जर समिश्र राष्ट्रवादाच्या ऊर्जिवास्थेचा कालखंड मानला जर १९२५ ते १९३५ हा त्या राष्ट्रवादाच्या लाटेला ओझेटी लागल्याचा काळ मानावा लागेल. युरोपच्या भांडवलशाही संस्कृतीच चिकित्सा करणारे आणि धर्मविशिष्टतेच्या पलीकडे जाऊन वर्गीय विश्लेषण करणारे समाजवादी तत्त्वज्ञान १९२५ च्या सुमारास भारतात विचारी व्यक्तींना आकर्षित करू लागले होते. ज्या प्रमाणात समिश्र हिंदी राष्ट्रवादाने सामान्य जनतेत निर्माण केलेल्या राजकीय जागृतीची पातळी उंचावत होती, राष्ट्रीय स्वातंत्र्यलढयात सहभागी झालेल्या कष्टकरी भारतीयांचे संख्याबळ वाढत होते आणि हिंदी राष्ट्रवादास समाजवादी स्वरूप येत चालले होते त्या प्रमाणात साम्राज्यसत्ताक भांडवलशाहीने धर्मविशिष्ट राष्ट्रवादाला खतपाणी घालण्याचे जोरदार प्रयत्न सुरू केले होते.

राष्ट्रसभा हिंदू-मुसलमानांचे एकराष्ट्र बनवण्याच्या प्रयत्नात यश मिळवू लागली आहे असे दिसताच तिला विरोध करण्याच्या भावनेतून लॉर्ड डफरिनने हिंदुस्थानात हिंदू व मुसलमान अशी दोन राष्ट्रे नांदत असल्याची हाकाटी सुरू केली. हिंदी समिश्र राष्ट्रवादाचे सामर्थ्यशाली आव्हान परतून लावण्यासाठी साम्राज्यसत्तेने रचलेले हे कपट कारस्थान होते. पण ते न ओळखता आल्यामुळे हिंदू व मुस्लिम दोन्ही गटातील नेते त्यास बळी पडले आणि धर्मविशिष्ट राष्ट्रवादाची मांडणी करू लागले. धर्मविशिष्ट राष्ट्रवाद ही हिंदी राष्ट्रीय





वृत्तीला जडलेली विकृती होती. या विकृतीकरणाला केवळ साम्राज्यसत्तेला भरलेली समिश्र हिंदी राष्ट्रवादाची घडकी एवढे एकच कारण नव्हते तर हिंदुस्थानच्या राष्ट्रवादाचा विकास समाजवादी दिशेने होऊ लागला होता याची ती एक प्रतिक्रिया होती हे लक्षात घेणे गरजेचे आहे. हिंदू राष्ट्रवादाची विचारसरणी तयार करण्यात वि.दा. सावरकर यांचे योगदान सर्वात मोठे आहे. राजकीय कार्याच्या सुरुवातीच्या काळात हिंदू-मुस्लिम ऐक्याचे समर्थक असलेले सावरकर पुढे मात्र मुस्लिम समाजाला वगळून राष्ट्राची व्याख्या करत होते. शेकडो वर्षे केवळ एकत्र राहण्यामुळे काही हिंदू व मुस्लिम यांचे एक राष्ट्र होऊ शकत नाही तर राष्ट्रनिर्मितीची तीव्र सामाईक इच्छाच त्यासाठी असायला पाहिजे अशी सावरकरांची भूमिका होती.

भाषा, राहणीमान, मूल्यनिष्ठा अशा सर्व बाबतीत आधुनिक व पारिचम्यात असलेले, पारंपरिक धर्म, कुराण, नमाज, शरियत वगैरंबद्दल अगदीच अनभिज्ञ असलेले आणि सावरकरांप्रमाणेच कधीकाळी हिंदू मुस्लिम ऐक्यासाठी आटापिटा करणारे महमंद अली जीना मुस्लिम समाजाच्या धर्माधिष्ठित राष्ट्रवादाचे शिल्पकार व्हावे हा भारताच्या स्वातंत्र्यचळवळीतील एक दैवदुर्विलास म्हणावा लागेल. समिश्र राष्ट्रवादाची मांडणी करणाऱ्या नेत्यांनी धर्माचा आधार जरूर घेतला होता पण धर्मवेषाचे राजकारण कधीच केले नव्हते. पुढे मात्र चळवळीत धर्मविशिष्ट पृथक राष्ट्रवादाचे प्रवाह बळावते. धर्मनिरपेक्षताचा आग्रह बाजूला ठेवणे भाग पडले, समाजवादी तत्वविचारी काहीकाळ गुंडाळून ठेवावा लागला. पण स्वातंत्र्य मिळाल्यानंतर मात्र त्या दोन्ही आदर्शांना संविधानकारणी शिरोधार्य मानले आणि स्वतंत्र भारताच्या समिश्र राष्ट्रवादाची रूपरेषा संविधानात अंतर्भूत केली. देशांनी धार्मिक विविधता, फाळणीचा विदारक अनुभव आणि अल्पसंख्यांना भेडसावणारी असुरक्षिततेची भावना या कारणांमुळे धर्मनिरपेक्षतेचा आधार घेणे निकडीचे झाले. प्रत्येक भारतीयाला धर्माचरणाचा व धर्मप्रसाराचा हक्क असला तरी राज्यसंस्थेचा असा काणताच धर्म नाही, येथील संविधानाची अखिप्तात्री अशी कोणतीही दैवी शक्ती नाही आणि धर्मसत्तेपेक्षा राजसत्ता ही निर्विवादपणे वरचढ आहे. अल्पसंख्याकांना संविधानाने विशेष हक्क व संरक्षण दिले आहेत. राष्ट्राचे ऐक्य आणि एकात्मता बळकट करण्यासाठी प्रत्येक नागरिकाला सामाजिक, आर्थिक व राजकीय न्यायाची, आचार-विचार-अविष्कार स्वातंत्र्याची, दर्जा व संधी यांच्या समानतेची आणि व्यक्तिप्रतिष्ठेची हमी देणे अत्यंत गरजेचे आहे याची संविधानात नमूद केल्या आहेत.

विसाव्या शतकाच्या अंतिम पर्वात भारतात हिंदू राष्ट्रवाद, हिंदू संघटन, व हिंदूराष्ट्र या संकल्पनांना पुन्हा महत्व प्राप्त झाले. १९८२-८३ मध्ये विश्वहिंदू परिषदेने दक्षिण भारतात एक-माता यात्रा काढली. मुसलमान व इतर अल्पसंख्याकांकडून धर्मांतरांच्या मार्गाने हिंदू संस्कृतीवर अतिक्रमण होत असून त्याच्या विरोधात जात, वर्म, लिंग व संप्रदाय विसरून सर्व हिंदूंनी एकत्र यावे असा या यात्रेचा हेतू होता. अयोध्या येथील बाबरी मशीद हे हिंदूंच्या तुडवलेल्या हक्कांचे प्रतीक असून सर्व धर्मसमूहांच्या समान हक्कांच्या आपल्या तथाकथित धर्मनिरपेक्षतेमुळे आणि अल्पसंख्याकांचा अनुनय करण्याच्या धोरणामुळेच ते कायम राहिले आहे अशी भावना निर्माण करण्यात हिंदुत्ववाद्यांनी यश मिळवले आहे. हिंदुत्वविचारावर उभ्या असलेल्या भारतीय जनता पक्षाला धर्मविशिष्ट राष्ट्रवादी प्रचाराने देशात निर्माण झालेल्या वातावरणाचा फायदा झाला असून त्याला राजकीय सत्ता उपभोगण्याची संधी मिळाली.

धर्मविशिष्ट राष्ट्रवादाचे आकाने स्वातंत्र्यप्राप्तीपूर्वी आणि स्वातंत्र्याची पन्नास वर्षे उलटण्याच्या दळणावरही भारतासमोर उभे राहते या वस्तुस्थितीची कारणे खोलात जाऊन शोधण्याची आवश्यकता आहे. धर्मविशिष्ट राष्ट्रवादाची पाळेमुळे येथील राष्ट्रवादाच्या मुख्य प्रवाहाच्या काही उणिवा आणि विकृतींमध्येच सापडतात. राष्ट्रीय सभेने लढा व्यापक करण्यासाठी जनतेला जे आवाहन केले त्यातच काही अंगभूत धोके होते.



**'RESEARCH JOURNEY' International E- Research Journal**  
**Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)**  
**Special Issue 165 (B)- Multidisciplinary Issue**  
**UGC Approved Journal**

**ISSN :**  
**2348-7143**  
**February-2019**

एकतर त्यात भारतीय राष्ट्रवाद म्हणजे ब्रिटीश साम्राज्याला विरोध असे सरधोपट समीकरण मांडलेले होते. स्वाभाविक या समाजांतर्गत जे इतर अंतर्विरोध होते त्यांच्याकडे काँग्रेसी नेत्यांनी साफ कानाडोळा केला होता. जातीपातीचे व धार्मिक-सामाजिक सुधारणेचे प्रश्न उपस्थित केल्यास लढयातील एकजूट भंगेल असे कारण त्यांनी पुढे केले. त्यामुळे राष्ट्रसभेचा राष्ट्रवाद संकुचित अर्थाने जरी धर्मविशिष्ट नसला तरी अभिजनवादी, ब्राम्हणी आणि पुरुषसत्ताक असाच होता.

आजही भारतीय राष्ट्रवाद त्याच्या समग्र मांडणीअभावी डाव्या व उजव्या विचारसरणीकडे असे हेलकावे खात अभ्यासकांसमोर प्रश्न म्हणून उभा आहे.

#### संदर्भसूची -

१. पाटील वा.भा., आंतरराष्ट्रीय संबंध, प्रशांत पब्लिकेशन, जळगाव - २०११
२. भोळे भा.ल., आधुनिक भारतातील राजकीय विचार, पिंपळापुणे प्रकाशन, नागपूर - २००३
३. विरमल नितीन व पवार वैशाली, राजकीय विचारप्रणाली, डायमंड पब्लिकेशन, पुणे - २०१५
४. चव्हाण शंकर, राजकीय संकल्पना आणि विचारप्रणाली, प्रतिमा पब्लिकेशन, पुणे - २०१२
५. सदाफळ विलास, कापडी दामोदर, पाटील एन.ए., राजकीय विचारप्रणाली, सक्सेस पब्लिकेशन, पुणे - २०१५
६. चव्हाण शंकर, आधुनिक राजकीय विचारप्रणाली, प्रशांत पब्लिकेशन, पुणे - २०१५



**50. A Study of relation between the bank and its depositor**

Online International Interdisciplinary Research Journal, (BI-Monthly), ISSN 2249-9598, Volume-09, Jan 2019 Special Issue (04)

**A Study of Relationship between the Bank and its Depositor**

**Yuvaraj Manohar Waghare**

Assitant Professor in Commerce, New Arts, Commerce and Science College, Parner, MS, India

**Abstract**

According to the Indian Bank Regulation Act 1949, all the banking businesses companies in India are required to do business based on the conditions laid down by the Reserve Bank of India. The credit of any bank is dependent on the credibility of the bank and its depositors or account holders, and therefore the bankers should return their deposits immediately after the demand of the t. In fact, it is them. It is the first duty of every bank, but in the last few years, the relationship between the bank and its depositors is in very bad condition. The credibility of the account holders is decreasing on the bank, and the result is seen in banking business.

In this research, the efforts of the bank and the depositors have been studied for the past few years by studying how it has been working. It has also been thought that what can be done to improve the banking system and its functioning, the responsibility of the account holder, and many such factors. The financial condition of any country will be good only if the banking system in that country is strong and it is entirely dependent on the banking policies towards its depositors and account holders. The Bank System in India is very suitable but it is necessary require to improve in the work within the banking system. It has been attempted in this research paper considering all these things.

**KEYWORDS:** Bank, Depositor, Reserve Bank of India, Government

**INTRODUCTION:** After independence, there was a need for a strong banking system in the banking sector in India. In the year of 1949 The Indian Bank Regulation Act was established for a number of reasons, due to the monopoly of merchants in the country, different method of working of each bank and the acquisition of depositors' trust. Thereafter, there was a major change in the banking business of the country. Reserve Bank became the country's central bank, State Bank of India established in 1969, Nationalization of 14 banks in 1969 and 6 major banks in 1980, Internet Banking, and Smart Banking. An important reason for this changes is that the depositors' trust is on their bank. It is the duty of the banks to provide the necessary facilities as per their requirement of the account holder with the primary work of accepting deposits and providing loans, but in doing so, the deposit of the depositors in the bank due to which the banks are making progress, cannot be forgotten that at the same time it is necessary to return them as per their needs. In the last few years, the bank's bankruptcy rate has increased very much. That is why the security of depositor's deposits is threatened. On the other side, fluctuating interest rates, different types policies of banks and hence the confidence of the public is diminishing.

There are many reasons for this the dependents of the depositors and account holders on the basis of today's situation are getting lesser. Before publishing light on the bad relationship between the bank and their depositor, we will explain the person who is the bank's customer.

**Who is the customer of the bank?**

There is a difference of opinion among various opinions about the bank's customer. According to experts, the person who is the bank account holder and the transaction is going on in the bank regularly, it can be called a customer. According to various judicial decisions, it was said that on the day the bank clear the first cheque of the bank account holder, the person becomes the bank's customer. It does not have to be done regularly. If you think about it on the other side, then the people who do not have a bank account but they use the service of the bank, then they are not the account holders? So, if you think in common language, the person who takes advantage of banking services and the bank provides service to that person can be called the bank's account holder.

**OBJECTIVES OF STUDY:** The main objective of this research is to find out the main reasons for the bad relationship between the bank and the customers, and what the bank and the customers should do to avoid it.

**RESEARCH METHODOLOGY:** The research in this paper is done using secondary data. It has been tried in detail study the reference books, periodicals, newspapers, online information and expand it here.

**DATA ANALYSIS:** It was dominated by the government and capitalists of that time before independence in the country. That's why, after getting independent, there was a need for a strong banking system in the country that would break the monopoly of these capitalists in India and bring all the bank business under a shadow. That is why in 1949, the Indian Banking Regulation Act was enacted. If it is considered a huge increase in the bank business of the country then today, 20 National banks (including IDBI), 56 Regional Rural Banks, 40 Private Sector Banks, 31 State Cooperative Banks, 45 Foreign Banks and many small big corporations, private, agriculture The subsidiaries, non-farming, banks operating on such a foundation are in India. These banks are doing their job properly. But many such banks have been in the country for the last few years not doing its banking business properly. It started in India in 2008 that, 22 banks in the country closed their operations in 2007-08 and 19 banks in 2008-09 became bankrupt. 142 crores amounting to Rs 100000 each to compensate to the depositors of these banks, but due to financial crises, all the sectors of the country were hit and the same could be said to be sitting in the banking sector, but after that, the bank's bankruptcy in the country did not end there till now. Nashik People Cooperative Bank was one of the big bank and The Punjab National Bank; it was the biggest issue in the country. According to current information, IBBI Chairman M. S. Sadhu said in an interview that more than 50000 crores will be filled up by 45 companies for bankruptcy. This means that the companies and lenders in the country are becoming bankrupt because it is a matter of great concern.

If we think of the situation mentioned above, it is need to answer the following questions.

1. According to the Bank Regulation Act 1949, is the functioning of banks in the country really the same? It is necessary to study whether the rules applied are closely followed by each bank.
2. According to the Reserve Bank's rules, does each bank keep at least 20% of its total time liability in the form of a reserve deposit?
3. When banks have lent their debt while supplying them? Have you got the right customer for a loan?

4. Most importantly, during the allocation of loans, the bankers are given a large amount of loan to directors and their relatives. Why?
5. It is really affecting the changing policy Reserve Bank of India's banking system?

There are many reasons for this to be considered. If every bank has complied with the rules and regulations, then the bank's position will be good.

The measures taken by the government and the RBI not to bankruptcy:

1. On 10th August 2017, the Central Government introduced a new bill, the Financial and Deposit Insurance Bill 2017, in which new amendments will be made to stop bankruptcy in the bank and insurance sector. According to the law of the Deposit Insurance and Credit Guarantee Corporation Act 1961, the banks are taking insurance on deposits of deposits of up to Rs 1 lakh.
2. This facility is not available for more than that amount. This bill will be revised in the new bill. But according to experts in the banking and insurance sector, this bill could have put the Reserve Bank's control over the bank's system.
3. According to the Reserve Bank's instructions, the banks have started taking action on the bank's borrowers. But it is very doubtful how serious it is being done.
4. With the approval in the Lok Sabha, the Central Government has sanctioned 80,000 crores through strengthening of public sector banks.
5. The government has allocated 3 trillion rupees in the 2018 budget for the small business owners who want to grow your business. This will reduce the burden of loan demand on banks.
6. The Reserve Bank has allowed many features such as unlimited funds transfer in wallets and bank accounts that Wales is expected to become a really strong player in the financial environment.

The central government and the Reserve Bank of India have been doing this and will continue to do so for many such measures, but can not say how strong the relationship between the bank and the depositor can be strengthened.

**CONCLUSION:** It is the responsibility of the bank and the depositor to safeguard the relationship between the bank and their depositor. There is difference between the bank's borrowers and the depositors. The depositor has deposited some amount in cash and the bank has given the remaining loan. Therefore, it is the bank's responsibility to safely recover the amount of the deposit with the interest in the bank. It is the duty of the bankers towards depositor and the account holders to return the deposits at the time of demand and for this, the bank has to recover the loan if the amount of cash is reduced. But if banks cannot recovered the loan, unable to return the deposit and then there is a question on the reliability of banks and It will be badly affected that, depositors take their deposits. At the time of lending by the banks, they should make statutory provision of loans without giving any specific ones. On the other hand, it is important that, Reserve Bank of India will equally to control each bank as per Bank Regulation Act 1949. There is no doubt that the government is doing its job properly, but the government should take steps to avoid the fact that it should not be insolvent rather than save it by giving donations to the bankrupt banks.

The government should not make such a new change in the law so that the central bank's autonomy is threatened. Other measures should be taken instead of giving the various subsidies to the banks to return the deposits to the depositors.

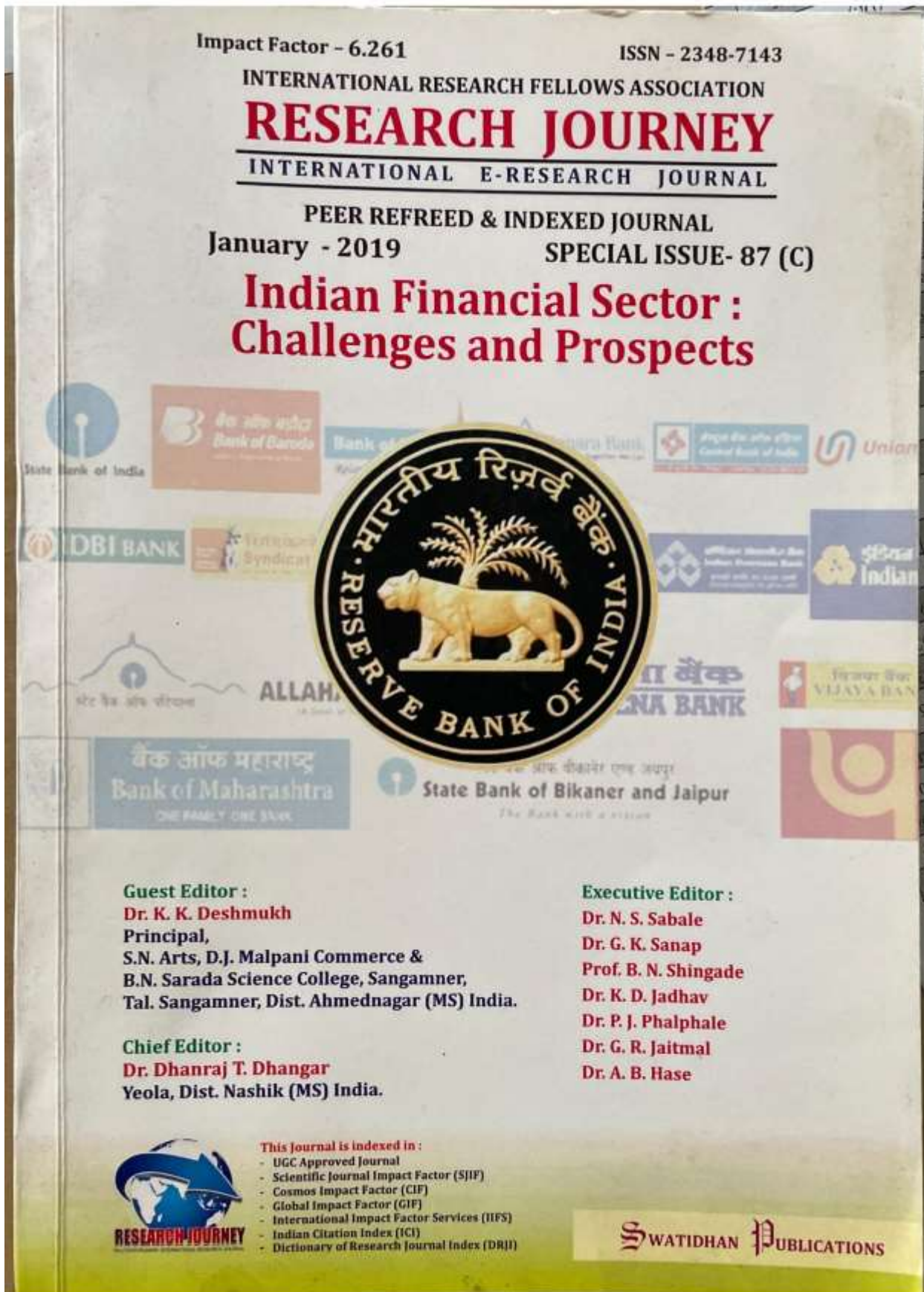
There is no doubt that the banks of the country are always contributing in the development of the country, but these same banks, which grow on deposits of their

depositors and then unable to return deposits in the face of financial problems due to wrong policies. In those times, the opposite effect has to be tolerated for a long time, and hence, once the banks fall short of facilitating their customers, they should not maintain the trust of the depositors.

**REFERENCE:**

- <https://www.thebetterindia.com/123705/deposits-bank-bankrupt-sbi/>
- <http://www.banknetindia.com/banking/coop0809.htm>
- <https://www.quora.com/How-many-nationalised-banks-are-there-at-present-2018-in-India>
- [https://en.wikipedia.org/wiki/Financial\\_crisis\\_of\\_2007%E2%80%932008](https://en.wikipedia.org/wiki/Financial_crisis_of_2007%E2%80%932008)
- <https://economictimes.indiatimes.com/topic/Insolvency-and-Bankruptcy-Board-of-India>
- <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/RBIA1934170510.PDF>

## 51. Study of Institutional Financial Sources to Entrepreneurship





**'RESEARCH JOURNEY' International E- Research Journal**  
 Impact Factor - (SJIF) – 6.261, (CIF) - 3.452(2015), (GIF)–0.676 (2013)  
 Special Issue 87(C)- Indian Financial Sector : Challenges & Prospects  
 UGC Approved Journal

E-ISSN :  
 2348-7143  
 January-2019

31	An Impact of Working Capital Management on Profitability: A Study of Idea Cellular Telecom Company	Dr. Bhavini Patel	130
32	Impact of Demonetisation on Jijamata Mahila Sahakri Bank Ltd	Sanjay Deshpande & Dr. T. N. Salve	136
✓33	Study of Institutional Financial Sources to Entrepreneurs	Yuvraj Waghere	142
34	Analytical Study of Women Empowerment through Non-Agricultural Women Credit Co-operative Societies in Ahmednagar District	Dr. Harjeet Panjabi	144

*Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.*

*- Chief & Executive Editor*







'RESEARCH JOURNEY' *International E- Research Journal*  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 87(C)- Indian Financial Sector : Challenges & Prospects  
 UGC Approved Journal

E-ISSN :  
 2348-7143  
 January-2019

## Study of Institutional Financial Sources to Entrepreneurs

**Yuvraj Manohar Waghare**

(Assistant Professor)

Department of Commerce

New Arts, Commerce & Science College, Parner.

### Introduction :

Businesses run on money and business finance guides you to make shrewd and prudent decisions about cash flow and longer-term funding strategies. As you develop skills and strategies for using the funds you have and for accessing additional capital when need, you'll improve your company's profitability and increase your potential for leveraging new opportunities.

There are lot of institutional financial sources available to the new entrepreneurs. Present study is undertaken for the purpose of to study the available sources.

### Objective:

The main objective of present studies is to find out the institutional financial sources available to the new entrepreneurs.

### Research Methodology:

The data are collected from different secondary sources, namely book, journals and news papers etc.

### Data Analysis:

Following institutional financial sources are available to entrepreneurs in India.

### Industrial Development Bank of India (IDBI Bank):

The Industrial Development Bank of India was established in 1964 under an Act of Parliament as a wholly owned subsidiary of the RBI. In 1976, the ownership of Industrial Development Bank of India was transferred to the Government of India and it was made the principal financial institution for coordinating the activities of institutions engaged in financing, promoting and developing industry in India.

### Industrial Finance Corporation of India (IFCI):

Industrial Finance Corporation of India was the first development finance institution set up in 1948 under the IFCI Act in order to pioneer long-term institutional credit to medium and large industries. It aims to provide financial assistance to industry by way of rupee and foreign currency loans, underwrites the issue of stocks, shares, bonds and debentures of industrial concerns, etc.

### State Financial Corporation's (SFC):

State Financial Corporation are the State-level financial institutions which play a crucial role in the development of small and medium enterprises in the concerned States. They provide financial assistance in the form of term loans, direct subscription to equity guarantees, discounting of bills of exchange and seed/ special capital, etc. SFCs providing assistance to newer types of business activities



'RESEARCH JOURNEY' *International E- Research Journal*  
 Impact Factor - (SJIF) - 6.261, (CIF) - 3.452(2015), (GIF)-0.676 (2013)  
 Special Issue 87(C)- Indian Financial Sector : Challenges & Prospects  
 UGC Approved Journal

E-ISSN :  
 2348-7143  
 January-2019

#### **Export Import Bank of Indian (EXIM Bank):**

Established by the Govt. of India we commenced operations in 1982 under the EXIM bank Act, 1981 as a purveyor of export credit, mirroring global Export Credit Agencies. With our rich pedigree, now we serve as a growth engine for industries and SMEs through a wide range of products and services.

#### **National Small Industries Corporation (NSIC):**

National Small Industries Corporation, is an ISO 9001-2015 certified Government of India Enterprise under Ministry of Micro, Small and Medium Enterprises (MSME). NSIC has been working to promote, aid and foster the growth of micro, small and medium enterprises in the country.

#### **Small Scale Industries Board of India :**

The Small Scale Industries Board (SSI Board) is the apex advisory body constituted to render suggest to the Government on all issues pertaining to the small scale sector. The Board is reconstituted every two years and is headed by the Minister In charge of SSI in the Government of India.

#### **Industrial Estate:**

An industrial estate is a place where the needed facilities and factory accommodation are provided by the government to the entrepreneurs to establish their industries there. In India, industrial estates have been used as an effective tool for the promotion and growth of small-scale industries. They have also been used as an effective tool to decentralize industrial activity to rural and backward areas.

#### **Conclusion:**

The number of unemployment in this country is very high due to the high proportion of population in the developing world like India. That's why young people have become a successful business entrepreneur. There is no doubt that the entrepreneur does the work of contributing to the development of the country along with himself. The government on the other side is helping them to promote such young entrepreneurs. That's why the commercial banks, Industrial Development Bank of India (IDBI Bank), Industrial Finance Corporation of India (IFCI), Life Insurance Corporation of India Ltd (LIC), Unit Trust of India (UTI), State Financial Corporation's (SFC), Small Banks like the Industrial Development Bank of India (SIDBI) are helping youth to promote industry.

**52. Synthesis and Characterization of Bismuth Ferrite Nanoparticle by Sol gel method**

JASC: Journal of Applied Science and Computations

ISSN NO: 1076-5131

**SYNTHESIS AND CHARACTERIZATION OF BISMUTH FERRITE NANOPARTICLES BY SOL-GEL AUTO COMBUSTION TECHNIQUE**V. B. Sherkar<sup>1</sup>, A.V. Mancharkar<sup>2</sup><sup>1</sup>Department of physics, New Arts Commerce and Science College, Parner 414302.<sup>2</sup>Department of physics, New Arts Commerce and Science College, Ahmednagar 414001.

E-Mail: sherkarvishal@gmail.com

**Abstract:** In the present work of Bismuth Ferrite (BiFeO<sub>3</sub>), Multiferroic nanoparticles synthesized by Sol-gel auto combustions technique followed by thermal treatment annealed at 300°C, 400°C and 500°C. It is found that BiFeO<sub>3</sub> nanoparticles crystallized at annealed 300°C. BiFeO<sub>3</sub> nanoparticles with different sizes distributions show obvious ferromagnetic properties, and the magnetization is increased with reducing the particle size. The prepared samples were characterized by X-ray diffraction of powder (XRD), scanning electron microscope (SEM) or extracting their surface morphology and their crystallographic structure and revealed a homogenous size distribution of nanometric Bismuth Ferrite Perovskite powders with a grain size of 200 nm which is in well agreement.

**Keywords:** Bismuth ferrite, Nanoparticles, X-ray diffraction, SEM

**INTRODUCTION**

Bismuth Ferrite BiFeO<sub>3</sub> is also commonly referred to as BFO in materials science. It is an inorganic chemical compound with perovskite structure and one of the most promising multiferroic materials [2] [4]. Bismuth ferrite BiFeO<sub>3</sub> (BFO) is one of the most popular research materials in condensed matter physics at present. The room temperature phase of BiFeO<sub>3</sub> is classed as rhombohedral belonging to the space group R<sub>3</sub>C [1]. It is synthesized in bulk and thin film form and both its antiferromagnetic (G type Ordering) Neel Temperature and ferroelectric Curie temperature are well above room temperature [3] [6]. BFO is much important for novel applications as sensors as well as actuators due to the coupling between magnetic and electric domains above room temperature and accepted high polarization in single crystal [5].

**EXPERIMENTAL METHOD**

Preparation of BiFeO<sub>3</sub> materials by sol-gel auto combustions technique. A stock solution of 0.2 M Bismuth nitrate in aqueous medium was prepared. The 0.2 M Ferric nitrate solution and 0.2 M Citric acid solution was prepared. Bismuth nitrate solutions were mixed with ferric nitrate in a 500 mL beaker under stirring condition. Citric acid was added cautiously. The ammonia solution was then added drop-wise into the mixed solution under continuous stirring condition and a light brownish gel was obtained [7] [9].

The powders obtained from the above procedures were annealed at 300°C, 400°C and 500 °C so that the volatile matters like moisture and other unwanted components were removed [9].

After the complete chemical synthesis and heat treatment of the synthesized products, the sample were characterized using X-ray diffraction (XRD) with a X-ray diffractometer with CuK $\alpha$  radiation ( $\lambda=0.154178$  nm) and Scanning Electron Microscope (SEM) for extracting their surface morphology and their crystallographic structure.

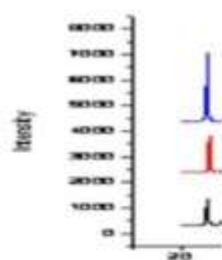
Volume VI, Issue I, January/2019

Page No:900

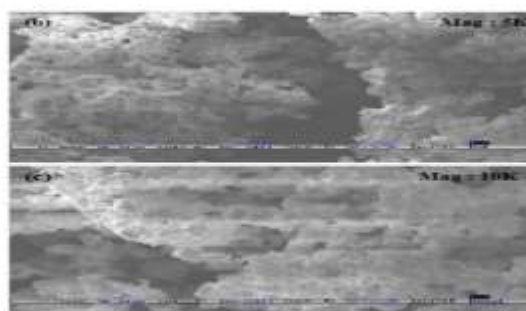
## RESULTS AND DISCUSSION

The synthesized bismuth ferrite nanoparticles were characterized by using the room temperature powder X-ray diffraction with filtered 0.154 nm CuK $\alpha$  radiation for their phase analysis studies at different annealed temperatures of annealed 300 °C, 400 °C and 500 °C.

The prominent peaks in XRD plot are indexed to various hkl planes of BFO, indicating formation of BFO. Besides these prominent peaks, some other peaks of low intensity are also observed, which do not belong to BFO. The sample annealed at 500 °C is having many extra peaks other than BFO whereas that prepared at 300 °C is less impurity peaks. The literature survey of BFO synthesis relates these impurity peaks to be that of BFO. The appearance of these extra phases at 500 °C could be due to large bismuth loss at higher temperature. Powder annealed at 400 °C is having less impurity phase of BFO, as is evident from the lesser peak height than 500 °C. The synthesized bismuth ferrite nanoparticles were characterized by using the SEM for revealing their surface morphology at different annealed temperatures of 300 °C, 400 °C and 500 °C. The particle size estimated from SEM images for the BFO sample is about 200 nm for the annealed temperature 300 °C, 400nm for the annealed temperature of 400 °C and 500 nm for the annealed temperature of 500 °C.



The proportional size is also confirmed morphology studies.



increase in particle by their surface

SEM image of BFO of nanoparticle size of 200nm

#### Conclusion

In the reported experiment, bismuth ferrite nanoparticles are successfully synthesized by sol-gel auto combustions technique using citric acid. The synthesized bismuth ferrite nanoparticles were characterized by X-Ray Diffraction (XRD) and Scanning Electron Microscope (SEM). The XRD characterization results indicates the rhombo centered structure of bismuth ferrite nanoparticles and the SEM analysis reveals that the diameter of bismuth ferrite nanoparticles changes with thermal treatment and varies from 200 to 500 nm by increasing the annealed temperature from 300 °C to 500 °C. This method avoids using traditional high temperature and therefore could be easily extended to other systems.

#### References

- [1] Glenda Biasotto, A.Z. Simoes, C.R. Foschini, S.G. Antonio, Maria A. Zaghete, Jose A. Varela, "A novel synthesis of perovskite bismuth ferrite nanoparticles", *Processing and Application of Ceramics* 5(3), pp 171-179, 2011.
- [2] K.Y. Yun, M. Noda, M. Okuyama, H. Saeki, H. Tabata, K. Saito, "Structural and multiferroic properties of BiFeO<sub>3</sub> thin films at room temperature", *J. Appl. Phys.*, 96, pp3399 -3403, 2004.
- [3] Y.P. Wang, L. Zhou, M.F. Zhang, X.Y. Chen, J.M. Liu, Z.G. Liu, "Room temperature saturated ferroelectric polarization in BiFeO<sub>3</sub> ceramics synthesized by rapid liquid phase sintering", *Appl. Phys. Lett.*, 84 pp1731-1734, 2004.
- [4] S. Ghosh, S. Dasgupta, A. Sen, H. Sankar, "Low temperature synthesis of nano sized bismuth ferrite by soft chemical route", *J. Am. Ceram. Soc.*, 88, pp 1349-1352, 2005.
- [5] C. Chen, J. Cheng, S. Yu, L. Che, Z. Meng, "Hydrothermal synthesis of perovskites bismuth ferrites crystallites", *J. Crystal Growth*, 291, pp135-139, 2006.
- [6] J.T. Han, Y.H. Huang, X.J. Wu, C.L. Wu, W. Wei, B. Peng, W. Huang, J.B. Goodenough, "Tunable synthesis of bismuth ferrites with various morphologies", *Adv. Mater.* 18, pp 2145-2148, 2006.
- [7] X. Qi, M. Wei, et al., "High Resolution X-Ray diffraction and transmission electrons microscopy of multiferroic BiFeO<sub>3</sub> films", *Appl. Phys. Lett.*, 87(2005)71913-71915.
- [8] Yongming Hu, Lingfeng Fei, Yiling Zhang, Jikang Yuan, YU Wang, and Haoshuang Gu, " Synthesis of Bismuth Ferrite Nanoparticles via a Wet Chemical route at low temperature.", *Journal of Nanomaterials*, vol. 2011 Article ID, 797639, 6 pages. 2011.
- [9] S.M. Selbach, T. Tybell, M. Aeinarsud and T. Grande, "Size dependent properties of multiferroic BiFeO<sub>3</sub> Nanoparticles", *Chem. Mater.*, 19(26) 6478-84, 2007.

## 53. Synthesis and Characterization of alpha -Al<sub>2</sub>O<sub>3</sub> Nanoparticles and its application in decolourization of methyl Orange Azo dye in presence of UV light

<https://doi.org/10.30799/jnst.192.19050101>

J. Nanosci. Tech. - Volume 5 Issue 1 (2019) 580-583



Share Your Innovations through JACS Directory

Journal of Nanoscience and Technology

Visit Journal at <http://www.jacsdirectory.com/jnst>

### Synthesis, Characterization of $\alpha$ -Al<sub>2</sub>O<sub>3</sub> Nanoparticles and Its Application in Decolorization of Methyl Orange Azo Dye in the Presence of UV Light

Vijaya P. Dhawale<sup>1,\*</sup>, Datta J. Late<sup>2</sup>, Satish D. Kulkarni<sup>3</sup>

<sup>1</sup>Post Graduate Department of Physics, New Arts Commerce and Science College Parner, Ahmednagar - 412 210, Maharashtra, India.

<sup>2</sup>Physical and Materials Chemistry Division, CSIR-National Chemical Laboratory, Dr. Homi Babha Road, Pune - 411 008, Maharashtra, India.

<sup>3</sup>Post Graduate Department of Environmental Science, New Arts Commerce and Science College, Ahmednagar - 414 001, Maharashtra, India.

#### ARTICLE DETAILS

##### Article history:

Received 05 December 2018

Accepted 23 December 2018

Available online 05 January 2019

##### Keywords:

Sol-Gel Method  
 $\alpha$ -Al<sub>2</sub>O<sub>3</sub> Nanoparticles  
Azo Dye  
Decolorization

#### ABSTRACT

Present study deals with the sol-gel synthesis and application of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles (alumina) to decolorize the azo anionic dye methyl orange (MO).  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles were successfully synthesized using aluminium oxide, 25% ammonia and polyvinyl alcohol (PVA) were used as low cost raw materials. The properties of synthesized nanoparticles were investigated by using UV-visible spectroscopy, XRD, FTIR, SEM, EDAX, Raman spectroscopy and TEM. From UV-visible spectra, band gap was calculated and it was found to be 3.31 eV. Average crystal size of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles from XRD peaks found to be 25 nm having rhombohedral structure. FTIR spectra reveals that functional groups (O-Al-O) are present. SEM image shows distribution pattern of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles. Chemical composition of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles was confirmed from EDAX spectroscopy measurement. Raman spectra showed crystalline nature of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles. The effect of concentration and pH of dye, dosage of nano adsorbent and contact time were studied. The systematic study shows that, successful color removal of methyl orange dye up to 54% in three hours contact time of pH 4. Hence  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles can be used for dye removal from waste water. Industrialization of this technique will be cost effective way to decolorize the textile dye present in water system.

#### 1. Introduction

Azo dyes represent the largest class of dyes, characterized by at least one azo group (-N=N-) with one or more aromatic groups. Most of these dyes are toxic and potentially carcinogenic in nature. Many industries like textiles, leather, paints, varnishes, pharmaceuticals, plastic and cosmetics etc. use dyes to colour their products. Consequently, the wastewater effluents are highly coloured, toxic and non-biodegradable. These dyes promote eutrophication and adversely affect the environment. About 100,000 dyes are commercially available [1] and more than 700,000 tons of dyes are synthesized worldwide annually for textile industry. An unfortunate side effect of their widespread use is the fact that up to 12% of these dyes are washed during the dyeing process, and that approximately 20% of this wastage enters the aquatic environment. Due to their complex structure, stability and synthetic origin, dyes are not easily biodegradable. Some dyes are reported to cause allergy, dermatitis, skin irritation, cancer and mutations in human being [2]. Therefore, the treatment of effluents containing dyes is one of the challenging problems all over the world.

Various methods such as adsorption, coagulation, biodegradation, advanced oxidation process (AOP) and the membrane process have been developed to degrade and remove these carcinogenic dyes from the wastewater. At present physical, chemical and biological methods are used as a treatment process for removal of dyes from wastewater. Among these methods, advanced oxidation process (AOP) have been reported to be effective for the degradation of soluble organic pollutants from wastewaters and soils as they provide an almost total degradation. As a result, an environmental-friendly technology has become a necessary for removal of dye from wastewater. All these processes have some advantages or disadvantages over the other method. Among these methods, adsorption is a conventional technology for dye removal with very high efficiency and simple process. Thus, application of nanoparticles as adsorbents has come up as an interesting area of research because of

their small particle size and high surface area. The active sites are also more and capable of interacting with pollutant species [3].

Methyl orange (MO), a basic (anionic) water soluble dye, is most widely used for coloring purposes. It is widely used worldwide in textile, paper, food, printing and pharmaceutical industries. The effluents from these industries are a major source of environmental pollution. Not only water bodies become coloured, but it also affects growth of aquatic organisms by blocking the penetration of sunlight and decreasing the dissolved oxygen capacity of water. Thus, MO is selected as a model dyeing pollutant to evaluate the catalytic activity of the aluminium oxide nanoparticles (AONP). Aluminium oxide nanoparticles are prepared by using sol-gel method [4]. The material of high purity can be prepared by this method. Polyvinyl alcohol (PVA) is used here as a capping agent to cap the particles, providing them stability [5]. In addition, polymer additives such as poly(vinyl) alcohol (PVA) or sodium citrate may be added as surfactant to keep the formed nanoparticles both dispersed and spherical in shape [6]. In the present study aluminium oxide nanoparticles are used as adsorptive removal of MO from aqueous medium.

#### 2. Experimental Methods

##### 2.1 Synthesis of Aluminium Oxide Nanoparticles

The nanoparticles were prepared by the sol-gel technology. All chemicals used were analytical grade. Aluminium chloride, AlCl<sub>3</sub> (Molychem), 25% NH<sub>3</sub> solution (Qualigen Fine Chemicals) and polyvinyl alcohol (PVA) (Modern Industries) were used as raw materials for the synthesis of aluminium oxide nanoparticles. 0.1 M alcoholic AlCl<sub>3</sub> solution was prepared, followed by addition of 25% ammonia solution. The resulting solution turned to a white solution. This was followed by the addition of PVA (0.5 M). The solution was stirred continuously using a magnetic stirrer until it became a transparent sticky gel. The gel was allowed to mature for 24 hours at room temperature. The resultant gel was heat treated at 100 °C for 24 hours which led to the formation of light weight porous materials due to the enormous gas evolution. The dried gel was, then calcined at 1200 °C for 4 hours and finally, the calcined powders were crushed using mortar and pestle to get the fine homogeneous dense powder [5].

\*Corresponding Author: [vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com) (Vijaya P. Dhawale)

<https://doi.org/10.30799/jnst.192.19050101>  
2455-0191 / JACS Directory ©2019. All Rights Reserved

Cite this Article as: Vijaya P. Dhawale, Datta J. Late, Satish D. Kulkarni, Synthesis, characterization of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles and its application in decolorization of methyl orange azo dye in the presence of UV light, J. Nanosci. Tech. 5(1) (2019) 580-583.

2.2 Photocatalytic Degradation Studies

Photocatalytic activities of the as-synthesized powder were evaluated by decolorization of methyl orange dye in aqueous solution. The experiments were carried out in the presence of UV light irradiation without any adsorbent (blank) and in the presence of UV light with adsorbent. The photocatalytic reactor consists of a glass chamber with an inlet tube for provision of dye solution purging during photocatalysis and outlet tube for the collection of samples. Distilled water was used to prepare all stock solution and stored in dark bottles. From a stock solution of 1000 mg/L of the dye, different concentrations were made. Reaction was set up by adding different dose of the as-synthesized aluminium oxide nanopowder (50, 80, 100 mg) into 1000 mL of MO solution of concentration (10 mg/L) in the glass chamber. The solution was magnetically stirred in with and without nanoparticle addition into dye solution for 180 minute to obtain adsorption equilibrium after irradiating the UV light sources in the chamber of the reactor. Sample was withdrawn at 30 minute time interval over contact time for 180 minute. The solution was filtered through Whatman filter paper to remove the nanoparticles before measuring absorbance. The absorbance of sample was measured at 466 nm using visible double beam spectrophotometer (Systronics, Model 1203). For quantitative analysis percentage degradation of MO dye was calculated using the following formula,

$$\% \text{ decolourisation} = \frac{(A_0 - A_t)}{A_0} \times 100$$

where  $A_0$  is absorbance of dye at initial stage,  $A_t$  is absorbance of dye at time  $t$ .

$$q_e = \frac{(A_0 - A_t)}{W} \times V$$

where,  $q_e$  is the amount of dye adsorbed at the time of equilibrium (mg/g),  $A_0$  and  $A_t$  are initial and final concentration of dye (mg/L),  $V$  (L) is the volume of sample, and  $W$  (g) is the mass of adsorbent [7].

3. Results and Discussion

3.1 Characterization

3.1.1 UV-Visible Spectroscopy

The UV absorption ability of  $\alpha\text{-Al}_2\text{O}_3$  is related with band gap energy. Band gap energy of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticle is calculated from UV -Vis absorption spectrum. The spectrum shows two absorption peaks at 205 nm and 265 nm in the UV region as shown in Fig. 1. The photo excitation of electron from valence band gives band gap energy ( $E_g$ ). The band gap energy ( $E_g$ ) was estimated by the Wood and Tauc method, according to the following equation,  $(h\nu)^\alpha = (h\nu - E_g)^\alpha$ , where, ' $\alpha$ ' is the absorption coefficient, ' $h$ ' is Planck's constant, ' $\nu$ ' is the frequency, ' $E_g$ ' is absorption band gap energy and ' $n$ ' is a constant associated to the different type of electronic transitions ( $n=1/2, 2, 3/2$  or 3 for direct allowed, indirect allowed, direct forbidden, indirect forbidden transitions respectively).  $E_g$  value for the  $\text{Al}_2\text{O}_3$  nanoparticles is 3.31 eV. These results are in good agreement with those previously reported by Varghese et al. [5] and, Farahmandjou and Golabiyan [8].

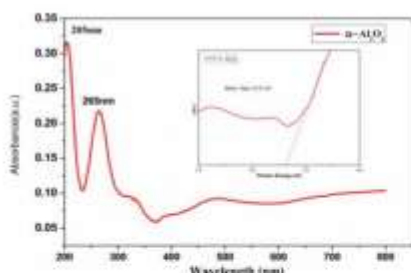


Fig. 1 Typical UV-vis spectra of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles. The inset shows the Wood and Tauc plot used to find out band gap of  $\alpha\text{-Al}_2\text{O}_3$ .

3.1.2 X-Ray Diffraction Patterns (XRD)

The peaks in the XRD pattern significantly supported formation of nano sized  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles from JCPDS file (71-1683) having rhombohedral structure. Eleven reflections were observed at  $2\theta$  angles around  $25^\circ$  (012),  $35^\circ$  (104),  $38^\circ$  (110),  $43^\circ$  (113),  $52^\circ$  (024),  $57^\circ$  (116),  $60^\circ$  (122),  $61^\circ$  (018),  $66^\circ$  (214),  $68^\circ$  (300) and  $70^\circ$  (119). Average <https://doi.org/10.30799/101.192.19050101>

Cite this Article as: Vijaya P. Dhawale, Datta J. Late, Satish D. Kulkarni, Synthesis, characterization of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles and its application in decolorization of methyl orange azo dye in the presence of UV light, J. Nanosci. Tech. 5(1) (2019) 580-583.

crystallite size was calculated from all peaks and was found to be 25 nm, whereas, the lattice constant 0.614 using Debye Scherrer formula,  $D=0.9\lambda/\beta\cos\theta$  where, ' $D$ ' is the crystallite size, ' $\lambda$ ' is the wavelength of  $\text{CuK}\alpha$  radiation, ' $\beta$ ' is full width half maximum (FWHM) of the diffraction peak and ' $\theta$ ' is Bragg's angle of X ray diffraction peak (Fig. 2a). Similar results have been obtained by others [9]. XRD analysis exhibits that the most stable phase,  $\alpha\text{-Al}_2\text{O}_3$  was obtained at  $1200^\circ\text{C}$ . The observations reported by Hyuk-joon et al. [10], noted that completion of the most stable phase of  $\alpha$ - alumina occurs at this temperature. During thermal treatment, stable  $\alpha\text{-Al}_2\text{O}_3$  phase can be obtained through the following series of phase transformation before conversion to  $\alpha\text{-Al}_2\text{O}_3$ :

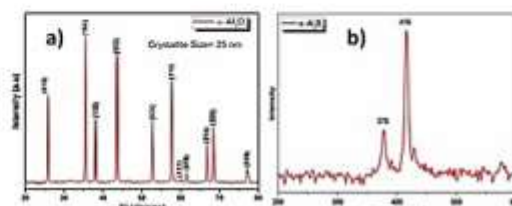


Fig. 2  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles (a) XRD pattern and (b) typical Raman Spectra

3.1.3 Fourier Transform Infrared Spectroscopy (FTIR)

The infrared spectrum (FTIR) of the synthesized  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles was in the range of  $400\text{-}4000\text{ cm}^{-1}$  wave number which identify the chemical as well as functional groups in the compound. The FTIR spectra revealed that, there are  $418.55, 432.05, 445.56, 455.20, 489.92, 507.28, 570.93, 588.29, 607.58, 630.72, 696.30\text{ cm}^{-1}$  (O-Al-O) functional groups (Fig. 3). An intense band centered  $3500\text{ cm}^{-1}$  and other around  $1600\text{ cm}^{-1}$  was assigned to O-H stretching and bending modes of water or alcohol respectively. The wide band appearing between  $500\text{ cm}^{-1}$  and  $900\text{ cm}^{-1}$  corresponds to the vibrational frequencies of co-ordinate O-Al-O bond. The wide band is divided into two peaks. The peaks in the region  $500\text{ - }750\text{ cm}^{-1}$  were assigned  $\nu\text{-AlO}_6$  and the other at  $800\text{ cm}^{-1}$  was assigned to  $\nu\text{-AlO}_4$  in nano  $\text{Al}_2\text{O}_3$  [11]. There are some wide and high peaks of Al-O stretching ( $\text{AlO}_4$  or  $\text{AlO}_6$  vibration) in the range of  $500\text{ - }1000\text{ cm}^{-1}$  ( $507.28, 570.93, 588.29, 607.58, 630.72, 696.30, 756.10, 813.96, 844.82$ ) that relates to the transitional phases of alumina and stable phase of alumina ( $\alpha$ ) [12].

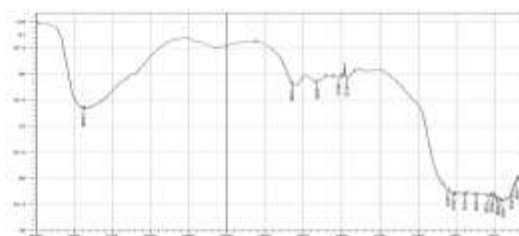


Fig. 3 FTIR of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles

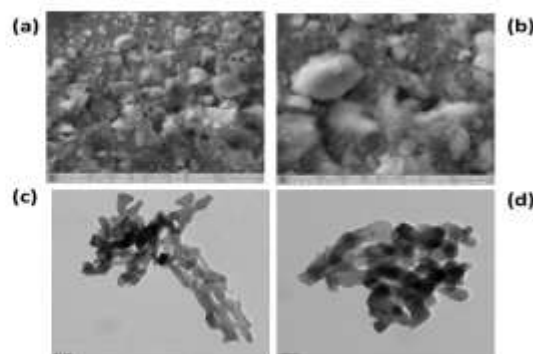


Fig. 4  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles (a,b) SEM images and (c,d) TEM images

### 3.1.4 Scanning Electron Microscopy (SEM)

SEM image gives the distribution pattern and size of the nanoparticles (Fig. 4a and b). The surface morphology of the alumina nanoparticles was obtained through SEM. The SEM micrograph shows irregular shape of particles and sponge like structure.

### 3.1.5 EDAX

EDAX spectrum shows the chemical composition of  $\text{Al}_2\text{O}_3$  nanoparticles analysed by EDAX. Result indicates the presence of Al and O as the main elements. This analysis is important because it confirms that  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles are effectively composed of Al and O with no contamination indication which confirms the formation of alumina nanoparticles.

### 3.1.6 Raman Spectroscopy

Raman spectra shows characteristics peaks at  $378\text{ cm}^{-1}$  and  $416\text{ cm}^{-1}$  (Fig. 2b). The results obtained are in accordance with previous works. Cava et al. [13] reported that transformation of all pure alumina into the single  $\alpha$ -phase was observed starting from  $1050\text{ }^\circ\text{C}$ , the sharp peaks of the  $\alpha$ -phase indicate the relatively large grain sizes and well-defined long-range order in corundum. Peaks due to  $\gamma\text{-Al}_2\text{O}_3$  disappear when the temperature is higher to  $1050\text{ }^\circ\text{C}$ , forming  $\alpha\text{-Al}_2\text{O}_3$  [13]. The powders do not present any impurities, due to incomplete transformations of any intermediate phases, as  $\theta$  and  $\delta$ , as it happens in conventional methods of processing [14]. Usually, by means of traditional methods of synthesis, any aluminum oxide or hydroxide only form  $\alpha\text{-Al}_2\text{O}_3$  when the material is fired upto  $1200\text{ }^\circ\text{C}$  [15].

### 3.1.7 Transmission Electron Microscopy (TEM)

The transmission electron microscope (TEM) analysis was carried out to confirm the actual size of the particles, their growth pattern and distribution of the crystallites. Fig. 4c and d show the TEM image of alumina prepared by sol-gel method. Figure shows the as-synthesized TEM image of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles with some agglomeration. Lin et al. had reported that drying of the sol invariably leads to the agglomeration, since the residual salts present in the sol forms solid bridges between particles as the water evaporates. Besides that, particle size and shape of the  $\alpha$ -alumina are determined by crystal structure of original hydroxide and series of phase transformations that occur during calcinations [16].

## 3.2 Photocatalytic Degradation Studies

### 3.2.1 Effect of pH

The pH of dye solution plays an important role in the whole adsorption process. In this study, MO dye concentration (10 mg),  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles dosage (100 mg) was kept constant and pH of dye varied between 2 to 8 at room temperature. Fig. 5a shows % dye removal at different pH of dye solutions. It also shows higher rate (50%) of MO dye removal at pH 4 and minimum removal (20%) of MO dye was found at pH 6. Monash and Pugazhenthil [17] reported the same trend for the adsorption of crystal violet dye on calcined and uncalcined mixed clay adsorbents. It is reported that, the zero point surface charge (zpc) of metal oxides play important role in the adsorption at different pH. The surface charge of  $\text{Al}_2\text{O}_3$  nanoparticles are strongly affected by the aqueous pH conditions. pHzpc facilitates in predicting the surface behaviour of adsorbent materials. The surface charge is positive at  $\text{pH} < \text{pHzpc}$ , neutral at  $\text{pH} = \text{pHzpc}$  and negative at  $\text{pH} > \text{pHzpc}$ . The pHzpc of the  $\text{Al}_2\text{O}_3$  nanoparticles was found to be 7.4.

At pH 7.4, the net surface charge of adsorbent surface is zero and it becomes electrically neutral whereas at  $\text{pH} > \text{pHzpc}$ , in basic medium, the adsorbent surface becomes negatively charged due to deprotonation thus the adsorption of anionic dye ions get decreased due to Coulomb repulsive forces. In acidic pH condition, when  $\text{pH} < \text{pHzpc}$ , the adsorbent surface is charged positively and leads a higher adsorption of anionic dye due to Coulomb attractive forces. Hence pH of 4.0 was taken as optimum pH for which the adsorbent efficiency for the colour removal of anionic dye is a maximum upto 50% with an initial dye concentration 10 mg/L and  $\text{Al}_2\text{O}_3$  nanoadsorbent dose 100 mg [18, 19]. The result indicate that the adsorption capacity has decreased with increasing pH. Further, at a fixed pH of 4.0 and 10 mg MO dye concentration, the effect of variation of  $\text{Al}_2\text{O}_3$  nanoparticles dosage study was carried out. The results are shown in Fig. 5b. It was observed that, percentage of colour removal was 50% for 100 mg  $\text{Al}_2\text{O}_3$  nanoparticles dose. When  $\text{Al}_2\text{O}_3$  nanoparticles dose was doubled (200 mg) the percentage of colour removal of dye remains nearly constant. This may be due to the fact that as the  $\text{Al}_2\text{O}_3$  nanoparticles dose was increased, the number of active sites on the adsorbent surface and the exposed surface area also increases but when the dose of adsorbent increases above the optimum value, the percentage removal rate

<https://doi.org/10.30799/jnt.192.19030101>

Cite this Article as: Vijaya P. Dhawale, Datta J. Late, Satish D. Kulkarni, Synthesis, characterization of  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles and its application in decolorization of methyl orange azo dye in the presence of UV light, J. Nanosci. Tech. 5(1) (2019) 580-583.

decreases due to interception of the light by the suspension [20]. Also excess dose of adsorbent prevent the illumination, 'OH radical, primary oxidant in the photocatalytic system decreased and the efficiency of the colour removal reduced accordingly. Furthermore, the increase of nanoparticle adsorbent dosage beyond the optimum may result in the agglomeration of nanoparticles, hence more adsorbent surface become unavailable for photo absorption and percentage of colour removal rate of adsorbent decreases [21].

### 3.2.2 Effect of Adsorbent Dose

The use of nanoadsorbent increases surface area of the adsorbent which can lead to more degradation of dye molecules. To investigate the effect of adsorbent dose on the colour removal of dye, experiments were conducted with  $\alpha\text{-Al}_2\text{O}_3$  nanoadsorbent dose 50 to 100 mg in 1000 mL dye solution at room temperature. It was found that with increase in adsorbent dose, percent degradation of dye molecules increases. Maximum 37% colour removal of dye occurred at 100 mg  $\alpha\text{-Al}_2\text{O}_3$  nanoadsorbent dose because of increased surface area of nanoparticles which provides more active sites for binding. The variation of % dye removal with respect to  $\alpha\text{-Al}_2\text{O}_3$  nano adsorbent dose are shown in Fig. 5c.

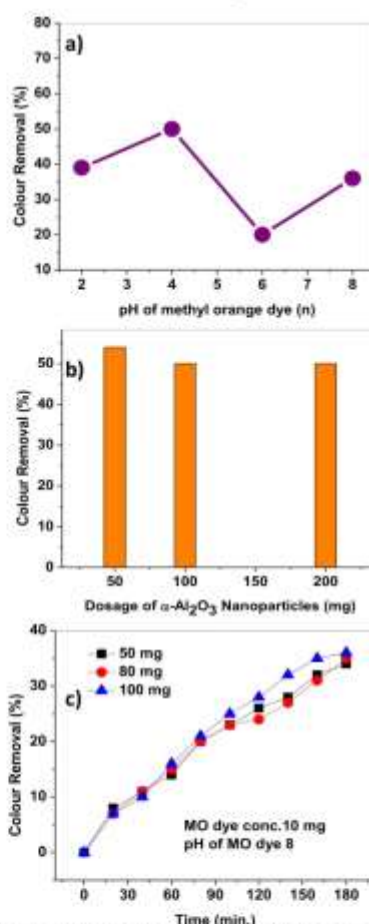


Fig. 5 (a) Variation of % colour removal with pH, (b) Variation of % colour removal with nanoadsorbent dosage and (c) the variation of % colour removal with different  $\alpha\text{-Al}_2\text{O}_3$  nanoparticles dosage

An attempt was made to enhance % colour removal as a function of nanoadsorbent dose in a solution of pH 4 and pH 8 (Fig. 5b and c). It was found that a fixed methyl orange dye concentration (10 mg) and fixed  $\text{Al}_2\text{O}_3$  nanoadsorbent dose (100 mg), maximum percentage of dye removal was 50% and 37% for pH 4 and pH 8 respectively. A slower rate of colour removal of dye was attributed to higher molecular weight and structural complexity of the dyes [22].



### 3.2.3 Effect of Initial Dye Concentration

The initial concentration of dye in a given photocatalytic reaction is also another factor which needs to be taken into account. It was found that percent degradation decreases with increasing amount of dye concentration, while keeping a fixed amount of catalyst [23].

### 3.2.4 Effect of Contact Time

Effect of contact time was studied in the batch mode at methyl orange dye concentration (10 mg/L). The average amount of dye adsorbed (%q<sub>e</sub>) in batch experiment was found to be 226.05 mg/g after three hours (Table 1). Result suggests that the adsorption capacity of dyes increases with increasing contact time. The rate of dye removal is initially high due to high concentration gradient and more availability of adsorption sites. The rapid transport of dye molecules from aqueous solutions to the bulk makes the adsorption fast. Surface of Al<sub>2</sub>O<sub>3</sub> nanoparticles is charged and net charge at the surface at a particular pH governs adsorptive removal of dye from the solution. The variation of % colour removal with respect to contact time are shown in Fig. 5c.

**Table 1** Amount of dye adsorbed (%q<sub>e</sub>) in batch experiment for concentration of methyl orange dye =10 mg/L.

pH of methyl orange dye	Dosage of alumina nanoadsorbent	Amount of dye adsorbed in batch experiment after 3 hours
0	50	391.8
0	80	240.8
0	100	210.8
2	100	166.0
4	100	221.1
6	100	85.4
8	100	210.8
4	50	460.3
4	100	166.0
4	200	107.5
Total Amount of dye adsorbed in batch experiment after 3 hours		2260.5
Average Amount of dye adsorbed in batch experiment after 3 hours		226.05

## 4. Conclusion

Aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>) were successfully synthesized by sol-gel method and the average crystal size was found to be 25 nm having rhombohedral structure from XRD technique. Band gap is 3.31 eV obtained from UV-visible spectra. FTIR spectra shows the (O-Al-O) functional groups thereby indicate formation of aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>). X-Ray diffraction patterns confirm the formation of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles. The formation of aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>) was validated from Raman spectra, SEM, EDAX and TEM analysis. Photo degradation study shows that MO dye can be successfully removed from the aqueous solution by adsorption on aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>). It can be effective, reliable and economically used for controlling water pollution due to dyes. The batch adsorption experiments shows that adsorption of MO dye over aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>) is dependent on pH, amount of adsorbent, initial dye concentration and contact time. pH of the dye plays important role in colour removal process. At pH 4 and 10 mg concentration of methyl orange dye, maximum colour removal was obtained 50% when aluminium oxide nanoparticles ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>) dose was 100 mg. So the aluminium oxide nanoadsorbent ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>) used in this study seems to be very promising for the application in waste water treatment and focus the attention on techniques leading to complete removal of dyes. The present work opens new avenue for the next generation.

## Acknowledgement

Smt. Dhawale V. P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under faculty improvement program.

## References

- [1] P. Nigam, G. Armour, I.M. Banat, D. Singh, R. Marchant, Physical removal of textile dyes from effluents and solid-state fermentation of dye-adsorbed agricultural residue, *Biores. Tech.* 72 (2000) 219-226.
- [2] R. Ansari, Z. Mosayebzadeh, Removal of basic dye methylene blue from aqueous solutions using sawdust and sawdust coated with polypropylene, *J. Iran Chem. Soc.* 7 (2010) 339-350.
- [3] A. Khaled, P.M. Kapoor, K.J. Klabunde, Nanocrystalline metal oxides as new adsorbents for air purification, *Nanostruct. Mater.* 13(4) (1999) 459-468.
- [4] Y.C. Sharma, V. Srivastava, S.N. Upadhyay, C.H. Weng, Alumina nanoparticles for the removal of Ni (II) from aqueous solutions, *Indus. Eng. Chem. Res.* 47 (2008) 8095-8100.
- [5] N. Varghese, M. Hariharan, A.B. Chertan, P.V. Sreenivasan, J. Paul, A. Antony, PVA - Assisted Synthesis and Characterization of Nano  $\alpha$ -Alumina, *Int. J. Sci. Res. Pub.* 4(10) (2014) 1-5.
- [6] Z. Zhang, T.M. Nenoff, K. Leung, S. Ferreira, J. Huang, et al., Room temperature synthesis of Ag-Ni and Pd-Ni alloy nanoparticles, *J. Phys. Chem. C* 114 (2010) 14309-14318.
- [7] H. Hassena, Photocatalytic degradation of methylene blue by using Al<sub>2</sub>O<sub>3</sub>/Fe<sub>2</sub>O<sub>3</sub> nano composite under visible light, *Mod. Chem. Appl.* 4 (2016) 176-1-5.
- [8] M. Farahmandjou, N. Golabiyani, Solution combustion preparation of nano-Al<sub>2</sub>O<sub>3</sub> synthesis and characterization, *Trans. Phenom. Nano Micro Scale.* 3(2) (2015) 100-105.
- [9] M. Farahmandjou, N. Golabiyani, Synthesis and characterization of alumina (Al<sub>2</sub>O<sub>3</sub>) nanoparticles prepared by simple sol-gel method, *Int. J. Bio-Inorg. Hybr. Nanomater.* 5(1) (2016) 73-77.
- [10] Y. Hyuk-joon, W.J. Jin, T.K. Lu S.H. Kug, Temperature formation of  $\alpha$ -alumina by doping of an alumina sol, *J. Colloid Interf. Sci.* 211(1) (1999) 110-113.
- [11] M.R. Karim, M.A. Rahman, M.A.J. Miah, H. Ahmad, M. Yanagisawa, M. Ito, Synthesis of  $\alpha$ -alumina particles and surface characterization, *The Open Colloid Sci. J.* 4 (2011) 32-36.
- [12] H. Arami, M. Mazlumi, K. Khalifebzadeh, S.K. Sarnezhaad, Bundles of self-assembled boehmite nanostrips from a surfactant free hydrothermal route, *J. Alloys Comp.* 461 (2008) 551-554.
- [13] S. Cava, S.M. Tebchevani, I.A. Souza, S.A. Pizarro, C.A. Paschoenimas, et al., Structural characterization of phase transition of Al<sub>2</sub>O<sub>3</sub> nanopowders obtained by polymeric precursor method, *Materials Chem. Phys.* 103 (2007) 394-399.
- [14] R.J. Damani, P. Makroczy, Heat treatment induced phase and microstructural development in bulk plasma sprayed alumina, *J. Eur. Ceram. Soc.* 20 (2000) 867-888.
- [15] C. Zuo, P.W. Jagodzinski, R-line luminescence from trace amounts of Cr<sup>3+</sup> in aluminium oxide and its dependence on sample hydration, *Appl. Spectrosc.* 56 (2002) 1055-1058.
- [16] A. Sedaghat, E. Taheri-Nasaj, R. Naghizadeh, An alumina mat with a nano microstructure prepared by centrifugal method, *J. Non-Cryst. Solids* 352(26-27) (2006) 2818-2828.
- [17] P. Monash, G. Pugazhenth, Removal of crystal violet dye from aqueous solution using calcined and uncalcined mixed clay adsorbents, *Sep. Sci. Tech.* 45(1) (2009) 94-104.
- [18] Y.M. Zheng, N. Li, W.D. Zhang, Preparation of nanostructured microspheres of Zn-Mg-Al layered double hydroxides with high adsorption property, *Colloids Surf. A: Physicochem. Engg. Aspects* 415 (2012) 195-201.
- [19] P. Monash, G. Pugazhenth, Utilization of calcined Ni-Al layered double hydroxide (LDH) as adsorbent for removal of methyl orange dye from aqueous solution, *Environ. Prog. Sustain. Energy* 33 (2014) 154-159.
- [20] K. Byrappa, A.K. Subramani, S. Ananda, R.K.M. Lokanatha, R. Dinesh, Photocatalytic degradation of Rhodamine B dye using hydrothermally synthesized ZnO, *Bull. Mater. Sci.* 29 (2006) 433-438.
- [21] J. Sun, L. Qiao, S. Sun, G. Wang, Photocatalytic degradation of Orange G on nitrogen - doped TiO<sub>2</sub> catalyst under visible light and sunlight irradiation, *J. Hazard. Mater.* 155 (2008) 312-319.
- [22] M. Huang, C. Xu, Z. Wu, Y. Huang, J. Lin, Photocatalytic discolorization of methyl orange solution by Pt modified TiO<sub>2</sub> loaded on natural zeolite, *Dyes Pig.* 77 (2008) 327-334.
- [23] H.T. Lee, S. Wu, Assessment of the effect of azo dye Rp2B on the growth of nitrogen fixing cyanobacterium - *Anabaena* Sp., *Bioresour. Technol.* 77 (2001) 93-95.

<https://doi.org/10.30799/int.192.19050101>

Cite this Article as: Vijaya P. Dhawale, Datta J. Late, Satish D. Kulkarni, Synthesis, characterization of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> nanoparticles and its application in decolorization of methyl orange azo dye in the presence of UV light, *J. Nanosci. Tech.* 5(1) (2019) 580-583.

## 54. Phytotoxicity and stimulated impact of nanoparticles and seedling growth of Moth Bean

1107

Environment and Ecology 37 (3B) : 1107–1113, July–September 2019  
Website: environmentandecology.com ISSN 0970-0420

### Phytotoxicity and Stimulatory Impact of Silver Nanoparticles on Seedling Growth of Moth Bean

Dhawale V. P., K. C. Mohite, S. D. Kulkarni

Received 17 April 2019; Accepted 20 May 2019; Published on 10 June 2019

**Abstract** Silver nanoparticles (AgNPs) are one of the most widely used nanoparticles and expected to enter natural ecosystem. We have investigated the effects of AgNPs on plant growth parameters such as % Germination, root length, shoot length, biomass, seedling vigor index (SVI) of an important pulses, moth beans (*Vigna aconitifolia*). Three concentrations of AgNPs viz. 50, 100, 150 mg/L were used to test the growth parameters. Among the treatments, application of 100 mg/L concentration of AgNPs proved best by giving the highest values for percent seed germination, root length, shoot height and seedling vigor index. A significant negative influence on biomass and root length was observed for all seeds in compared to those of control germination. Application of 150 mg/L AgNPs concentrations decreased mean germination time in comparison to control. Overall, this study has shown that direct exposure of germinating seeds to AgNPs may cause phytotoxicity and underscores the need

for eco-responsible disposal of wastes and sludge containing nanoparticles.

**Keywords** Phytotoxicity, Silver nanoparticles, Moth bean, Seedling growth.

#### Introduction

Distinct properties of nanomaterials ( $\text{\AA}$  100 nm) such as large surface area to volume ratio, small size and high reactivity enable them to find applications in various industrial sectors and our daily lives (Handford et al. 2014). There has been rising demand for nanotechnology-based products in recent years. Nanotechnology has many applications in the field of agricultural research, such as in reproductive science and technology disease prevention and various other plant treatments, the transfer of agricultural and food waste to energy and other helpful by-products through enzymatic nanobioprocessing and various other plant treatments using nanocides (Carmen et al. 2003). Silver nanoparticles, is one of the most commonly used in the field of agriculture due to their antimicrobial and safety potential associated with human and environmental use. Silver nanoparticles have been used to create new consumer products, drugs, various food and other medical products.

Efficient seed germination and early seedling establishment are important processes in commercial agriculture. Rapid and uniform seedling emergence leads to successful plant establishment. Some reports have shown that both positive and negative impact on seed germination and seedling growth. Unique properties of nanoparticles can be used to improve

Dhawale V. P\*,  
Post Graduate, Department of Physics, New Arts Commerce and Science College, Parner, Ahmednagar 414302, India

K. C. Mohite  
Post Graduate, Department of Physics, C.T. Bora College, Shirur, Pune 412210, India

S. D. Kulkarni  
Post Graduate, Department of Environmental Science, New Arts Commerce and Science College, Ahmednagar 414001, India  
e-mail: vjaya.dhawale2009@gmail.com  
\*Corresponding author

1108

seed germination and crop performance. Gubbins et al. (2011) demonstrated that AgNPs could inhibit the growth of *Lemna minor*. Only few studies on vascular plants showed that AgNPs have deleterious effects on plant growth (Stampoulis et al. 2009). Pulate et al. (2011), Patilola et al. (2012) found that nanoparticles have different levels of toxicities which may be size and shape dependent and have ability of penetrate the cell walls. Phytotoxicity studies reported both positive and negative effects of nanoparticles on higher plants as seed germination, cell division, root elongation, growth and metabolic processes (Carlson et al. 2008). Lin and Xing (2007) evaluate phytotoxicity of five types of metallic nanoparticles in six plant species and showed that seed germination was not affected except for the inhibition of nanoscale zinc oxide on *Zea mays* and nanoscale zinc on *Lolium multiflorum*. They found that inhibition of root growth varied significantly among nanoparticles and plants and that it was partially correlated to nanoparticle concentrations. Kumar et al. (2011) investigated that AgNPs had cytotoxic and genotoxic impacts on *Allium cepa* meristems.

*Vigna aconitifolia*, commonly known as moth beans is a popular Indian crop cultivated as a forage and cover crop. It is also grown in Pakistan, United States, Thailand, Australia and other parts of Asia. Moth beans are an excellent source of proteins and other essential minerals and vitamins. These are considered to be effective in the prevention of constipation heart diseases, high blood pressure, high cholesterol, osteoporosis and low energy.

Rapid and uniform seedling emergence leads to successful plant establishment, as a deep root system is formed before the upper layers of the soil dry out, harden or reach supra-optimal temperatures (Chen and Arora 2013). The unique properties of nanoparticles can be used to improve seed germination and crop performance. This use of the positive impacts of nanoparticles may be useful approach to decrease use of chemical agents in agriculture that would help to lower environmental pollution. Poor seed germination is a common occurrence in pulses and there are no studies on the effects of nanoparticles on *Vigna aconitifolia*. This study was therefore carried out to investigate possible phytotoxicity and/or beneficial

stimulatory effects of AgNPs concentrations on moth bean seed and seedling growth.

## Materials and Methods

### Nanoparticle preparation

The sol-gel method was used for preparation of silver nanoparticles. silver nitrate ( $\text{AgNO}_3$ , 99.9%) and sodium oleate ( $\text{C}_{18}\text{H}_{33}\text{NaO}_2$ , 99%) were purchased from Molychem and Modern industries respectively. It was used without further purification, 1M silver nitrate ( $\text{AgNO}_3$ ) and 1M sodium oleate ( $\text{C}_{18}\text{H}_{33}\text{NaO}_2$ ) solution in deionized water were prepared. Sodium oleate was added in silver nitrate solution and stirred at 20°C on a magnetic stirrer for 2 h. After that filtered by Whatmann filter paper, dried mixture and heated in furnace at 300°C for 4 h (Kim et al. 2004).

### Preparation of nanoparticles suspension

Nanoparticles stock suspensions (1000 mg/L) was prepared by pre-weighed AgNPs in deionized water (DI-water) and dispersed by ultrasonic vibration (100 W, 40 kHz) for 30 min. For further stabilization of nanoparticle suspension, 10% (v/v) polyethylene glycol (PEG-400) a dispersant was added (Zhang et al. 2007). The suspensions were sonicated again for at least 1 min before use.

### Seeds germination and exposure

Seeds of moth bean (*Vigna aconitifolia*) were purchased from the local market. The seeds were stored in dark under room temperature. All the seeds were checked for their viability by suspending them in deionized water. The seeds which settle to the bottom were selected for further study. Seeds were immersed in 10% sodium hypochloride for 10 minutes to ensure surface sterility (USEPA 1996). After rinsing three times with DI-water, seeds were soaked in deionized water (control) and different concentrations of AgNPs suspension solution. To investigate the promotory and inhibitory effects of nanomaterials on moth bean, three concentrations (50, 100, 150 mg/L) were prepared. Seeds were soaked in each suspensions (50, 100, 150 mg/L) for 2 h. One piece of a moisture germination paper was into each 100 mm × 15 mm

petri dish. In each petri dish 5 ml of test medium of AgNPs (50, 100 and 150 mg/L) were added. Seeds were then transferred onto the moisture germination paper, with 10 seeds per dish and 1 cm of larger distance between each seed (Yang and Watts 2005). Petri dishes were covered and sealed with tape and allowed to germinate. All concentrations of AgNPs and the control were tested at the same time to ensure uniform conditions of light and temperature across all tests. Seeds were considered germinated when the radical showed at least 2 mm in length (ISTA 2009). The dry weight of seedling was recorded and expressed in gram after oven drying at 70°C for 72 h.

Germination percentage was calculated when no further germination took place. Mean germination time was calculated based on Mathews and Khajeh-Hosseini (2007) (Eq. (1)).

$$MGT = \frac{\sum FX}{\sum F} \quad (1)$$

Where *F* is the number of seeds newly germinated at the time of *X* and *X* is the number of days

from sowing. After germination, the length of roots and shoots for all treatments and related controls (untreated) were measured.

For the germination rate and root and shoot growth investigation, seeds were allowed to germinate for 10 days. Seed germination and percent (FGP) of each treatment was calculated. Seedling root length and shoot length was measured. A seed was considered to have germinated when radical emerged from the seed coat according to the following equation (Ellis and Robert 1981, Ruan et al. 2002).

$$FGP = \frac{\text{No. of germinated seeds after 4 days}}{\text{Total number of germinated seeds}} \times 100$$

Germination Index (GI)

Germination index was calculated according to the following equation

$$GI = \frac{\text{Germination percentage of each treatment}}{\text{Germination percentage in the control}} \times 100$$

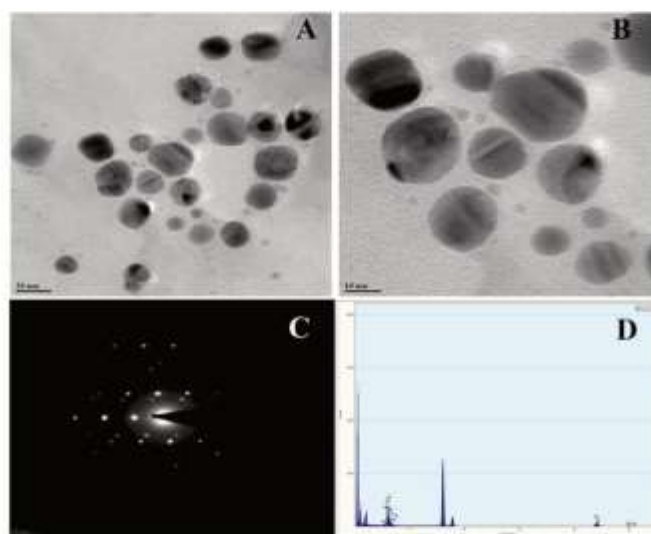
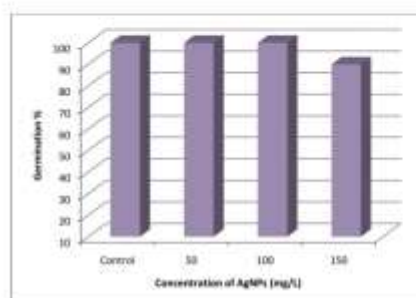


Fig. 1. Transmission electron micrographs (TEM) (A, B), selected area electron diffraction pattern (C) and EDAX of Ag nanoparticles (D).

1110



**Fig. 2.** Effect of different concentrations of AgNPs on germination percent of *Vigna acuminifolia*.

#### Seedling Vigor Index (SVI)

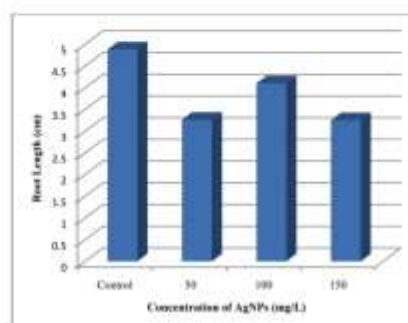
It was calculated according to the following formula

$$SVI = \frac{\text{Average shoot length}}{\text{Average root length}} \times \text{Germination percentage}$$

#### Results and Discussion

The transmission electron microscopy (TEM) image Figure 1 (A, B), selected area electron diffraction (SAED) pattern of AgNPs and EDAX are shown in Figure 1 (C, D). The TEM micrographs indicated that the AgNPs shows spherical morphology and their average particle size were found to be 17.3 nm by ImageJ software EDAX spectrum shows the chemical composition of AgNPs. Result indicates the presence of Ag as the main element. This analysis confirms that AgNPs are effectively composed of Ag with no contamination. The SAED pattern of AgNPs shows that the rings are composed of dots suggesting the crystalline nature of these particles.

The effect of AgNPs on germination of moth beans at 50, 100 and 150 mg/L concentration was examined. The obtained data clearly revealed slightly negative effects on seed germination percent as compared to the control (untreated) (Fig. 2). These results indicating that AgNPs had insignificant toxicological effect on seed germination. This may be due to the selective permeability of seed coats that does not allow nanoparticle material to pass through it (Lin and



**Fig. 3.** Effect of different concentrations of AgNPs on root length of *Vigna acuminifolia*.

Xing 2007, Wierzbicka and Obidzinska 1998). These findings agree with recent reports stating that seed germination for different species was not affected by  $n\text{Al}_2\text{O}_3$  (Yang and Watts 2005, Lee et al. 2010). Burklew et al. (2012) have been stated that the seed coat of tobacco seeds were most likely permeable to the  $\text{Al}_2\text{O}_3$  nanoparticles, therefore the germination rate was not affected.

Regarding root growth exposure to AgNPs has a marked reduction in root length where the highest average growth was 4.1 cm after treatment with 100 mg/L concentration as compared to the control (4.88 cm). However minimum root length was observed in 3.25 cm in 150 mg/L AgNPs concentration (Fig. 3). These findings are consistent with other studies which reported that exposure of some seeds to several nanomaterials significantly reduced root growth (Yin et al. 2012). Dietz and Herth (2011) stated that nanoparticles may have to penetrate cell walls of plasma membranes of epidermal layers in root to intervascular tissues explaining why to root exposure was strong. Seed coats, which can have selective permeability play a very important role in protecting the embryo from harmful external factors. The process of seed germination and a root growth is rapid and widely used acute phytotoxicity test owing to sensitivity, simplicity, low cost and suitability for unstable chemicals. Pollutants as nanoparticles could penetrate root system causing obviously growth inhibition, may not affect seed germination if they cannot

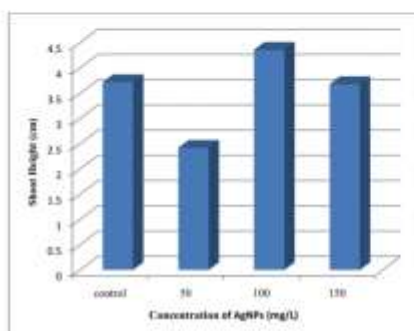


Fig. 4. Effect of different concentrations of AgNPs on shoot height of *Vigna aconitifolia*.

pass through seed coats. This may explain that seed germination in this study was not greatly affected by nanoparticles.

Seeds with high vigor is important for crop production because it cannot significantly enhance seedling establishment but also improve the capability to compete against weeds at seedling stage. Huang et al. (2004) stated that seedling vigor is the ability of seed to rapidly from water or soil mainly reference to seed germination rate and early seedling growth. A significant reduction on SVI of various nanoparticle concentration was observed as compared to control

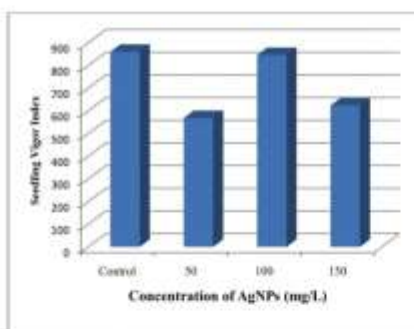


Fig. 5. Effect of different concentrations of AgNPs on seedling vigor index of *Vigna aconitifolia*.

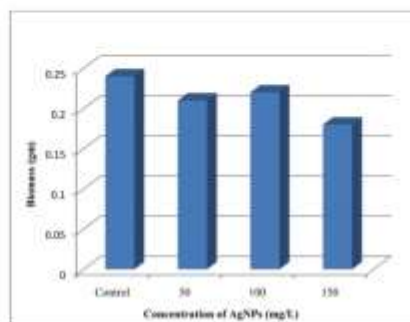


Fig. 6. Effect of different concentrations of AgNPs on biomass of *Vigna aconitifolia*.

(Fig. 5). Highest seedling vigor index was produced in 100 mg/L AgNPs concentration which was 486 followed by 623.7 and 568 in 150 mg/L and 50 mg/L AgNPs concentrations respectively.

Shoot, root and biomass was significantly affected by AgNPs concentrations. Application of AgNPs in 50 mg/L concentration greatly decreased shoot height (2.42 cm) compared to control seeds (3.72 cm). The highest shoot length (4.36 cm) was observed in 100 mg/L concentration showing significant positive effect (Fig. 4). The greatest biomass was found in 100 mg/L AgNPs concentration (0.22 g). Application of 150 mg/L AgNPs concentration greatly decreased biomass (0.18 g) compared to the control seeds (0.24 g), but at the concentrations of 100 mg/L (0.22 g) did not demonstrate a marked reduction in biomass (Fig. 6). It is probable that increasing the concentration of AgNPs induced aggregation of particles and resulted in clogging of pores that interrupted water uptake by seeds. In addition, application of 100 mg/L concentration of AgNPs increased moth beans seedling root length, shoot height and biomass. However, a significant decrease was observed at 150 mg/L concentration of AgNPs. It seems that AgNPs could stimulate process of seed germination just like water and oxygen uptake results in, improved seed germination percentage but in later growth stages seedling might respond as different. Lin and Xing (2007) confirmed the phytotoxicity of nano-Al and Al<sub>2</sub>O<sub>3</sub> significantly affected root elongation of rye

1112

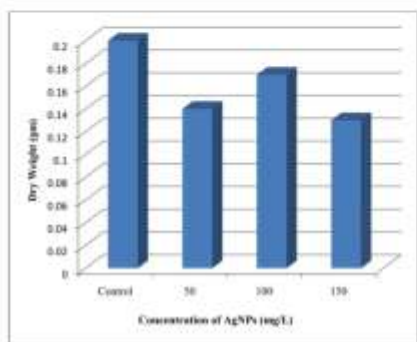


Fig. 7. Effect of different concentrations of AgNPs on dry weight of *Vigna acouitifolia*.

grass and corn respectively whereas nano-Al facilitated root growth in radish and rape. Bamea et al. (2009) stated that although root length and weight are not standardized in toxicity tests, they may be helpful to compare the toxicity effects after seed exposure to nanoparticles since low values can be related to non-acute toxicological effects.

Significant reduction in dry weight was observed as compared to control, the results are graphically illustrated in Fig. 7. In general, lower mean germination time shows the earlier germination. In the present study moth bean seeds were exposed to 50, 100 and 150 mg/L AgNPs concentrations. The results revealed that seeds in 50 and 100 mg/L AgNPs concentrations obtained the lowest mean germination

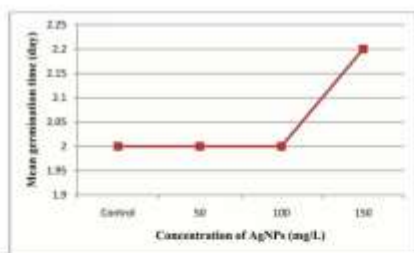


Fig. 8. Effect of different concentrations of AgNPs on mean germination time of *Vigna acouitifolia* seed.

time (2 d) same as that of control. However higher AgNPs concentration (150 mg/L) did not improve mean germination time (Fig. 8). Zheng et al. (2005) stated that the considerable effect of nanosized TiO<sub>2</sub> in spinach germination in tests was probably because of small particle size, which allowed nanoparticles to penetrate the seed during the treatment period, exerting its enhancing function during growth. Feizi et al. (2013) observed that the mean germination time in 40 ppm concentration of nanosized TiO<sub>2</sub> treatment reduced by 31.8% and of bulk TiO<sub>2</sub> treatment (40 ppm concentration) reduced by 21% in comparison with the control.

**Conclusion**

Seed germination and seedling growth is a rapid and widely used phytotoxicity test owing to sensitivity, simplicity, low cost and suitability for unstable chemicals. Seed coat play an important role in protecting the embryo from harmful external factors. Pollutants as nanomaterials may not affect seed germination but could penetrate root system causing obviously root growth inhibition. Our findings indicate that germination percentage was not adversely affected after all treatments whereas root growth, shoot height, biomass and seedling vigor index have negative impact after treatment with the various concentrations of AgNPs as compared to the control. It was observed that low and higher AgNPs concentrations have more adverse effects as compared to intermediate concentration on seedling growth (100 mg/L).

Overall, the study demonstrates the adverse effects of AgNPs on seedling growth, which underscores the necessity of taking remedial measures in the disposal of wastes and sludge containing the nanoparticles and calls for further research for assessing the potential impacts of manufactured nanoparticles on agriculture and environmental systems.

**Acknowledgement**

Smt Dhawale V.P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship under faculty improvement program.

## References

- Barnea R, Casals E, Colón J, Font X, Sánchez A, Puentes V (2009) Evaluation of the ecotoxicity of model nanoparticles. *Chemosphere* 75 : 850–857.
- Burklew CE, Ashlock J, Winfrey WB, Zhang B (2012) Effects of aluminum oxide nanoparticles on the growth, development, and microRNA expression of tobacco (*Nicotiana tabacum*). *PLoS ONE* 7 (5) : e34783.
- Carlson C, Hussain SM, Schrand AM, Brayditch-Stolle LK, Hess KL, Jones R, Schlager JJ (2008) Unique cellular interaction of silver nanoparticles : Size dependent generation of reactive oxygen species. *J Physical Chem* 112 (43) : 13608–13619.
- Carmen IU, Chithra P, Huang Q, Takhistov P, Liu S, Kokini JL (2003) Nanotechnology : A new frontier in food science. *Food Technol* 57 : 24–29.
- Chen K, Arora R (2013) Priming memory invokes seed stress-tolerance. *Environm Experim Bot* 94 (1) : 33–45. DOI : org/10.1016/j.envexpbot.2012.03.005
- Dietz KJ, Herth S (2011) Plant nanotoxicology. *Trends in Pl Sci* 16 : 582–589. doi: 10.1371/journal.pone.0047674
- Ellis RH, Robert EH (1981) The quantification of aging and survival of orthodox seeds. *Seed Sci Technol* 9 : 373–409.
- Feizi H, Kamali M, Jafari L, Moghaddam R (2013) Phytotoxicity and stimulatory impacts of nanosized and bulk titanium dioxide on fennel (*Foeniculum vulgare* Mill). *Chemosphere* 91 : 506–511.
- Gubbins EJ, Batty LC, Lead JR (2011) Phytotoxicity of silver nanoparticles to *Lemna minor* L. *Environm Poll* 159 : 1551–1559.
- Handford CE, Dean M, Henchion M, Spence M, Elliott CT, Campbell K (2014) Implications of nanotechnology for the agric-food industry : Opportunities, benefits and risks. *Trends food Sci Technol* 40 (2) : 226–241.
- Huang Z, Yu T, Su L, Yu SB, Zhang ZH, Zhu YG (2004) Identification of chromosome regions associated with seedling vigor in rice. *Yi Chuan Xue-Bao* 31 : 596–603.
- ISTA (2009) ISTA rules. International Seed Testing Association. Zurich, Switzerland.
- Kumar N, Shah V, Walker YK (2011) Perturbation of an arctic soil microbial community by metal nanoparticles. *J Hazard Mater* 190 : 816–822.
- Lee CW, Mahendra YS, Zdrorow YK, Li YD, Tsai YY-C, Braam J, Alvarez PJJ (2010) Developmental phytotoxicity of metal oxide nanoparticles to *Arabidopsis thaliana*. *Environ Toxicol Chem* 29 : 669–675.
- Lin D, Xing B (2007) Phytotoxicity of nanoparticles : Inhibition of seed germination and root growth. *Environ Poll* 150 : 243–250.
- Matthews S, Khajeh-Hosseini M (2007) Length of the lag period of germination and metabolic repair explain vigor differences in seed lots of maize (*Zea mays*). *Seed Sci Technol* 35 : 200–212.
- Patilola AK, Berry A, May L, Tehounwou PB (2012) Genotoxicity of silver nanoparticles in *Vicia faba* : A pilot study on the environmental monitoring of nanoparticles. *Int J Environ Res Public Hlth* 9 (5) : 1649–1662.
- Palate PV, Gharde MJ, Deshmukh VR (2011) Cytological effects of the biological and chemical silver-nanoparticles in *Allium cepa* L. *Int J Innovat Bio-Sci* 1 : 32–35.
- Ruan S, Xue Q, Tylkowska K (2002) The influence of priming on germination of rice (*Oryza sativa* L.) seeds and seedling emergence and performance in flooded soil. *Seed Sci Technol* 30 : 61–67.
- Stampoulis D, Sinha SK, White JC (2009) Assay-dependent phytotoxicity of nanoparticles to plants. *Environ Sci and Tech* 43 : 9473–9479.
- US Environmental Protection Agency (USEPA), Ecological effects test guidelines : Seed germination/root elongation toxicity test. OPPTS 850. 4200. EPA 712-c-96- 154, Washington, DC, Salama, 1996.
- Wierzbicka M, Obidzinska J (1998) The effect of lead on seed inhibition and germination in different plant species. *Pl Sci* 137 : 155–171.
- Yang L, Watts DJ (2005) Particle surface characteristics may play an important role in phytotoxicity of alumina nanoparticles. *Toxicol Letters* 158 : 122–132.
- Yin L, Benjamin PC, Bonnie MM, Justin PW, Emily SB (2012) Effects of silver nanoparticle exposure on germination and early growth of eleven wetland plants. *PLoS ONE* 7 : 47674.
- Zhang LL, Jiang YH, Ding YL, Povey M, York D (2007) Investigation in to the antibacterial behavior of suspensions of ZnO nanoparticles (ZnO nanofluids). *J Nanoparticle Res* 9 : 479–489.
- Zheng L, Hong F, Lu S, Liu C (2005) Effect of nano-TiO<sub>2</sub> on strength of naturally aged seeds and growth of spinach. *Biol Trace Element Res* 105 : 83–91.



## 55. Synthesis and Antibacterial Screening of Novel Thiazolyl Pyrazole and Benzoxazole



**ORIENTAL JOURNAL OF CHEMISTRY**  
An International Open Access, Peer Reviewed Research Journal

www.orientjchem.org

ISSN: 0970-020 X  
CODEN: OJCHEG  
2019, Vol. 35, No.(1):  
Pg. 481-484

Brief Communication

## Synthesis and Antibacterial Screening of Novel Thiazolyl Pyrazole and Benzoxazole

VAIBHAV PRABHAKAR LANDAGE<sup>1</sup>, DILIP RAOSAHEB THUBE<sup>1\*</sup>  
and BHAUSAHEB KISAN KARALE<sup>2\*</sup>

<sup>1</sup>Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar-414302, India,

<sup>2</sup>Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar-414001, India,

\*Corresponding author Email: drthube@rediffmail.com

<http://dx.doi.org/10.13005/ojc/350164>

Received: June 18, 2018; Accepted: December 10, 2018)

### ABSTRACT

A new series of (2-hydroxyphenyl)(1-(4-p-tolylthiazol-2-yl)-1H-pyrazol-4-yl)methanone 3a-g, 2[(E)-(1-[4-(p-tolyl)-1, 3-thiazol-2-yl]-1H-pyrazol-4-yl)](hydroxyimino)methylphenol 4a-g and 2-(1-(4-p-tolylthiazol-2-yl)-1H-pyrazole-4-yl)benzo[d]oxazole 5a-g have been synthesised. These synthesised compounds have been characterised by the spectral, analytical data and scanned for their antibacterial activities.

**Keywords:** Thiazole, 3-formylchromone, Pyrazole, Benzo[d]oxazole.

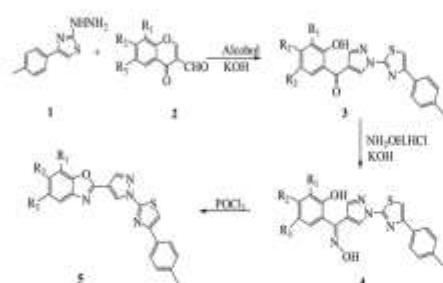
### INTRODUCTION

The introduction of heterocyclic moieties found in molecules have advantage in drug discovery and development because of its broad range of biological activities. Thiazole and its derivatives show biological activities such as anti-inflammatory<sup>1</sup>, analgesic<sup>2</sup>, antimicrobial<sup>3,4</sup>, antioxidant<sup>5</sup>, antitumor<sup>6,7</sup>, anticonvulsant<sup>8</sup>, 3-formylchromone and its derivatives are known to associate in organic synthesis<sup>9</sup> and showing biological activities include antitumor<sup>10</sup>, antibacterial<sup>10</sup>, antitubulin<sup>11</sup>, anti-helicobacter pylori<sup>12</sup>, antiallergic<sup>13</sup>, antioxidant<sup>14</sup>, topoisomerase I inhibitor<sup>15</sup>. Pyrazole containing heterocyclic molecules are associated with wide range of biological

activities such as antimicrobial<sup>16</sup>, anticancer<sup>17</sup>, antifungal<sup>18</sup>, anti-inflammatory<sup>19</sup>, antitumor<sup>20</sup>, and anti-anxiety<sup>21</sup>. Benzoxazoles derivatives are found to be associated with anticancer<sup>22</sup>, antimicrobial<sup>23</sup>, HIV-1 reverse transcriptase inhibitor Activity<sup>24</sup>, inhibitors of lysophosphatidic acid acyltransferase-beta<sup>25</sup>, anti-inflammatory<sup>26</sup>, analgesic<sup>26</sup>, antibacterial<sup>27</sup>, antifungal<sup>27</sup>, anticancer<sup>28</sup> activities. As a part of our interest in heterocyclic molecules have a extensive variety of biological activities and that have been explored for developing pharmaceutically important molecules, we here in report the synthesis of a set of new series of thiazolyl pyrazoles and benzoxazoles and their antibacterial activities.

This is an Open Access article licensed under a Creative Commons license: Attribution 4.0 International (CC-BY).  
Published by Oriental Scientific Publishing Company © 2018





Scheme 1

Table 1: Physical characterisation of synthesised derivatives

Derivatives	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Yield(%)	m.p.(°C)
3a	H	H	Me	62	220-222
3b	H	H	Cl	64	230-232
3c	H	Me	H	60	236-238
3d	H	Me	Cl	68	204-206
3e	H	H	H	61	186-188
3f	H	H	Br	63	228-230
3g	Cl	H	Cl	65	210-212
4a	H	H	Me	58	232-234
4b	H	H	Cl	54	246-248
4c	H	Me	H	55	192-194
4d	H	Me	Cl	60	250-252
4e	H	H	H	52	214-216
4f	H	H	Br	56	206-208
4g	Cl	H	Cl	64	202-204
5a	H	H	Me	67	232-234
5b	H	H	Cl	54	196-198
5c	H	Me	H	55	202-204
5d	H	Me	Cl	53	240-242
5e	H	H	H	56	224-226
5f	H	H	Br	52	228-230
5g	Cl	H	Cl	54	244-246

## EXPERIMENTAL

All the chemicals were from Sigma – Aldrich and used without any purification. Melting Points of synthesised compounds were taken in open capillary tubes and uncorrected. IR spectra were obtained in KBr pallet on a FT-IR spectrophotometer and Mass spectra were recorded on a Q-TOF MS ES-3.84e3. <sup>1</sup>H NMR spectra were recorded on Bruker Avance II 400 MHz spectrometer with DMSO-*d*<sub>6</sub> as a solvent and using TMS as internal standard. Chemical shift (δ) values are expressed in ppm.

**(2-hydroxyphenyl)(1-(4-p-tolylthiazol-2-yl)-1H-pyrazol-4-yl)methanone 3**

Equimolar mixture of thiazolyl hydrazine

1 (0.01 mol) and 3-formyl chromone 2 (0.01 mol) in ethanol were refluxed for 45 min, hydrazone derivative was obtained. Further, refluxing continues for 4-5 h by addition of 10 ml 15% potassium hydroxide. After completion of reaction the content was cooled, poured into ice and then neutralised by using c. HCl, solid pyrazolyl methanone derivative 3a produced. Then it was filtered and recrystallised from ethyl alcohol. The compounds 3b-g were synthesised by the same procedure.

**3d.** IR : 3105, 1654, 1610, 1106 cm<sup>-1</sup>; Mass: m/z 409.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.37 (s, 6H, Ar-CH<sub>3</sub>), 6.99 (s, 1H, Ar-H), 7.24 (d, 2H, Ar-H), 7.60 (s, 1H, Ar-H), 7.81 (s, 1H, Ar-H), 7.87 (d, 2H, Ar-H), 8.23 & 8.96 (s, 2H, Pyrazole), 10.88 (s, 1H, Ar-OH); Elemental analysis-Calculated. C<sub>21</sub>H<sub>19</sub>O<sub>2</sub>N<sub>3</sub>S Cl: C, 61.53; H, 3.93; N, 10.25. Found: C, 61.55; H, 3.91; N, 10.27 %.

**2[(E)-{1-[4-(p-tolyl)-1,3-thiazol-2-yl]}-1H-pyrazol-4-yl](hydroxyimino)methyl]phenol 4**

To a solution of pyrazolyl methanone 3 (55 mmol) in ethanol, 15 ml 25% potassium hydroxide in water was added at about 0-4°C followed by hydroxylamine hydrochloride (1.2 mol) in heaps. Once the the addition was complete, continues stirring for 4 h at room temperature. After reaction completion, content was poured into ice water and neutralised with acetic acid, solid thiazole anchored pyrazolyl oxime 4a separated. It was filtered and recrystallised from ethyl alcohol. The compounds 4b-g were synthesised by same procedure.

**4d.** IR : 3085, 1612, 1110 cm<sup>-1</sup>; Mass: m/z 424.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.33 (s, 3H, Ar-CH<sub>3</sub>), 2.37 (s, 3H, Ar-CH<sub>3</sub>), 6.89 (s, 1H, Ar-H), 7.20 (s, 1H, Ar-H), 7.24 (d, 2H, Ar-H), 7.66 (s, 1H, Ar-H), 7.82 (m, 3H, Ar-H), 8.88 (s, 1H, Ar-H), 9.98 (s, 1H, N-OH), 11.88 (s, 1H, Ar-OH); Elemental analysis-Calculated: C<sub>21</sub>H<sub>17</sub>O<sub>2</sub>N<sub>3</sub>Cl: C, 59.36; H, 4.03; N, 13.19. Found: C, 59.35; H, 4.05; N, 13.17%.

**2-(1-(4-p-tolylthiazol-2-yl)-1H-pyrazole-4-yl)benzo[d]oxazole 5**

The thiazolyl oxime 4 (5mmol) in 5 ml POCl<sub>3</sub> was taken in round bottom flask and refluxed for about 4 hour. After completion of reaction, cooled content was poured into ice and neutralised with 2% sodium hydroxide, solid gets separated. Then it was filtered and recrystallised from alcohol to afford oxazole 5a. Compounds 5b-g was synthesised by same method.

**5d.** IR : 1638, 1241, 1110  $\text{cm}^{-1}$ ; Mass:  $m/z$  406.5 ( $M^+$ );  $^1\text{H NMR}$  ( $\text{DMSO-}d_6$ ):  $\delta$  2.36 (s, 3H, Ar- $\text{CH}_3$ ), 2.50 (s, 3H, Ar- $\text{CH}_3$ ), 7.30 (d, 2H, Ar-H), 7.82 (s, 1H, Ar-H), 7.89 (s, 1H, Ar-H), 7.95 (d, 2H, Ar-H), 7.98 (s, 1H, Ar-H), 8.58 & 9.36 (s, 2H, Ar-H); Elemental analysis- Calculated:  $\text{C}_{21}\text{H}_{15}\text{ON}_2\text{S}$ : C, 61.99; H, 3.72; N, 13.77. Found: C, 61.97; H, 3.74; N, 13.79 %.

#### Antibacterial activity

An antibacterial activity of synthesised compounds 3a-g, 4a-g and 5a-g were determined *in vitro* against two bacterial species *E. coli* and *B. subtilis*. By using agar well diffusion method, bacterial species were cultured on nutrient agar plates at 37°C. Plate containing 20 ml of nutrient agar was spread with 100  $\mu\text{l}$  of culture. The wells were made in the agar cork boarer of width of 6 mm. The 100  $\mu\text{l}$  of test compounds were loaded in the well along with ampicillin as positive control and DMSO as vehicle control. The plates incubated at 37°C for 24 hours. Growth was evaluated visually by comparing a test plate with the control plates. The figures in Table-II indicates inhibition zone in mm and these are the mean of triplicate assays.

**Table 2: Results of antibacterial activities of synthesised compounds**

Synthesised compounds	Inhibition zone in mm	
	<i>Bacillus subtilis</i>	<i>Escherichia coli</i>
3a	11	13
3b	9	14
3c	11	15
3d	12	15
3e	15	16
3f	13	10
3g	12	12
4a	13	14
4b	10	15
4c	12	14
4d	11	16
4e	11	16
4f	11	9
4g	13	14
5a	14	11
5b	12	16
5c	13	13
5d	13	14
5e	10	16
5f	12	14
5g	14	9
Ampicillin	16	17

#### RESULT AND DISCUSSION

Synthesised compounds 3a-g were obtained from the thiazole anchored molecule 1 and 3-formyl chromone 2. The yield of 3a-g compounds were in the range of 60-70%. The FTIR spectra of 3d shown peak at 3105 and 1654  $\text{cm}^{-1}$  indicated the presence of Ar-OH and C=O groups in molecule. Whereas, the NMR spectra of 3d show the two singlets at  $\delta$  2.37 & 10.88 indicated the presence of Ar- $\text{CH}_3$  and Ar-OH. The compounds 4a-g were obtained from the compounds 3a-g and hydroxylamine hydrochloride by stirring at room temperature, practical yield of 4a-g compounds were in the range of 55-65%. From the FTIR spectra of 4d, the appearance of peak at 3085  $\text{cm}^{-1}$  indicated the presence of Ar-OH and the disappearance of peak at 1654  $\text{cm}^{-1}$  shown the absence of C=O group. The NMR spectra of 4d shown one singlet at  $\delta$  9.98 indicated the presence of -OH group of oxime. The compounds 5a-g were obtained from the refluxing the compounds 4a-g in  $\text{POCl}_3$ , yield in the range of 50-60%. The disappearance of IR peak at 3085  $\text{cm}^{-1}$  shown the absence of Ar-OH in 5d. In the NMR spectra of 5d, absence of two singlet at  $\delta$  9.98 and 11.88 of N-OH & Ar-OH, confirmed the formation of compound 5d. Mass spectroscopy also supported for the formation of 3a-g, 4a-g and 5a-g compounds. Physical characterised data of synthesised compounds are given in the Table-1. The antibacterial activities of synthesised compounds are summarised in the Table-2. The figures indicate the zone of inhibition in mm. From the results it is apparent that among synthesised compounds 3e, 4g and 5b have shown good antibacterial activities.

#### ACKNOWLEDGEMENT

The authors are thankful to the P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar and Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar for providing chemicals. Authors are also thankful to the Management of Anekant Education Society, Baramati, Pune for providing necessary research facilities moreover to the Directors, SAIF and CIL, Panjab University, Chandigarh for providing the spectral and analytical data.

## REFERENCES

- Sharma, R. N.; Xavier, F. P.; Vasu, K. K.; Chaturvedi, S. C. & Pancholi, S. S. *J. Enz. Inhib. Med. Chem.*, **2009**, *24*, 890.
- Kalkhambkar, R.J.; Kulkarni, G.M.; Shivkumar, H. & Nagendra Rao, R. *Eur. J. Med. Chem.*, **2007**, *42*, 1272.
- Karegoudar, P.; Karthikeyan, M. S.; Prasad, D. J.; Mahalinga, M.; Holla, B. S. & Kumari, N. S. *Eur. J. Med. Chem.*, **2008**, *43*, 261.
- Mhaske, P. C.; Vadgaonkar, K. S.; Jadhav, R. P. & Bobade, V. D. *J. Korean Chem. Soc.*, **2011**, *55*(5), 882.
- Jaishree, V.; Ramdas, N.; Sachin, J. & Ramesh, B. *J. Saudi Chem. Soc.*, **2012**, *16*, 371.
- Bradshaw, T. D. & Westwell, A. D. *Curr. Med. Chem.*, **2004**, *11*, 1009.
- Hutchinson, I.; Jennings, S. A.; Vishnuvajjala, B. R.; Westwell, A. D. & Stevens, M.F.G. *J. Med. Chem.*, **2002**, *45*, 744.
- Hays, S.J.; Rice, M.J.; Ortwine, D.F.; Johnson, G.; Schwarz, R. D.; Boyd, D. K.; Copeland, L. F.; Vartanian, M. G. & Boxer, P. A. *J. Pharm. Sci.*, **1994**, *83*, 1425.
- Sabitha, G. *Aldrichimica Acta.*, **1996**, *29*, 15.
- Nawrot-Modranka, J.; Nawrot, E. & Graczyk, J. *Eur. J. Med. Chem.*, **2006**, *41*, 1301.
- Wang, B.; Yang, Z-Y. & Li, T. *Bioorg. Med. Chem.*, **2006**, *14*, 6012.
- Masami, K.; Toru, T.; Hiroyuki, K.; Satoru, T.; Hideki, N. & Hiroshi, S. *In Vivo*, **2007**, *21*, 829.
- Fitzmaerice, C. & Wragg, A. H. *Chem. Abstr.*, **1966**, *65*, 3444.
- Lee, H.; Lee, K.; Jung, J. K.; Cho, J. E. & Theodorakis, E. A. *Bioorg. Med. Chem. Lett.*, **2005**, *15*, 2745.
- Boege, F.; Straub, T.; Kehr, A.; Boesenberg, C.; Christiansen, K.; Andersen, A.; Jakob, F. & Köhrle, J. *J. Bio. Chem.*, **1996**, *271*, 2262.
- Karale, B. K.; Pawar, P. Y.; Gadakh, A. V.; Akolkar, H. N.; & Rindhe, S. S. *Indian J. Het. Chem.*, **2014**, *23*(3), 283.
- Amandeep, K.; Rashmi, A. & Gill, N. S. *Int. J. Nat. Prod. Sci.*, **2012**, *1*, 247.
- Zhao, P.L.; Wang, F. & Zhang, M. Z. *J. Agreec. Foodchem.*, **2008**, *56*, 1076.
- Benard, M.; Hulley, E.; Molenda, H. & Stochla, K. *Pharmazie*, **1986**, *41*, 560.
- Park, H.J.; Lee, K.; Park, S. J.; Ahn, B.; Lee, J. C.; Cho, S. Y. & Lee, K. I. *Bioorg. Med. Chem. Lett.*, **2005**, *15*, 3307.
- Wastrow, D. J.; Knobelsdorf, J. A.; Akanne, H.; Mackenzie, D. R.; Pugsley, T. A.; Zoski, K. T.; Heffner, T. G. & Wise, L. D. *Bioorg. Med. Chem. Lett.*, **1998**, *8*, 2067.
- Gadakh, A.V.; Pandit, C.; Rindhe, S. S. & Karale, B. K. *Bioorg. Med. Chem. Lett.*, **2010**, *20*(18), 5572.
- Narwade, S. K.; Karale, B. K.; Jagdhani, S. G.; Chaudhari, C. S. & Rindhe, S.S. *Orient. J. Chem.*, **2008**, *24*(3), 1029.
- Akbay, A.; Ören, I.; Arpacı, Ö. T.; Sener E. A. & Yalçın, I. *Arzneimittel-Forsch.*, **2003**, *53*, 266.
- Gong, B.Q.; Hong, F.; Kohm, C.; Bonham, L. & Klein, P. *Bioorg. Med. Chem. Lett.*, **2004**, *14*, 1455.
- Unlu, S.; Baytas, S. N.; Kupeli, E. & Yesilada, E. *Arch Pharm.*, **2003**, *336*, 310.
- Ramalingan, C.; Balasubramanian, S.; Kabilan, S. & Vasudevan, M. *Eur. J. Med. Chem.*, **2004**, *39*, 527.
- Murty, M. S. R.; Ram, K. R.; Rao, R. V.; Yadav, J. S.; Rao, J. V. & Cheriyan, V. T. *J. Med. Chem. Res.*, **2011**, *20*, 576.

## 56. Synthesis, Characterization and Antibacterial Screening of some Thiazolyl chromones and Pyrazole

Indian Journal of Chemistry  
Vol. 58B, August 2019, pp. 916-920

### Synthesis, characterisation and antimicrobial screening of some new thiazolyl chromones and pyrazoles

V P Landage<sup>a</sup>, D R Thube<sup>a\*</sup> & B K Karale<sup>b</sup>

<sup>a</sup>P.G. Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar 414 302, India  
(Affiliated to Savitribai Phule Pune University, Pune)

<sup>b</sup>P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar 414 001, India  
(Affiliated to Savitribai Phule Pune University, Pune)

E-mail: drthube@rediffmail.com

Received 16 February 2018; accepted (revised) 2 May 2019

A series of substituted chromones and pyrazole derivatives have been synthesized from esterification of acid **1** with 2-hydroxy acetophenones **2** to give compounds **3** which is in turn converted in to  $\beta$ -diketones **4** in presence of excess of KOH by Baker-Venkatraman transformation. Acid catalysed cyclisation of  $\beta$ -diketones **4** yield a series of 2-substituted chromones **5**. 2-Substituted chromones **5** have been used to synthesise substituted pyrazole derivatives **6**. All the synthesised compounds have been characterised by spectral and analytical data. Chromones and pyrazoles have been evaluated for their antibacterial and antifungal activities.

**Keywords:** Baker-Venkatraman transformation,  $\beta$ -diketones, chromones, pyrazoles

In recent years it was found that microbial infections and drug resistivity of microbes have been increased enormously. Therefore it is necessary to develop a new and effective antimicrobial drug. The researcher's efforts have been made towards the designation of new agent. For designation of new agents heterocyclic molecules play important role because most of the heterocyclic compounds are biologically active. Chromones are found to be naturally occurring oxygen containing heterocyclic compounds and well known for their biological activities such as antitumor<sup>1</sup>, antioxidant<sup>2</sup>, antiinfective<sup>3</sup>, antiallergic<sup>4</sup>, antiinflammatory<sup>5</sup>, anticancer<sup>6</sup>, antiplatelet<sup>7</sup>, antifungal<sup>8</sup> and antibacterial<sup>9</sup> activities. 3-formylchromones are important synthon for incorporating chromone moieties into heterocyclic system<sup>10,11</sup>.

Pyrazole moiety is one of the most important biologically active heterocyclic compound. Pyrazole and its derivatives are associated with antibacterial<sup>12</sup>, antifungal<sup>13</sup>, antidiabetic<sup>14</sup>, antiparasitic<sup>15</sup>, anti-tubercular<sup>16</sup> and antiviral<sup>17</sup> activities (Figure 1 and Figure 2).

Thiazole is nitrogen and sulphur containing heterocyclic compound and found to be a structural fragment of naturally occurring vitamin, vitamin B1 (Thiamine). Thiazole derivatives are associated with wide range of biological activities including antibacterial<sup>18</sup>,

anticancer<sup>19</sup>, anticonvulsant<sup>20</sup>, antituberculosis<sup>21</sup>, antifungal<sup>22</sup>, antianaesthetic<sup>23</sup>, antiinflammatory<sup>24</sup> and antisedative<sup>25</sup>. Chlorinated heterocyclic compounds are found to be biological active and shows biological activities such as antioxidant<sup>26</sup>, antiinflammatory<sup>26</sup> and analgesic<sup>26</sup> (Figure 1).

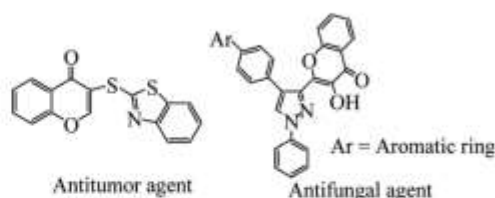


Figure 1

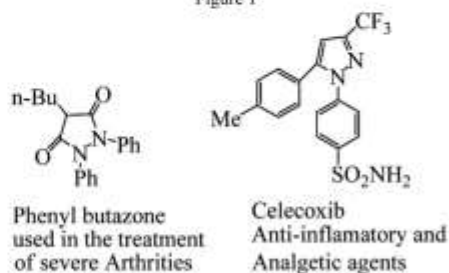


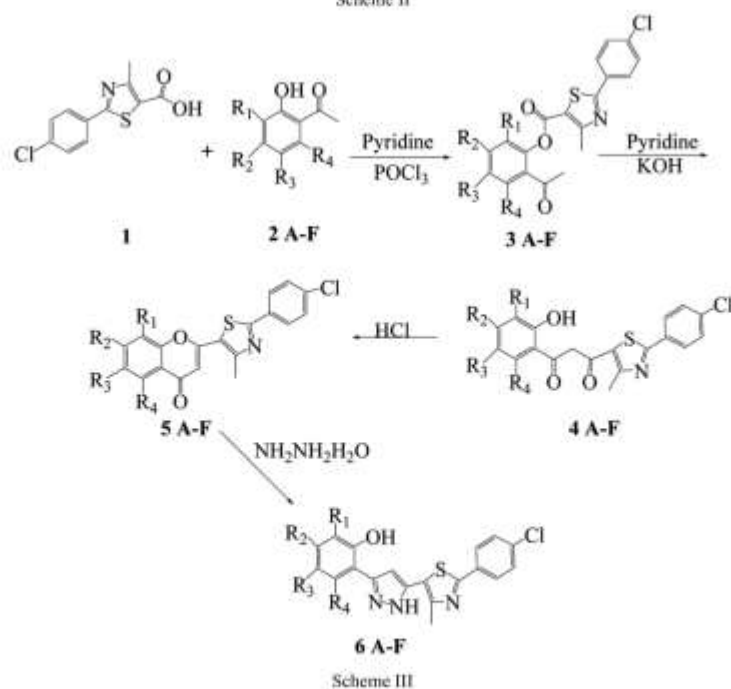
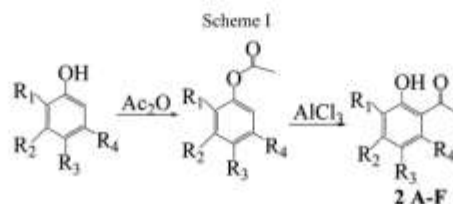
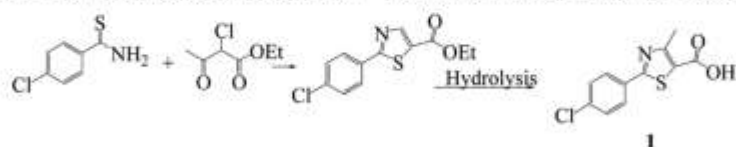
Figure 2

Promoted from this data, we synthesised a new series of thiazolyl chromones and pyrazoles and investigated for their antimicrobial activities.

### Result and Discussion

For the synthesis of target molecules, 2-(4-chlorophenyl)-4-methylthiazole-5-carboxylic acid **1** and a series of substituted 2-hydroxyacetophenones **2** were used. Compounds **1** and **2A-G** were prepared by using

well known literatures methods as shown in Scheme I and Scheme II. Esterification of acid **1** and 2-hydroxyacetophenones **2** results compounds **3A-G**.  $\beta$ -Diketones **4A-G** were obtained from compounds **3A-G** by stirring in pyridine and excess of KOH. Chromones **5A-G** was results from **4A-G** by intermolecular cyclisation in presence of conc. HCl. Pyrazoles **6A-G** were yielded by refluxing Chromones **5A-G** in hydrazine hydrate as shown in Scheme III. Physical



characterisation data of synthesised compounds is given in Table I. The  $^1\text{H}$  NMR spectrum of **3C** showed two singlets at  $\delta$  2.58 and 2.74 for two methyl groups. Two doublet signals at  $\delta$  7.61 and 7.63 supported the presence of tetrasubstituted phenyl ring. The IR spectrum of **3C** showed 1736 and 1698  $\text{cm}^{-1}$  bands for ester and ketone carbonyl stretching frequencies. The  $^1\text{H}$  NMR spectrum of **4C** showed one singlet at  $\delta$  2.70 of methyl groups. Disappearance of one methyl signal from  $^1\text{H}$  NMR spectrum supported the structure of **4C**. The IR spectrum of **4C** showed a band at 1735  $\text{cm}^{-1}$  for carbonyl stretching frequency of ketone. The  $^1\text{H}$  NMR spectrum of **5C** showed one singlet at  $\delta$  2.50 of methyl groups. The IR spectrum of **5C** showed a band at 1664  $\text{cm}^{-1}$  for a conjugated carbonyl stretching frequency. The  $^1\text{H}$  NMR spectrum of **6C** showed two signals at  $\delta$  10.60 and  $\delta$  13.40 confirm the presence of  $-\text{OH}$  &  $-\text{NH}$  protons indicating the presence of pyrazole ring in synthesised molecule. The IR spectrum of **6C** showed a band at 3350  $\text{cm}^{-1}$  showed the presence of

phenolic  $-\text{OH}$  group. Mass spectroscopy also supported for confirmation of formation of these compounds.

#### Antimicrobial activity

An antimicrobial activity of synthesised compounds **5A-G** and **6A-G** was determined *in vitro* against four bacterial strains *Escherichia coli*, *Salmonella typhi*, *Bacillus subtilis* and *Staphylococcus aureus* maintained on nutrient agar plates at 37°C by agar well diffusion method. Plate containing 20 mL of nutrient agar was spread with 100  $\mu\text{l}$  of culture. The wells were made in the agar cork boarer of width of 6 mm. The 100  $\mu\text{l}$  of test compounds were loaded in the well along with ciprofloxacin as positive control and DMSO as vehicle control. The plates incubated at 37°C for 24 hrs. Growth was evaluated visually by comparing a test plate with the control plates. All the experiments were performed in triplicates.

Similarly an antifungal activity of synthesised compounds **5A-G** and **6A-G** was determined *in vitro* against fungal strain *Aspergillus niger* on sabouraud agar plates at 37°C by disc diffusion method. Plates containing 20 mL sabouraud agar spread with 0.1 mL of suspension of *Aspergillus niger* of  $10^6$  / mL of spores. Whatman filter paper disc soaked in solution of compounds (0.1 mg/ mL) was placed on plates along with Flucanazole as positive control and DMSO as a negative control. The plates were incubated at 37°C for 48 hrs. In this study results showed that except **5G** and **6G** no other compound shows antifungal activities. **5G** shows moderate and **6G** shows weak antifungal activity as shown in Table II.

#### Experimental Section

Melting points were determined by open capillary method and are uncorrected. The homogeneity of compounds was checked on silica gel TLC plates. IR spectra were recorded in KBr on a FT-IR spectrophotometer and mass spectra were recorded on a Q-TOF MS ES-3.84e3.  $^1\text{H}$  NMR spectra on BRUKER AVANCE II 400 NMR spectrometer with DMSO- $d_6$  as a solvent and chemical shift ( $\delta$ ) are expressed in ppm using TMS as internal standard.

#### General procedures

##### 2-Acetyl-4-methylphenyl-5-(4-chlorophenyl)-4-methylthiazole-2-carboxylate **3A**

Equimolar quantities of compound **1** (0.01 mol) and compound **2** (0.01 mol) was dissolved in 10 mL of dry pyridine and the mixture were cooled to 0°C in

Table I— Physical characterisation data of synthesised compounds

Compd	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	Yield (%)	m.p.(°C)
<b>3A</b>	H	H	Me	H	66	168-170
<b>3B</b>	H	H	Cl	H	64	176-178
<b>3C</b>	Cl	H	Cl	H	62	126-128
<b>3D</b>	H	H	Br	H	63	178-180
<b>3E</b>	H	H	Cl	Me	61	148-150
<b>3F</b>	H	H	H	H	60	128-130
<b>3G</b>	H	H	H	Me	55	134-136
<b>4A</b>	H	H	Me	H	72	180-182
<b>4B</b>	H	H	Cl	H	74	188-190
<b>4C</b>	Cl	H	Cl	H	70	182-184
<b>4D</b>	H	H	Br	H	76	252-254
<b>4E</b>	H	H	Cl	Me	75	220-222
<b>4F</b>	H	H	H	H	78	218-220
<b>4G</b>	H	H	H	Me	80	210-212
<b>5A</b>	H	H	Me	H	67	186-188
<b>5B</b>	H	H	Cl	H	64	180-182
<b>5C</b>	Cl	H	Cl	H	65	188-190
<b>5D</b>	H	H	Br	H	63	168-170
<b>5E</b>	H	H	Cl	Me	66	198-200
<b>5F</b>	H	H	H	H	62	178-180
<b>5G</b>	H	H	H	Me	60	180-182
<b>6A</b>	H	H	Me	H	58	220-222
<b>6B</b>	H	H	Cl	H	54	248-250
<b>6C</b>	Cl	H	Cl	H	52	258-260
<b>6D</b>	H	H	Br	H	53	218-220
<b>6E</b>	H	H	Cl	Me	60	244-246
<b>6F</b>	H	H	H	H	56	234-236
<b>6G</b>	H	H	H	Me	58	238-240

Table II — Results of antimicrobial activities of synthesised compounds:

Synthesised Compl	Zone of inhibition in mm				
	<i>E. coli</i>	<i>Styphi</i>	<i>B.subtilis</i>	<i>S.aureus</i>	<i>A.niger</i>
5A	15	13	13	13	—
5B	16	12	13	15	—
5C	14	15	14	13	—
5D	14	12	15	16	—
5E	17	15	15	15	—
5F	19	16	16	17	—
5G	18	15	16	16	8
6A	12	11	12	10	—
6B	12	12	13	11	—
6C	13	13	13	14	—
6D	15	13	12	13	—
6E	18	14	14	16	—
6F	16	15	15	14	—
6G	17	14	17	16	6
Ciprofloxin	20	18	20	18	—
Flucanazole	—	—	—	—	12

an ice bath. To this reaction mixture 0.01 mol POCl<sub>3</sub> was added with stirring maintaining the temperature below 5°C. After the complete addition of POCl<sub>3</sub>, the reaction mixture was kept overnight and then poured over crushed ice. The resulting solid product thus obtained was filtered and washed with cold 1% NaOH solution followed by water. The desired product **3A** was purified by recrystallisation from ethanol. Compounds **3B-G** were prepared using the same method.

**3C**: Brown solid. IR (KBr): 3081, 2924, 1736, 1698, 1088 cm<sup>-1</sup>; MS: *m/z* 440.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.54 (s, 3H, CH<sub>3</sub>), 2.37 (s, 3H, CH<sub>3</sub>), 7.61 (d, 1H, Ar-H), 7.63 (d, 1H, Ar-H), 8.08 (m, 3H, Ar-H), 8.13 (d, 1H, Ar-H). Anal. Calcd for C<sub>19</sub>H<sub>12</sub>O<sub>3</sub>Cl<sub>3</sub>NS: C, 51.78; H, 2.74; N, 3.18. Found: C, 51.75; H, 2.76; N, 3.16%.

**3D**: Brown solid. IR (KBr): 3074, 1728, 1682, 1049 cm<sup>-1</sup>; MS: *m/z* 450.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.56 (s, 3H, CH<sub>3</sub>), 2.73 (s, 3H, CH<sub>3</sub>), 7.41 (d, 1H, Ar-H), 7.63 (m, 2H, Ar-H), 7.91 (dd, 1H, Ar-H), 8.09 (m, 2H, Ar-H), 8.16 (d, 1H, Ar-H). Anal. Calcd for C<sub>19</sub>H<sub>13</sub>O<sub>3</sub>ClBrNS: C, 50.63; H, 2.91; N, 3.11. Found: C, 50.65; H, 2.92; N, 3.14%.

**1-[5-(4-chlorophenyl)-4-methylthiazole-2-yl]-3-(2-hydroxy-5-methylphenyl) propane-1, 3-dione 4A**

Compound **3A** (0.055 mol) was taken in 15 mL dry pyridine to this excess of powdered KOH was added with constant stirring. After complete addition of KOH the reaction mixture was stirred at R.T. for 3 hrs. Then

the content was poured over crushed ice and acidified with conc. HCl. The resulting product was filtered and purified by recrystallisation from ethanol to get **4A**. Compounds **4B-G** were prepared using the same method.

**4C**: Yellow solid. IR (KBr): 3451, 2923, 1735, 1094 cm<sup>-1</sup>; MS: *m/z* 440.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.70 (s, 3H, CH<sub>3</sub>), 6.46 (s, 1H, CO-CH<sub>2</sub>), 7.54 (d, 2H, Ar-H), 7.65 (s, 1H, Ar-H), 7.86 (s, 1H, Ar-H), 7.96 (d, 2H, Ar-H), 11.26 (s, 1H, Ar-H) 14.03 (s, 1H, C=C-OH). Anal. Calcd. for C<sub>19</sub>H<sub>12</sub>O<sub>3</sub>Cl<sub>3</sub>NS: C, 51.78; H, 2.74; N, 3.18. Found: C, 51.76; H, 2.72; N, 3.20%.

**4D**: Yellow solid. IR (KBr): 3429, 2925, 1737, 1098 cm<sup>-1</sup>; MS: *m/z* 450.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.50 (s, 3H, CH<sub>3</sub>), 6.40 (s, 1H, CO-CH<sub>2</sub>), 7.47 (d, 2H, Ar-H), 7.60 (d, 2H, Ar-H), 7.89 (s, 1H, Ar-H), 7.99 (d, 2H, Ar-H), 11.28 (s, 1H, Ar-H), 13.76 (s, 1H, C=C-OH). Anal. Calcd. for C<sub>19</sub>H<sub>13</sub>O<sub>3</sub>ClBrNS: C, 50.63; H, 2.91; N, 3.11. Found: C, 50.62; H, 2.93; N, 3.13%.

**2-[5-(4-chlorophenyl)-4-methylthiazole-2-yl]-6-methyl-4H-chromen-4-one 5A**

Compound **4A** (0.05 mol) was mixed with in 20 mL ethanol to this 1 mL conc. HCl was added. Reaction mixture was refluxed for 2 hr. After completion of reaction, reaction mixture was cooled and poured into crushed ice. The resulting product was filtered and purified by recrystallisation from ethanol to get **5A**. Compounds **5B-G** were prepared using the same procedure.

**5C**: Yellow solid. IR (KBr): 3076, 2923, 1664, 1094 cm<sup>-1</sup>; MS: *m/z* 422.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.50 (s, 3H, CH<sub>3</sub>), 7.10 (s, 1H, CO-CH=C), 7.63 (s, 1H, Ar-H), 7.72 (s, 1H, Ar-H), 7.85 (s, 1H, Ar-H), 7.93 (d, 2H, Ar-H), 8.03 (s, 1H, Ar-H). Anal. Calcd for C<sub>19</sub>H<sub>10</sub>O<sub>2</sub>Cl<sub>3</sub>NS: C, 53.99; H, 2.38; N, 3.31. Found: C, 53.97; H, 2.40; N, 3.29%.

**5D**: Yellow solid. IR (KBr): 3078, 2924, 1653, 1094 cm<sup>-1</sup>; MS: *m/z* 432.5 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.51 (s, 3H, CH<sub>3</sub>), 6.70 (s, 1H, CO-CH=C), 6.82 (s, 1H, Ar-H) 7.40 (d, 2H, Ar-H), 7.55 (d, 2H, Ar-H), 7.81 (s, 1H, Ar-H), 7.93 (s, 1H, Ar-H). Anal. Calcd. for C<sub>19</sub>H<sub>11</sub>O<sub>2</sub>ClBrNS: C, 52.74; H, 2.56; N, 3.24. Found: C, 52.97; H, 2.60; N, 3.26%.

**2-[5-(5-[4-chlorophenyl]-4-methylthiazol-2-yl)-1H-pyrazol-3-yl]-4-methylphenol 6A**

Compound **5A** (0.02 mol) and hydrazine hydrate (0.005 mol) were taken in ethanol and refluxed for 4 h. After completion of reaction, the reaction mixture was cooled to RT and poured over crushed ice and



neutralised with glacial acetic acid. The resulting product was separated by filtration and purified by recrystallisation from ethanol to get **6A**. Compounds **6B-G** were prepared using the same procedure.

**6C**: White solid. IR (KBr): 3350, 2922, 1091  $\text{cm}^{-1}$ ; MS:  $m/z$  436.5 ( $M^+$ );  $^1\text{H NMR}$  ( $\text{DMSO}-d_6$ ):  $\delta$  2.63 (s, 3H,  $\text{CH}_3$ ), 7.22 (s, 1H, Ar-H), 7.37 (s, 1H, Ar-H), 7.51 (d, 2H, Ar-H), 7.83 (s, 1H, Ar-H), 7.93 (s, 2H, Ar-H), 10.60 (bs, 1H, Ar-OH), 13.40 (bs, 1H, N-H). Anal. Calcd. for  $\text{C}_{10}\text{H}_{12}\text{OCl}_2\text{N}_2\text{S}$ : C, 52.25; H, 2.77; N, 9.62. Found: C, 52.24; H, 2.75; N, 9.60%.

**6D**: White solid. IR (KBr): 3442, 2922, 1091  $\text{cm}^{-1}$ ; MS:  $m/z$  446.5 ( $M^+$ );  $^1\text{H NMR}$  ( $\text{DMSO}-d_6$ ):  $\delta$  2.65 (s, 3H,  $\text{CH}_3$ ), 6.92 (d, 1H, Ar-H), 7.10 (s, 1H, Ar-H), 7.29 (dd, 1H, Ar-H), 7.51 (d, 2H, Ar-H), 7.91-7.95 (m, 3H, Ar-H), 10.69 (bs, 1H, Ar-OH), 13.19 (bs, 1H, N-H). Anal. Calcd. for  $\text{C}_{10}\text{H}_{12}\text{OClBrN}_2\text{S}$ : C, 51.08; H, 2.93; N, 9.41. Found: C, 51.10; H, 2.95; N, 9.45%.

#### Acknowledgement

The authors are thankful to P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar and P.G. Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar for providing chemicals and also thankful to the Management of Anekant Education Society, Baramati for constant encouragement and providing necessary research facilities, YCIS College, Satara for providing antimicrobial activities of synthesised compounds and to the Directors, SAIF and CIL, Panjab University, Chandigarh for providing spectral data and analytical data.

#### References

- Huang W, Ding Y, Miao Y, Liu M, Li Y & Yang G, *Eur J Med Chem*, 44 (2009) 3687.
- Kuroda M, Uchida S, Watanabe K & Mimaki Y, *Phytochemistry*, 70 (2009) 288.
- Rode M, Gupta R C, Karale B K & Rindhe S S, *J Heterocycl Chem*, 45 (2008) 1597.
- Augstein J, Cairns H, Chamber A, Burns J W & Radziwonk H, *J Pharm Pharmacol*, 28 (1976) 919.
- Gamal-Eldeen A M, Djemgou P C, Tchuendem M, Ngadjui B T, Tane P & Toshifumi H Z, *Naturforsch C*, 62 (2007) 331.
- Muzzei M, Balbi A, Roma G, Braccio M D, Leoncini G, Buzzi E & Maresca M, *Eur J Med Chem*, 23 (1988) 237.
- Gonzalez A G, Darias V, Estevez E & Vivas J M, *Plant Med*, 47 (1983) 56.
- Karale B K, Takate S J, Salve S P, Zaware B H & Jadhav S S, *Indian J Chem*, 54B (2015) 798.
- Kaspentakis G C, Tsolerdis C A & Stephanatou J S, *J Heterocycl Chem*, 44 (2007) 425.
- Sosnovshikh V & Moshkin V, *Russian Chem Bull*, 59 (2010) 1056.
- Desai K, Patel R & Chikhulia K, *Indian J Chem*, 45 (B) (2006) 773.
- Karale B K, Pawar P Y, Gadakh A V, Akolkar H N & Rindhe S S, *Indian J Heterocycl Chem*, 23(3) (2014) 283.
- Li M, Liu C L, Yang J C, Zhang J B, Li Z N, Zhang H & Li Z M, *J Agric Food Chem*, 58(5) (2010) 2664.
- Kees K L, Fitzgerald J J, Steiner K E, Mattes J F, Mihan B, Tosi T, Moondoro D & McCaleb M L, *J Med Chem*, 39 (1996) 3920.
- Rathelot P, Azas N, El-Kashef H, Delmas F, Giorgio C D, Timon-David P, Maldonada J & Vanelle P, *Eur J Med Chem*, 37 (2002) 671.
- Khunt R C, Khedkar V M, Chawda R S, Chauhan N A, Parikh A R & Coutinho E C, *Bioorg Med Chem Lett*, 22(1) (2012) 666.
- Meghasham & Narule N, *J Chem Pharm Res*, 3(3) (2011) 38.
- Tsuji K & Ishikawa H, *Bioorg Med Chem Lett*, 4(13) (1994) 1661.
- Gu X H, Wan X Z & Jiang B, *Bioorg Med Chem Lett*, 9(4) (1999) 569.
- Raslan M A & Khalil M A, *Heterocycl Chem*, 14(2) (2003) 114.
- Banothu J, Vaarla K, Bavantula R & Crooks P A, *Chinese Chem Lett*, 25(1) (2001) 172.
- Milinkevich K A, Ye L & Kurth M J, *J Combin Chem*, 10(4) (2008) 521.
- Geronikaki A & Theophilidis, *Eur J Med Chem*, 27(7) (1992) 709.
- Giridhar T, Reddy R B, Prasanna B & Chandra Mouli G V P, *Indian J Chem*, 40B (2001) 1279.
- Louis L, *Eur Pat, Chem Abstr*, 109 (1998) 128995q.
- Chidananda N, Poojari B, Sumangala V & Lobo P L, *J Appl Chem*, 2 (2013) 1080.

## 57. Performance of Polyaniline Nanofibers (PANI NFs) as PANI NFs-Silver Nanocomposites (NCs) for Energy Storage and Antibacterial Applications

ACS  
OMEGA

Cite This: ACS Omega 2018, 4, 5741–5749

http://pubs.acs.org/journal/acsodf



Article

### Performance of Polyaniline Nanofibers (PANI NFs) as PANI NFs-Silver (Ag) Nanocomposites (NCs) for Energy Storage and Antibacterial Applications

Rahul S. Diggikar,<sup>\*,†</sup> Shamkumar P. Deshmukh,<sup>‡</sup> Tukaram S. Thopate,<sup>†</sup> and Santosh R. Kshirsagar<sup>§</sup>

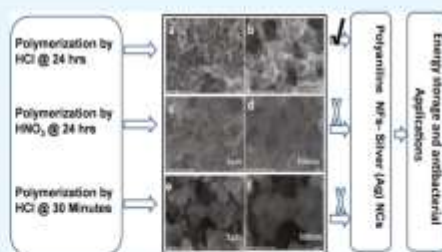
<sup>†</sup>Department of Chemistry and Research Centre, New Arts, Commerce and Science College, Parner, Ahmednagar, Maharashtra 414302, India

<sup>‡</sup>Department of Chemistry, D.B.F. Dayanand College of Arts and Science, Solapur, Maharashtra 413002, India

<sup>§</sup>Department of Chemistry, R.B.N.B. College, Shrirampur, Ahmednagar, Maharashtra 413709, India

#### Supporting Information

**ABSTRACT:** The conductive property of polyaniline nanofibers (PANI NFs) has attracted great attention due to their higher capacitance, high flexibility, low cost, and ease of synthesis. Herewith, it is demonstrated that at room temperature, the template-free synthesized PANI NFs show the properties of PANI NFs–silver nanocomposites (Ag NCs) without a silver precursor with a new physical insight into energy storage devices and antibacterial applications. The diffraction peak at  $2\theta = 19.1^\circ$  using X-ray diffraction analysis indicates the silver nature. UV–vis absorption peaks at 408 and 369 nm indicate the silver absorption (HCl-doped). The spectroscopic studies by FTIR, Raman, and NMR indicate that the PANI NFs behave in a similar manner to PANI NFs–Ag NCs with  $48.47 \text{ S cm}^{-1}$  conductivity and  $570 \text{ F g}^{-1}$  capacitance. Morphological studies by FESEM (size: 50 nm) and HRTEM reveal that the growth of PANI NFs is one-dimensional and more preferable. It also shows higher bacterial inhibition at lower values of minimum inhibitory concentration and minimum bacterial concentration.



#### 1. INTRODUCTION

Polyaniline (PANI) as a conducting polymer has been immensely researched due to its conducting nature and tunable chemical properties for electrochemical devices as energy storage devices (ESDs), antistatic coating films, sensors actuators, and antibacterial (AB) activity applications.<sup>1,2</sup> A variety of approaches have been engaged to synthesize PANI NFs including template-assisted polymerization, interfacial polymerization, seeding polymerization, etc.<sup>3</sup> The percentage of doping of acids during synthesis of PANI nanofibers (NFs) is the key factor responsible for the conducting polymers.<sup>2–8</sup> The formation of PANI NFs is mainly dependent on the homogeneous nucleation process, and by taking advantage of this nucleation mechanism, significant research efforts have been directed in the past few years toward the improvement in various syntheses of PANI NFs.<sup>9–11</sup> In recent reports, analysis of the controlled growth and morphology of PANI has been carried out by using surfactants to minimize the above issues. However, small enlargements in the NFs may act as nucleation points for further growth of nanorods (NRs) during polymerization.<sup>7,8</sup> Nowadays, many researchers have focused their work on preparation of different metal–polymer nanocomposites (NCs) to improve the ESDs and AB applications.<sup>9–12</sup> The synthesis of mixed morphologies (NFs, nanotubes, nongranular particles) of PANI using a template

with rapid polymerization at high temperature was reported by Du et al.,<sup>9</sup> Tran et al.,<sup>3</sup> Qiu et al.,<sup>13</sup> Ma et al.,<sup>14</sup> and Pan et al.<sup>15</sup> However, Sapurina et al.<sup>16</sup> suggested that nanostructures of PANI can act as NCs of PANI–metal by changing the synthesis method.<sup>17</sup> Poole et al.<sup>18</sup> reported that the PANI NFs can play the role of silver–PANI NFs NCs. Factors like temperature, post-polymerization, monomer and acid concentration, mechanical disturbances, seeding strategy, and percentage of dopant can affect the morphology of PANI.<sup>9</sup> Our other group also presented PANI-SVO (silver vanadium oxide, silver vanadium sulfide) and lithium vanadium oxide–silver (LVO/Ag) NCs for ESDs and AB applications.<sup>19–22</sup>

We tuned the reported time-dependent methods of synthesis for HCl-doped PANI nanostructures for the first time; results predict that, as variation in polymerization period (24 h) is implemented at room temperature, the HCl-doped PANI NFs show similar activity to PANI NFs–Ag NCs without using a silver precursor, which is excellent for ESDs and AB activity applications.<sup>12,25</sup> For comparison, a sample of PANI NFs doped with nitric acid (HNO<sub>3</sub>), which is one of the highly oxidizing agents, has also been synthesized. Ag nanoparticles

Received: October 16, 2018

Accepted: January 14, 2019

Published: March 22, 2019

ACS Publications © 2019 American Chemical Society

5741

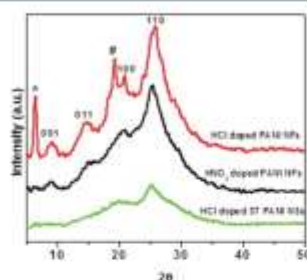
DOI: 10.1021/acsomega.8b02854  
ACS Omega 2018, 4, 5741–5749

Downloaded via 103.132.1.32 on December 24, 2019 at 09:08:38 (UTC).  
See https://pubs.acs.org/sharingguidelines for options on how to legitimately share published articles.

are routinely used as an AB agent, but in the present context, PANI NFs act the role of PANI NFs-Ag NCs, which is more economical and efficient than the methods used earlier for synthesis of PANI NFs-Ag NCs. This study opens up a new avenue for the scientific community.

## 2. RESULTS AND DISCUSSION

**2.1. X-ray Diffraction (XRD) Analysis.** Figure 1 reveals the XRD patterns of HCl- and HNO<sub>3</sub>-doped PANI NFs and

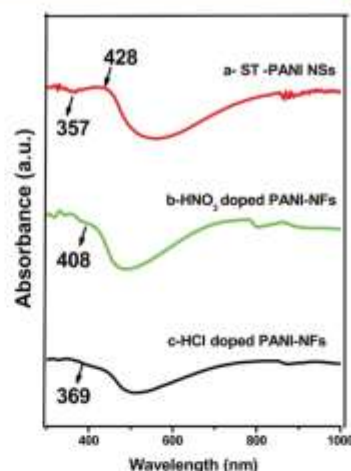


**Figure 1.** XRD patterns of the HCl- and HNO<sub>3</sub>-doped PANI NFs and HCl-doped ST-PANI NSs.

HCl-doped ST-PANI NSs. XRD patterns of HCl- and HNO<sub>3</sub>-doped PANI NFs show the characteristic peaks centered at  $2\theta = 9.76^\circ$  (001),  $14.71^\circ$  (011),  $21.53^\circ$  (100), and  $25.96^\circ$  (110). All peaks are in good agreement with results by Pouget et al.<sup>3</sup> The sharp peak in HCl-doped PANI NFs at  $6.34^\circ$  specified by an asterisk (\*) corresponds to the organization of lamellae of PANI NFs<sup>23</sup> as well as the formation of silver-PANI NFs NCs. The XRD peak of silver is obtained at  $19.1^\circ$  denoted by a number sign (#) corresponds to JCPDS-011164. The two peaks that appeared in  $6.34^\circ$  and  $19.1^\circ$  are the indication of the silver behavior of the PANI NFs.<sup>24,25</sup> The simultaneous appearance of the two peaks at  $2\theta = 19.1^\circ$  and  $21.53^\circ$  are not yet reported, providing the evidence of formation of a new phase of PANI NFs synthesized by HCl doping polymerization. Peaks at  $2\theta = 21.53^\circ$  and  $25.53^\circ$  are the characteristic peaks of silver-PANI NFs NCs observed in HCl-doped PANI NFs.<sup>26,27</sup> Park et al.<sup>28</sup> presented that each XRD pattern gives the individual components of PANI NFs. The peak at (110) decreases in HCl-doped PANI NFs, HNO<sub>3</sub>-doped PANI NFs, and ST-PANI NSs. The results indicate that the structural changes are obtained on successive exposure to HCl as proven by NMR studies.<sup>15,29</sup> It is important that the broad peaks at  $2\theta = 10^\circ$  to  $35^\circ$  are found in the amorphous nature of PANI, but the sharp peak at  $19.1^\circ$  is only obtained from PANI NFs-Ag NCs.<sup>28,30</sup> The same results are presented by Wei et al.<sup>31</sup> in the nanocomposites of PANI-WO<sub>3</sub> (tungsten oxide).

In ST-PANI NSs, the conductive phase is formed, but it is difficult to recognize other phases (Figure 1) since the spectrum is very broad and the peak resolution is poor. The similarity of XRD patterns of PANI prepared by using different dopants indicates the presence of emeraldine salt form of the product. All these results confirm that the products with good crystallinity can be synthesized at room temperature with same morphologies instead of the system at high temperatures and by rapid polymerization.<sup>5,8</sup>

**2.2. UV-Vis Spectroscopy.** Figure 2a–c demonstrates the UV-visible spectra of ST-PANI NSs and HNO<sub>3</sub>-doped and



**Figure 2.** UV-vis spectra of (a) ST-PANI NSs, (b) HNO<sub>3</sub>-doped PANI NFs, and (c) HCl-doped PANI NFs.

HCl-doped PANI NFs, respectively. The characteristic bands of ST-PANI NSs and PANI NFs appear at 357, 428, and 812 nm with a free carrying tail extending to the near-infrared region. These bands are attributed to the  $\pi-\pi^*$  electronic transition of benzene rings, polaron- $\pi^*$  transition, and  $\pi$ -polaron transition, respectively (Figure 2a). However, the characteristic peaks at 357 and 428 nm are absent in Figure 2b,c, while the presence of 408 and 369 nm bands indicates similar absorption of silver in HCl-doped PANI NFs. The absorption band of the Ag usually appears at around 400 nm, which is caused by surface plasmon resonance. It is difficult to differentiate these bands due to the merging of two bands.<sup>32,33</sup>

**2.3. Fourier Transform Infrared Spectroscopy (FTIR).** The FTIR spectra of PANI NFs and PANI NSs are shown in Figure 3. The characteristic peaks at  $1477$  and  $1558$   $\text{cm}^{-1}$  belong to the C=C stretching vibration mode of benzenoid and quinonoid rings, respectively. The absorption bands at  $1282$ ,  $1100$ , and  $1230$   $\text{cm}^{-1}$  correspond to the C–N stretching, C–H bending, and the protonated C–N group, respectively. The characteristic bands at about  $1601$  and  $1494$   $\text{cm}^{-1}$  are the sign of the PANI NF backbone due to the stretching modes of the protonated metal PANI NFs NCs.<sup>31</sup> The high intensity peaks in Figure S1a indicate that the activity of HCl-doped PANI NFs is similar to the NC of PANI NFs-Ag.<sup>30,31</sup>

**2.4. Field Emission Scanning Electron Microscopy (FESEM).** Figure 4a,b shows the morphology of HCl-doped and HNO<sub>3</sub>-doped PANI NFs, respectively, at different magnifications. The ST-PANI morphology is presented in Figure 4e,f. The use of different monobasic acids is seen to significantly affect the morphology of PANI NFs. The growth of PANI NFs is one-dimensional (1D) (Figure 4b) instead of two-dimensional (2D).<sup>34</sup>

In Figure 4a, the bulk quantity of PANI in the form of entangled chains appears as worm-like nanofibers (NFs). The diameter of the nanofibers is  $\sim 50$  nm with lengths up to several micrometers, and most of the NFs show the aspect ratio 1:4 (Figure S2). In Figure 4b, the PANI NFs are in the form of a cluster (aspect ratio, 1:2). In Figure 4c, the PANI

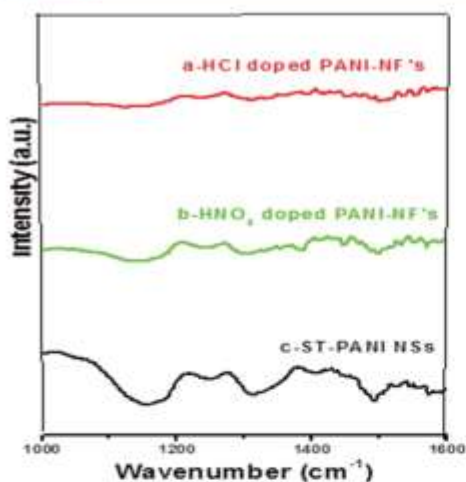


Figure 3. FTIR spectra of (a) HCl-doped PANI NFs, (b) HNO<sub>3</sub>-doped PANI NFs, and (c) ST-PANI NSs.

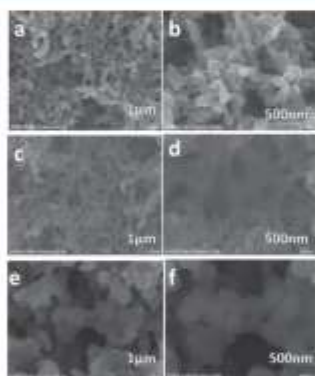


Figure 4. FESEM images of the (a,b) HCl-doped PANI NFs, (c,d) HNO<sub>3</sub>-doped PANI NFs, and (e,f) ST-PANI NSs.

NFs are in the quinonoid ring and the benzenoid ring. The band at 1277 cm<sup>-1</sup> can be assigned to the C–N stretching mode in a secondary aromatic amine.

Therefore, the results of FTIR spectrum demonstrated that the PANI NFs and ST-PANI NSs exist in the conducting emeraldine form. However, these spectra exhibited a difference in their intensities. The integrated band intensities are minimum in HCl-doped PANI NFs (Figure 3a).<sup>30</sup> However, slightly higher intensity bands are observed in HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs (Figure 3b,c).

The FTIR spectra of the HCl-doped PANI NFs NCs and other two nanostructures of PANI (NFs and NSs) are quite similar (irrespective of band intensities) and indicate the formation of PANI backbone. However, in the HCl-doped PANI NFs, the integrated peak intensity and appearing peaks of benzenoid ring against quinonoid ring are significantly different with those in the HNO<sub>3</sub>-doped PANI NFs and PANI

NSs, suggesting that HCl-doped PANI NFs indicate higher conjugation.<sup>8</sup> The decrease in intensities and slight shift in C–N and N–H bands of HCl-doped PANI NFs (Figure 3a) are due to the activities similar to silver-PANI NFs NCs.<sup>32</sup>

**2.5. Raman Spectroscopy Studies.** Figure S1a,b (Supporting information) reveals Raman studies of HCl-doped and HNO<sub>3</sub>-doped PANI NFs, respectively. The intensity of several sharp peaks in HCl-doped PANI NFs is higher than that of HNO<sub>3</sub>-doped PANI NFs. It indicates that the surface enhanced with laser excitement is due to the behavior of the form of a network of NFs with an aspect ratio of 1:8, and the same is also observed in Figure 4d. The morphology of ST-PANI NSs is observed in the form of agglomeration/nanospheres (Figure 4e,f) because supersaturation is not achieved and heterogeneous nucleation dominates, which can form PANI NFs by a long period of polymerization.<sup>5</sup> The isolated HCl-doped PANI NFs show higher aspect ratios (Figure 4b) than HNO<sub>3</sub>-doped PANI NFs.<sup>34</sup> This is quite similar to the report of Bober's group (Figure S3).<sup>35</sup> In order to obtain isolated PANI NFs, the use of HCl as a dopant is preferable.

The PANI NFs are showing a random, interconnected, and flat web structure having ~30–70 nm in diameter and 0.4–3 μm in length. This highly interconnected microstructure is the identity of the formation of PANI NFs-Ag NCs.<sup>31,33,36</sup>

**2.6. Transmission Electron Microscopy (TEM).** Figure 5a,b represents the TEM images of HCl-doped and HNO<sub>3</sub>-

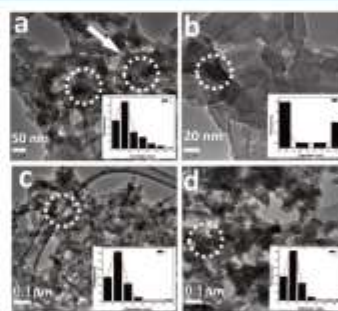


Figure 5. TEM images of (a,b) HCl-doped PANI NFs and (c,d) HNO<sub>3</sub>-doped PANI NFs.

doped PANI NFs, respectively. NFs synthesized at 60 °C are found to be thinner and broader in size according to the FESEM investigations (Figure 4a,b and Figure S4) of Du et al.<sup>8</sup> and Patil et al.<sup>34</sup> Figure 5c,d reveals the TEM images of HNO<sub>3</sub>-doped PANI NFs showing a tubular network. The thickness of HNO<sub>3</sub>-doped PANI NFs is observed to be higher than HCl-doped PANI NFs. In addition, the TEM image indicates that the PANI NFs have a coarse surface. The coarse surface has a positive effect on the specific surface area of PANI NFs. All these factors should be considered in designing PANI NF DE with higher capacitance.<sup>6,34</sup>

Morphological studies show that the experimental conditions affect the morphology of PANI and longer periods of polymerization formation of smoother and thinner PANI NFs (Figure 5b) and longer PANI NFs are possible.<sup>8</sup> White circles indicate one of the cross-link points between each PANI NF within a network structure common in silver-polymer NC.<sup>36,37</sup>

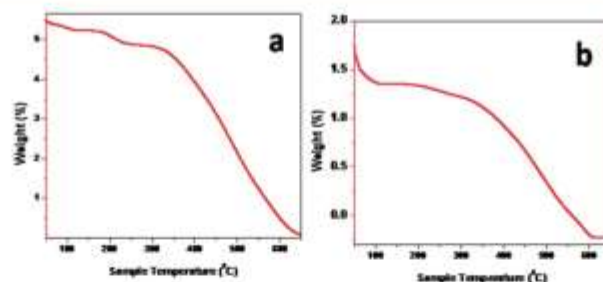


Figure 6. Thermogravimetric analysis (TGA) of (a) HCl-doped and (b)  $\text{HNO}_3$ -doped PANI NFs.

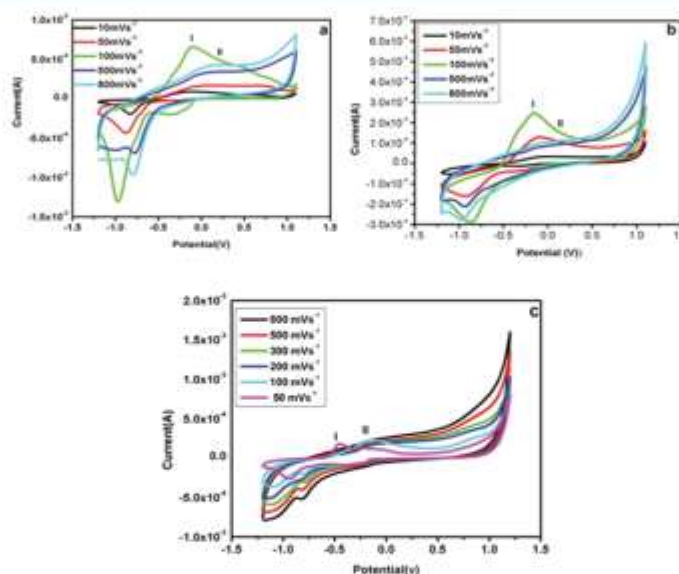


Figure 7. Cyclic voltammetry (CV) of (a) HCl-doped and (b)  $\text{HNO}_3$ -doped PANI NFs and (c) ST-PANI NSs.

In Figure 5a,b, the thinner PANI NFs along with the bridging (in white circles) indicate similar behavior of PANI NFs-Ag NCs.<sup>30</sup>

**2.7. Thermal Studies.** Thermal behavior was studied by (TGA, SETRAM) in the range of 50–650 °C with a heating rate of 10 °C  $\text{min}^{-1}$  under an inert atmosphere. In Figure 6a,b, the major similarity is the presence of three-step thermal decomposition patterns. The first step of thermal decomposition is observed at 50–100 °C due to the loss of absorbed water molecules present in the PANI NFs. In Figure 6a,b, the second step of thermal decomposition starts at ~140 °C and continued up to 240 °C followed by the third step of the thermal decomposition pattern. The weight loss is mainly due to the loss of a dopant ion (thermal dedoping of the polymer) from the polymer chains (second stage). There is not much variation in the first and second steps of the thermal decomposition in HCl- and  $\text{HNO}_3$ -doped PANI NFs. However, the third step of thermal decomposition is found to be varied; in  $\text{HNO}_3$ -doped PANI NFs (Figure 6b), the 99%

loss is observed at 550 °C, while it is extended up to 600 °C in HCl-doped PANI NFs, indicating high thermal stability. This is due to the PANI NFs-Ag NCs behavior of the HCl-doped PANI NFs.<sup>32</sup>

**2.8. Electrochemical Studies.** Figure 7 reveals the electrochemical studies of HCl-,  $\text{HNO}_3$ -doped PANI NFs, and ST-PANI NSs.

The cyclic voltammetry results obtained from ST-PANI NSs and HCl- and  $\text{HNO}_3$ -doped PANI NFs revealed several common features such as (1) the sharp exponential rise of anodic current beyond +1.06 V, (2) weak shoulder at +1.0 V, (3) the reduction peak observed at about 0.15 V that results from a surface-confined electrochemical reaction, and (4) the peak current that is directly proportional to the scan rate.<sup>30</sup>

The specific capacitance values of HCl- and  $\text{HNO}_3$ -doped PANI NFs and ST-PANI NSs are observed to be 570, 320, and 270  $\text{F g}^{-1}$ , respectively. The capacitance of HCl-doped PANI NFs, which behave like PANI NFs-Ag NCs, is 570  $\text{F g}^{-1}$  higher than that of the pure PANI, as capacitance depends on

morphology, metallic behavior, as well as percentage of dopant. The polymerization time for HCl-doped PANI NFs is 24 h.<sup>39–41</sup> This capacitance is higher than those reported for silver vanadium oxide (SVO)-PANI NCs (365.5 F g<sup>-1</sup>) and silver vanadium sulfide (SVS)-PANI NCs (440 F g<sup>-1</sup>). It is also greater than that reported for lithium vanadium oxide/silver NCs (124 F g<sup>-1</sup>).<sup>31</sup> Nonfibrillar PANI synthesized by a conventional method shows a capacitance of 33 F g<sup>-1</sup>.<sup>40,43</sup>

In Figure 7a,b, it is observed that the current increases with scan rate due to the increase in nearby surface and the number of rechargeable redox sites created by PANI NFs but not by ST-PANI NSs (Figure 7c). It is also evident that the as-synthesized PANI NFs show similar activity to PANI NFs-Ag NCs, which is supported by XRD, FTIR, and UV-vis spectroscopy.

The electrochemical stability of the HCl-doped behavior of PANI NFs-Ag NCs and HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs was examined in 1 M HClO<sub>4</sub> aqueous electrolyte for consecutive cycles at a current density of 1 A g<sup>-1</sup>. The better stability of HCl-doped PANI NFs came from the synergistic effect of PANI NFs-Ag NCs, which can avoid damaging of the electrode.

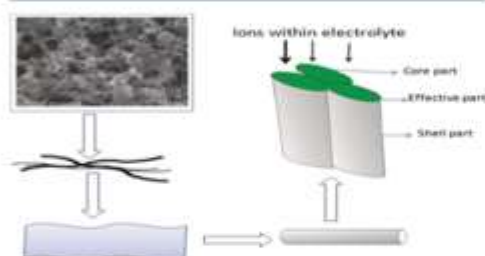


Figure 8. Schematic representation of how the required diffusion length is reduced in DE.

The electrochemical impedance (EI) data of HCl-doped and HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs were analyzed using Nyquist plots given in Figure S6. These plots show the frequency response of the electrode/electrolyte system and the imaginary component ( $Z''$ ) of the impedance against the real component ( $Z'$ ). The more vertical behavior of the curve corresponds to a cell that is more similar to an ideal capacitor. The Nyquist plots of HCl- and HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs exhibit squares over the high-frequency range, followed by a straight sloped line in the low-frequency region of HCl-doped PANI NFs behaving like PANI NFs-Ag NCs also obtained in graphene-based conducting polymer nanocomposites.<sup>43,44</sup>

Large data observed for these electrodes are indicative of high interfacial charge-transfer resistance, which can be attributed to the poor electrical conductivity of these materials. The sloped portions of the Nyquist plots are the Warburg resistance resulting from the frequency dependence of ion diffusion/transport in the electrolyte. The larger Warburg region of these electrodes indicates greater variations in ion-diffusion path lengths and increased obstruction of ion movement. Different from HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs, the squares at high frequency are not detected for HCl-doped PANI NFs behaving like silver-PANI NFs NCs,

suggesting that interfacial charge transfer is low and the conductivity is high, which can be attributed to the behavior of PANI NFs-Ag NCs. Except for the low electrical resistance, HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs also exhibit short and equal diffusion path lengths of ions in the electrolyte, which can be seen from the negligible Warburg region on the Nyquist plots. This may be illuminated by the unique morphology of the PANI NFs.<sup>41</sup>

Figure 9 shows the charge/discharge curves of HCl-doped and HNO<sub>3</sub>-doped PANI NFs and HCl-doped ST-PANI NSs.

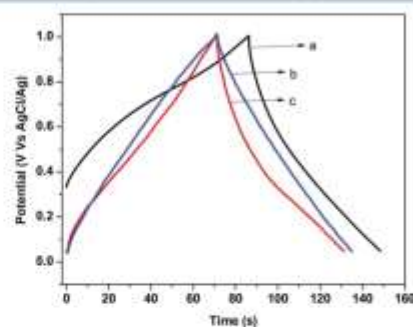


Figure 9. Charge/discharge cycling curves of electrodes (a) HCl-doped PANI NFs behaving like PANI NFs-Ag NCs, (b) HNO<sub>3</sub>-doped PANI NFs, and (c) HCl-doped PANI NSs at a current density 1 A g<sup>-1</sup>.

All curves exhibit an equilateral triangle shape, showing that the potential of charge/discharge is a linear response to time, indicating a good reversibility during the charge/discharge processes. On the basis of the charge/discharge curves, the specific capacitance values for electrodes HCl-doped and HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs are summarized in Figure S6. It can be seen that at a current density of 1 A g<sup>-1</sup>, the HCl-doped PANI NFs increase the specific capacitance and charge/discharge curves. Similar results are also found in our graphene-based PANI NCs.<sup>44</sup>

**2.9. Growth, Mechanism, and Work for Energy Storage Devices of PANI NFs.** We reported the formation of fibrillar morphology by long period of polymerization of aniline in the dopant of HCl and HNO<sub>3</sub>. Two important factors are common to long period of polymerization: (i) an induction period followed by a rather rapid formation of a precipitate, and (ii) the influence of inert surfaces (walls of the reaction flask) on the progress of the reaction. We believe that polymerization first occurs on the surface whose morphology is mirrored by the growing polymer chain. Indeed, a blue-green film of pernigraniline salt is formed on the walls of the reaction flask well before a precipitate is observed in bulk. Due to in situ deposition of pernigraniline, a (fibrillar) salt seed fresh polymer growth triggering in a continuous seeding process resulting in a black precipitate, the nanoscale morphology of the original is obtained in various lengths.<sup>45–47</sup> It is also supported by Tran et al.<sup>5</sup> and our experimental observations during polymerization of aniline. We have also noticed the significantly decreasing polymerization rate.

Secondary growth leads to agglomeration not seen in PANI NFs except in ST-PANI NSs. These results reveal important insights into a semirigid rod nucleation phenomenon that has

hitherto been little explored. When PANI nucleates homogeneously, surface energy necessitates the formation of ordering nuclei, which leads to the directional polymerization of aniline. This ultimately leads to the formation of 1D nanofibrillar morphology of the final product. This interesting point noted that the HCl-doped polyaniline nanofibers lead to the formation of silver–polyaniline nanofibers NCs. Li et al.<sup>48</sup> reported that PANI NFs perform like a concentric cable where only a small part of PANI NFs is involved in the cyclic voltammetry. The nanometer-sized PANI NFs in the form of fibers formed a well-organized pipe-like structure and yield a high electrochemical capacitance performance. This is the reason for such structure electrode material showing the best capacitance (Figure 8).

**2.10. Electrodes with Numerous Pipe-like Channels of PANI NFs.** In Figure 8, the faint gray shield stands for the part where the insertion/expulsion of HCl/HNO<sub>3</sub> can take place, and the dark green core stands for the conductive part of NFs where no change occurs during the cycles. Therefore, the dark green core has no contribution to the enhancement in the capacitance, and only the faint gray shield is available for deciding the capacitance. The ratio of the dark green core to the whole NF represents the proportion of PANI generating the capacitance.<sup>48</sup> The PANI NFs must be conducted for electron transfer during the redox reaction. As mentioned in FESEM and TEM analyses, the PANI NFs have a 1D structure (Figure 5a–d and Figures S2–S4).

Hence, we believe that data presented in this paper as well as those discussed regarding the capacitance of PANI NFs are the most reliable. Template-free synthesized PANI NFs could play a pioneering role and replace nonfibrillar PANI in the development of next-generation ESDs as it behaves like a metal-PANI NC with higher capacitance. This synthetic procedure is quite economical and facile.

**2.11. Correlation of FTIR and NMR Spectroscopy with CV.** The electrochemistry of nitrogen compounds is of particular interest because of the availability of two reaction sites for removal and addition of an electron in PANI NFs, but very limited work has been done with these systems. We take this trend as evidence that the site of electron abstraction in the PANI NFs is the lone pair on nitrogen delocalized into the aromatic ring.<sup>49</sup> Due to the presence of phenazine rings in PANI NFs and in ST-PANI NSs, peaks I and II show the formation of the cross-linked PANI NFs. The FTIR peak of the products aniline cation (C<sub>6</sub>H<sub>5</sub>NH<sup>+</sup>) and nitrenium ion (C<sub>6</sub>H<sub>4</sub>N<sup>+</sup>) of the PANI NFs corresponds to ~1477 cm<sup>-1</sup>, whereas <sup>13</sup>C NMR signals at 7–7.5 ppm and <sup>1</sup>H signals with chemical shifts at 7.0–8.5 ppm (<sup>1</sup>H) are associated with protons that are directly bonded to aromatic rings due to the chemical shift (Figure S5).

Studies of the evolution of the voltammetry curves of HCl-doped and HNO<sub>3</sub>-doped PANI NFs and ST-PANI as a function of the upper potential limit are supported by FTIR and NMR studies. In the corresponding PANI NFs, the middle peak (I) frequently appears in the cyclic voltammetry curves that correlate to the formation of cross-linked PANI NFs (Figure 5a–d) through the substitution of a nitrenium cation into each other and that of ST-PANI due to agglomeration. However, peak II is not observed due to the lower concentration of nitrenium ion (C<sub>6</sub>H<sub>4</sub>N<sup>+</sup>).<sup>49,50</sup>

**2.12. Electrical Conductivity.** The conductivities of HCl-doped and HNO<sub>3</sub>-doped PANI NFs and ST-PANI NSs were observed to be 48.47, 32.08, and 11.9 S cm<sup>-1</sup>, respectively.

Here, we found that the conductivity of HCl-doped PANI NFs is approximately 38 times higher than that generally found in nonfibrillar PANI. The nanofibrillar composite materials exhibit enhanced conductivities with values up to 95 S cm<sup>-1</sup>.<sup>50</sup> In ST-PANI NSs, the conductivity is low, indicating low doping of HCl (Table S1).

Recently, Shi et al.<sup>51</sup> reported that the polymerization time and dopant concentration play the major role on the electronic conductivity of PANI/PANI NFs/PANI NCs. In the present work, a network of PANI NFs behaved like silver-PANI NFs NCs. The formation of new phases and the doping level of acids due to post-polymerization show the positive effect on conductivity.<sup>52</sup>

**2.13. Justification of Behavior of PANI NFs as PANI NFs-Ag NCs.** According to Jia et al.<sup>24</sup> polyaniline shows several peaks around 2θ = 20° that are probably induced by the dopant. The silver peaks obtained around 2θ = 20° are disappearing in silver–polyaniline nanofibers NC synthesized by using surfactant-like poly(styrene sulfonate) (PSS). In XRD (Figure 1, HCl dopant), the peaks appear around 2θ = 19.1° indicate the behavior of PANI NFs-Ag NCs synthesized by a template-free method similar to the work of Huang et al.<sup>1</sup> Recently, Ghani et al.<sup>33</sup> reported that the preparation method of PANI can affect the morphology and properties of it.

**2.14. Antibacterial Studies.** PANI NFs behaving like PANI-Ag NCs is used for antibacterial studies. PANI NFs are used to determine the MIC and MBC of Gram-positive *Staphylococcus aureus* and Gram-negative *Escherichia coli*. PANI NFs and Ag nanoparticles are used as antibacterial agents. Bacterial inhibition zones of *E. coli* and *S. aureus* are shown in Figure 10. The PANI NFs NCs display zones of inhibition at



Figure 10. Zones of inhibition of bacteria at 10 and 20 μL/mL of (a) Ag NPs of *S. aureus*, (b) PANI NFs of *S. aureus*, (c) Ag NPs of *E. coli*, and (d) PANI NFs of *E. coli*.

20 μL/mL of 15 and 19 mm for *S. aureus* and *E. coli*, respectively, which were higher than other concentrations and silver nanoparticles, as shown in Table 1. The formation of the zones of inhibition indicates AB activity. In addition, the zone of inhibition of *E. coli* is elevated than *S. aureus* in PANI NFs as well as for Ag nanoparticles. This is due to positively charged ions binding with negatively charged thiols, carboxylates, amides, and indoles, destructing and disabling the DNA and cellular enzyme.<sup>33</sup> This indicates the PANI NFs play the role of PANI NFs-Ag NCs without Ag nanoparticles. The nanostruc-

**Table 1. Zone of Inhibition Measured by Disc Diffusion Method**

catalyst/bacteria	zone of inhibition (mm)			
	<i>E. coli</i>		<i>S. aureus</i>	
	10 $\mu\text{L}/\text{mL}$	20 $\mu\text{L}/\text{mL}$	10 $\mu\text{L}/\text{mL}$	20 $\mu\text{L}/\text{mL}$
Ag NPs	7	10	8	9
PANI NFs	14	19	13	15

tures of PANI NFs can play a major role in the antibacterial performance because of their high atom density.<sup>51</sup>

Minimal inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) are determined by the standard methods. MIC is the lowest concentration where there is no noticeable growth of bacteria, and the complete absence of colony noticed at the lowest concentration is known as MBC. Here, the MBCs at 600 and 700  $\mu\text{g}/\text{mL}$  of *E. coli* and *S. aureus*, respectively, were considered for their study. The antibacterial agents having ability to kill bacteria at lower concentration. Herein, the lower values of MIC (200–300  $\mu\text{g}/\text{mL}$ ) of *E. coli* and *S. aureus* bacteria exhibiting efficient antibacterial agent.

Tolerance factor is used to determine bactericidal or bacteriostatic nature of an antibacterial agent by using MIC and MBC values. *E. coli* has a tolerance factor of 3, and *S. aureus* has a tolerance factor of 2.3. As per literature reports, the agents that kill microorganisms are called bactericidal, while the agent that inhibits the bacterial development is called bacteriostatic. Therefore, the tolerance factors conclude that the antibacterial agent has a bacteriostatic or bactericidal nature by taking into account its MBC/MIC ratio. When the MBC/MIC ratio is larger or identical to 16, it is bacteriostatic, and when the MBC/MIC ratio is less than 4, it is believed to be bactericidal.<sup>54</sup> The antibacterial agent is also bactericidal if colony-forming units (CFU)/mL is reduced by 99.9% after the incubation period. In the present context, PANI NFs encompass a proficient and complete reduction of  $1 \times 10^6$  CFU/mL. Therefore, the PANI NFs demonstrate the bactericidal consequence against these bacteria because of the lower value of the MBC/MIC ratio. This outcome indicates that the bactericidal effect on both bacteria and is concordance with earlier reports.<sup>55–57</sup>

### 3. EXPERIMENTAL SECTION

**3.1. Materials.** All the precursors and chemicals used were of analytical reagent (A.R.) grade, purchased from commercial sources (Fluka, Aldrich), and used without further purification except for aniline. Aniline was purified by double distillation method. The two bacterial species were purchased from the National Collection of Industrial Microorganisms (NCIM), Pune Maharashtra, India.

**3.2. Synthesis of HCl-Doped PANI NFs.** In a round-bottom flask, 100 mL of 1 M HCl solution and 1 mL of aniline were slowly mixed under constant magnetic stirring at a speed of 1200 rpm on a Remi magnetic stirrer for 12 h. During constant stirring, 0.25 M APS was slowly added to the above mixture and continued for 48 h at room temperature. Finally, the formation of dark green emeraldine salt and a colorless filtrate confirmed the formation of PANI. The precipitate was washed with deionized distilled water several times and then with acetone and dried in oven at 45 °C for 24 h afterward. A

free-flowing powder of HCl-doped PANI NFs was obtained and used for further characterization.

**3.3. Synthesis of HNO<sub>3</sub>-Doped PANI NFs.** For synthesis of HNO<sub>3</sub>-doped PANI NFs, the same experimental protocol for HCl-doped PANI NFs was used. Instead of HCl, an appropriate amount of HNO<sub>3</sub> was used.

**3.4. Synthesis of HCl-Doped PANI Nanospheres (Short-Time (ST)-PANI NSs).** HCl-doped PANI nanospheres were synthesized by employing a similar procedure adopted for HCl-doped PANI NFs and by decreasing the time of addition to 30 min and the polymerization time to 1 h.

**3.5. AB Activity: Strain Selection and Inoculum Preparation.** The Gram-positive bacteria used are *S. aureus* (NCIM-2121), while the Gram-negative bacteria used are *E. coli* (NCIM-2110). Each of the strain was grown in nutrient broth (NB) medium (HiMedia, India) for about 24 h. The culture was then suspended in physiological saline using a turbidity of McFarland standard no. 2. From that, an aliquot of 50  $\mu\text{L}$  was added to 5 mL of sterile nutrient broth, resulting in an inoculum of approximately  $1 \times 10^6$  CFU/mL.

**3.6. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) Determination.** The catalyst PANI NFs were treated for 24 h with B cultures, which was diluted  $1 \times 10^6$  CFU/mL, and cell strain was determined with an absorbance at 600 nm. In the control, a set of B cultures is grown in the absence of PANI NFs, and for sterility testing, a sterile uninoculated nutrient broth of the same set was used. Minimum B concentration of the PANI NFs was determined by spreading the catalyst with a culture broth solution of  $1 \times 10^6$  CFU/mL in the range of 100 to 1000  $\mu\text{g}/\text{mL}$ . The ratio of the bacterial culture with catalyst solution was optimized to 1:1 and incubated at 35–37 °C for 18–24 h. The MIC is measured as the lowest concentration of an antimicrobial agent that resulted into no any visible growth. MBC is also determined after determination of MIC. Thus, for MBC, 50  $\mu\text{L}$  of the bacterial culture was collected sterily from the incubated set of the MIC determination and was uniformly distributed on the nutrient agar plate. These plates were incubated for 24 h at 37 °C with the reduction of CFU of the inoculum by 99.9% or more determined. The above protocols were repeated in triplicates.

The electrochemical study was also performed using a button-type cell configuration with the help of a computer-controlled Autolab PGSTAT30 (Eco Chemie) potentiostat/galvanostat system. The working electrode was prepared by mixing the HCl-doped and HNO<sub>3</sub>-doped PANI NF and PANI NS powder (separately), carbon black, and Nafion (70:25:5 by weight) followed by compacting and drying under a primary vacuum for 2 h at 600 °C. The electrolyte used was 1 M HClO<sub>4</sub> in propylene carbonate (PC), and a lithium foil was used as the anode. The PANI NFs were also characterized using nuclear magnetic resonance (NMR) spectroscopy (<sup>1</sup>H and <sup>13</sup>C) for percentage determination of doping of acids. Conductivity was calculated by using the resistance measured using a Keithley electrometer.

**3.7. Characterization.** X-ray diffraction (XRD) patterns of HCl-doped and HNO<sub>3</sub>-doped PANI NFs were recorded on Rigaku (Japan) D/MAX-2400. The morphology was examined by field emission scanning electron microscopy (FESEM, Hitachi S-4800) and transmission electron microscopy (TEM, JEOL, JEM 2100). For detection of functional groups and measurement of order and disorder in PANI, Fourier transform infrared (FTIR, PerkinElmer) techniques have



been used with sufficient loading of samples. UV-vis spectroscopy measurement was recorded by using PerkinElmer Lambda 950 in the range of 200–1000 nm in aqueous medium. Thermal behavior was studied by (TGA, SETRAM) in the range of 50–650 °C under an inert atmosphere.

#### 4. CONCLUSIONS

In the present investigation, we have demonstrated an economical, room-temperature, and template-free method for fabrication of PANI NFs. The HCl-doped PANI NFs show similar properties of PANI NFs NCs with an enhanced capacitance (570 F g<sup>-1</sup>) compared with PANI (33 F g<sup>-1</sup>) and PANI NFs (122 F g<sup>-1</sup>). The presented PANI NFs can promote remarkable enhancement in the performance of the DE. Morphological studies indicate that the size of PANI NFs is around ~50 nm in diameter and few micrometers in length with good aspect ratio. The XRD pattern of HCl-doped PANI NFs shows that additional peaks at  $2\theta = 6.34^\circ$  and  $19.1^\circ$  indicate the formation of silver, indicating that the corresponding NFs behave like silver-PANI NFs NCs. The detailed mechanism of formation of PANI NFs has also been interpreted. The high capacitance of PANI NF electrodes that are behaving like PANI NFs-Ag NCs is making them attractive for DE applications. On the basis of this hypothesis, it is easy to alter elongated 1D NFs to 3D hollow nanospheres without any template. The PANI NFs exhibited the efficient antibacterial agent as compared to only Ag nanoparticles, which revealed that the PANI NFs are acting as a competent antibacterial agent than PANI NFs-Ag NCs. Significantly, water-soluble PANI NFs are useful for applications in biosensors, electronics, and electrical and optical devices. Moreover, as PANI can act as a synthetic metal, the PANI NFs can also act as PANI NFs-Ag NCs. This opens up a new spectrum of research in NFs of other conducting polymers like polypyrrole and polythiophene and their metallic behavior.

#### ■ ASSOCIATED CONTENT

##### Supporting Information

The Supporting Information is available free of charge on the ACS Publications website at DOI: 10.1021/acsomega.8b02834.

Raman spectroscopy, FESEM images of HCl-doped PANI NFs, FESEM image of HNO<sub>3</sub>-doped PANI-NFs, TEM image of HCl-doped PANI-NFs, NMR study, EI study, and conductance and specific capacitance (PDF)

#### ■ AUTHOR INFORMATION

##### Corresponding Author

\*E-mail: diggikars@gmail.com.

##### ORCID

Rahul S. Diggikar: 0000-0001-8573-3999

##### Notes

The authors declare no competing financial interest.

#### ■ ACKNOWLEDGMENTS

This work was financed by the University Grants Commission, New Delhi, India under Major Research Project Scheme (file no. 43/408/2014 (SR)). The authors are deeply acknowledged to Dr. Bharat B. Kale, Director, C-MET, Pune, Maharashtra, India for constant support and motivation.

#### ■ REFERENCES

- (1) Huang, W.-S.; Humphrey, B. D.; MacDiarmid, A. G. Polyaniline, a novel conducting polymer. Morphology and chemistry of its oxidation and reduction in aqueous electrolytes. *J. Chem. Soc., Faraday Trans. 1* **1986**, *82*, 2385–2400.
- (2) Tamboli, M. S.; Kulkarni, M. V.; Deshmukh, S. P.; Kale, B. B. Synthesis and spectroscopic characterization of silver-polyaniline nanocomposite. *Mater. Res. Innovations* **2013**, *17*, 112–116.
- (3) Pouget, J. P.; Jozefowicz, M. E.; Epstein, A. J.; Tang, X.; MacDiarmid, A. G. X-ray structure of polyaniline. *Macromolecules* **1991**, *24*, 779–789.
- (4) Jung, Y. S.; Ross, C. A. Well-Ordered Thin-Film Nanopore Arrays Formed Using a Block-Copolymer Template. *Small* **2009**, *5*, 1654–1659.
- (5) Tran, H. D.; Wang, Y.; D'Arcy, J. M.; Kaner, R. B. Toward an understanding of the formation of conducting polymer nanofibers. *ACS Nano* **2008**, *2*, 1841–1848.
- (6) Huang, L.; Wang, Z.; Wang, H.; Cheng, X.; Mitra, A.; Yan, Y. Polyaniline nanowires by electropolymerization from liquid crystalline phases. *J. Mater. Chem.* **2002**, *12*, 388–391.
- (7) Chiou, N.-R.; Epstein, A. J. A simple approach to control the growth of polyaniline nanofibers. *Synth. Met.* **2005**, *153*, 69–72.
- (8) Du, X.-S.; Zhou, C.-F.; Mai, Y.-W. Facile synthesis of hierarchical polyaniline nanostructures with dendritic nanofibers as scaffolds. *J. Phys. Chem. C* **2008**, *112*, 19836–19840.
- (9) Jayakrishnan, P.; Ramesan, M. T. Temperature dependence of the electrical conductivity of poly (Anthranilic acid)/magnetite nanocomposites and the applicability of different conductivity models. *Polym. Compos.* **2018**, *39*, 2791–2800.
- (10) Ramesan, M. T.; Sampreeth, T. Synthesis, characterization, material properties and sensor application study of polyaniline/niobium doped titanium dioxide nanocomposites. *J. Mater. Sci.: Mater. Electron.* **2017**, *28*, 16181–16191.
- (11) Ramesan, M. T.; Sampreeth, T. In situ synthesis of polyaniline/Sn-doped TiO<sub>2</sub> nanocomposites: evaluation of structural, morphological, conductivity studies and gas sensing applications. *J. Mater. Sci.: Mater. Electron.* **2018**, *29*, 4301–4311.
- (12) Ramesan, M. T.; Santhi, V. Synthesis, characterization, conductivity and sensor application study of polypyrrole/silver doped nickel oxide nanocomposites. *Compos. Interfaces* **2018**, *25*, 725–741.
- (13) Qiu, H.; Wan, M.; Matthews, B.; Dai, L. Conducting Polyaniline Nanotubes by Template-Free Polymerization. *Macromolecules* **2001**, *34*, 675–677.
- (14) Ma, H.-y.; Li, Y.-w.; Yang, S.-x.; Cao, F.; Gong, J.; Deng, Y.-l. Effects of solvent and doping acid on the morphology of polyaniline prepared with the ice-templating method. *J. Phys. Chem. C* **2010**, *114*, 9264–9269.
- (15) Pan, L.; Qiu, H.; Dou, C.; Li, Y.; Pu, L.; Xu, J.; Shi, Y. Conducting polymer nanostructures: template synthesis and applications in energy storage. *Int. J. Mol. Sci.* **2010**, *11*, 2636–2657.
- (16) Sapurina, I.; Stejskal, J. The mechanism of the oxidative polymerization of aniline and the formation of supramolecular polyaniline structures. *Polym. Int.* **2008**, *57*, 1295–1325.
- (17) Schnippering, M.; Powell, H. V.; Mackenzie, S. R.; Unwin, P. R. Real-time monitoring of polyaniline nanoparticle formation on surfaces. *J. Phys. Chem. C* **2009**, *113*, 20221–20227.
- (18) Poole, C. P., Jr.; Owens, J. F., *Introduction to Nanotechnology*. Springer, 2005.
- (19) Diggikar, R. S.; Dhavale, V. M.; Shinde, D. B.; Kanbargi, N. S.; Kulkarni, M. V.; Kale, B. B. Morphology controlled synthesis of LiV<sub>2</sub>O<sub>5</sub>/Ag nanocomposite nanotubes with enhanced electrochemical performance. *RSC Adv.* **2012**, *2*, 3231–3233.
- (20) Diggikar, R. S.; Patil, R. H.; Kale, S. B.; Thombre, D. K.; Gade, W. N.; Kulkarni, M. V.; Kale, B. B. Silver-decorated orthorhombic nanotubes of lithium vanadium oxide: an impedor of bacterial growth and biofilm. *Appl. Microbiol. Biotechnol.* **2013**, *97*, 8283–8290.
- (21) Diggikar, R. S.; Kulkarni, M. V.; Kale, G. M.; Kale, B. B. Formation of multifunctional nanocomposites with ultrathin layers of

polyaniline (PANI) on silver vanadium oxide (SVO) nanospheres by in situ polymerization. *J. Mater. Chem. A* **2013**, *1*, 3992–4001.

(22) Diggikar, R. S.; Ambekar, J. D.; Kulkarni, M. V.; Kale, B. B. Nanocrystalline silver vanadium sulfide (SVS) anchored polyaniline (PANI): new nanocomposite system for supercapacitor. *New J. Chem.* **2013**, *37*, 3236–3243.

(23) Dhand, C.; Das, M.; Sumana, G.; Srivastava, A. K.; Pandey, M. K.; Kim, C. G.; Datta, M.; Malhotra, B. D. Preparation, characterization and application of polyaniline nanospheres to biosensing. *Nanoscale* **2010**, *2*, 747–754.

(24) Jia, Q.; Shan, S.; Jiang, L.; Wang, Y. One-step synthesis of polyaniline nanofibers decorated with silver. *J. Appl. Polym. Sci.* **2010**, *115*, 26–31.

(25) Khanna, P. K.; Singh, N.; Kulkarni, D.; Deshmukh, S.; Charan, S.; Adhyapak, P. V. Water based simple synthesis of re-dispersible silver nano-particles. *Mater. Lett.* **2007**, *61*, 3366–3370.

(26) Neelgand, G. M.; Hrehorova, E.; Joyce, M.; Bliznyuk, V. Synthesis and characterization of polyaniline derivative and silver nanoparticle composites. *Polym. Int.* **2008**, *57*, 1083–1089.

(27) Gao, Y.; Shan, D.; Cao, F.; Gong, J.; Li, X.; Ma, H.-y.; Su, Z.-m.; Qu, L.-y. Silver/polyaniline composite nanotubes: one-step synthesis and electrocatalytic activity for neurotransmitter dopamine. *J. Phys. Chem. C* **2009**, *113*, 15175–15181.

(28) Park, H.-W.; Kim, T.; Huh, J.; Kang, M.; Lee, J. E.; Yoon, H. Anisotropic Growth Control of Polyaniline Nanostructures and Their Morphology-Dependent Electrochemical Characteristics. *ACS Nano* **2012**, *6*, 7624–7633.

(29) Gupta, V.; Mitra, N. Electrochemically deposited polyaniline nanowire's network a high-performance electrode material for redox supercapacitor. *Electrochim. Solid-State Lett.* **2005**, *8*, A630–A632.

(30) Tamboli, M. S.; Kulkarni, M. V.; Patil, R. H.; Gade, W. N.; Navale, S. C.; Kale, B. B. Nanowires of silver–polyaniline nanocomposite synthesized via in situ polymerization and its novel functionality as an antibacterial agent. *Colloids Surf., B* **2012**, *92*, 35–41.

(31) Wei, H.; Yan, X.; Wu, S.; Luo, Z.; Wei, S.; Guo, Z. Electropolymerized polyaniline stabilized tungsten oxide nanocomposite films: electrochromic behavior and electrochemical energy storage. *J. Phys. Chem. C* **2012**, *116*, 25052–25064.

(32) Khanna, P. K.; Singh, N.; Charan, S.; Viswanath, A. K. Synthesis of Ag/polyaniline nanocomposite via an in situ photo-redox mechanism. *Mater. Chem. Phys.* **2005**, *92*, 214–219.

(33) Ghani, S.; Sharif, R.; Shahzadi, S.; Zafar, N.; Anwar, A. W.; Ashraf, A.; Zaidi, A. A.; Kambhoj, A. H.; Bashir, S. Simple and inexpensive electrodeposited silver/polyaniline composite counter electrodes for dye-sensitized solar cells. *J. Mater. Sci.* **2015**, *50*, 1469–1477.

(34) Patil, D. S.; Shaikh, J. S.; Pawar, S. A.; Devan, R. S.; Ma, Y. R.; Moholkar, A. V.; Kim, J. H.; Kalubarme, R. S.; Park, C. J.; Patil, P. S. Investigations on silver/polyaniline electrodes for electrochemical supercapacitors. *Phys. Chem. Chem. Phys.* **2012**, *14*, 11886–11895.

(35) Bober, P.; Trchová, M.; Prokeš, J.; Varga, M.; Stejskal, J. Polyaniline–silver composites prepared by the oxidation of aniline with silver nitrate in solutions of sulfonic acids. *Electrochim. Acta* **2011**, *56*, 3580–3585.

(36) Liu, Z.; Zhang, X.; Poyraz, S.; Surwade, S. P.; Manohar, S. K. Oxidative template for conducting polymer nanoclips. *J. Am. Chem. Soc.* **2010**, *132*, 13158–13159.

(37) Hyder, M. N.; Lee, S. W.; Cebeci, F. Ç.; Schmidt, D. J.; Shao-Horn, Y.; Hammond, P. T. Layer-by-layer assembled polyaniline nanofiber/multiwall carbon nanotube thin film electrodes for high-power and high-energy storage applications. *ACS Nano* **2011**, *5*, 8552–8561.

(38) Hong, S.-Y.; Jung, Y. M.; Kim, S. B.; Park, S.-M. Electrochemistry of conductive polymers. 34. Two-dimensional correlation analysis of real-time spectroelectrochemical data for aniline polymerization. *J. Phys. Chem. B* **2005**, *109*, 3844–3850.

(39) Zhang, X.; Goux, W. J.; Manohar, S. K. Synthesis of polyaniline nanofibers by “nanofiber seeding”. *J. Am. Chem. Soc.* **2004**, *126*, 4502–4503.

(40) Sawangphruk, M.; Kaewsongpol, T. Direct electrodeposition and superior pseudocapacitive property of ultrahigh porous silver-incorporated polyaniline films. *Mater. Lett.* **2012**, *87*, 142–145.

(41) Hu, Z.; Zu, L.; Jiang, Y.; Lian, H.; Liu, Y.; Li, Z.; Chen, F.; Wang, X.; Cui, X. High specific capacitance of polyaniline/mesoporous manganese dioxide composite using  $K_2H_2SO_4$  electrolyte. *Polymers* **2015**, *7*, 1939–1953.

(42) Lin, Y.-F.; Chen, C.-H.; Xie, W.-J.; Yang, S.-H.; Hsu, C.-S.; Lin, M.-T.; Jian, W.-B. Nano approach investigation of the conduction mechanism in polyaniline nanofibers. *ACS Nano* **2011**, *5*, 1541–1548.

(43) Choi, E.-K.; Jeon, I.-Y.; Oh, S.-J.; Baek, J.-B. “Direct” grafting of linear macromolecular “wedges” to the edge of pristine graphite to prepare edge-functionalized graphene-based polymer composites. *J. Mater. Chem.* **2010**, *20*, 10936–10942.

(44) Diggikar, R. S.; Late, D. J.; Kale, B. B. Unusual morphologies of reduced graphene oxide and polyaniline nanofibers-reduced graphene oxide composites for high performance supercapacitor applications. *RSC Adv.* **2014**, *4*, 22551–22560.

(45) Zhang, X.; Kolla, H. S.; Wang, X.; Raja, K.; Manohar, S. K. Fibillar growth in polyaniline. *Adv. Funct. Mater.* **2006**, *16*, 1145–1152.

(46) Wei, Z.; Zhang, Z.; Wan, M. Formation mechanism of self-assembled polyaniline micro/nanotubes. *Langmuir* **2002**, *18*, 917–921.

(47) Zhang, L.; Wan, M. Self-Assembly of Polyaniline-From Nanotubes to Hollow Microspheres. *Adv. Funct. Mater.* **2003**, *13*, 815–820.

(48) Li, H.; Wang, J.; Chu, Q.; Wang, Z.; Zhang, F.; Wang, S. Theoretical and experimental specific capacitance of polyaniline in sulfuric acid. *J. Power Sources* **2009**, *190*, 578–586.

(49) Pomerantz, M.; Marynick, D. S.; Rajeshwar, K.; Chou, W. N.; Throckmorton, L.; Tsai, E. W.; Chen, P. C. Y.; Cain, T. NMR spectroscopy and cyclic voltammetry of N-aryl-P, P, P-triphenylphosphazene-5-azenes. Substituent effects and correlation with molecular orbital calculations. *J. Org. Chem.* **1986**, *51*, 1223–1230.

(50) Genies, E. M.; Lapkowski, M.; Penneau, J. F. Cyclic voltammetry of polyaniline: interpretation of the middle peak. *J. Electroanal. Chem. Interfacial Electrochem.* **1988**, *249*, 97–107.

(51) Shi, Y.; Yu, G. Designing hierarchically nanostructured conductive polymer gels for electrochemical energy storage and conversion. *Chem. Mater.* **2016**, *28*, 2466–2477.

(52) Acharya, S.; Santino, L. M.; Lu, Y.; Anandarajah, H.; Wayne, A.; D’Arcy, J. M. Ultrahigh stability of high-power nanofibillar PEDOT supercapacitors. *Sustain Energy Fuels* **2017**, *1*, 482–491.

(53) Upadhyay, J.; Kumar, A.; Gogoi, B.; Buragohain, A. K. Antibacterial and hemolysis activity of polypyrrole nanotubes decorated with silver nanoparticles by an in-situ reduction process. *Mater. Sci. Eng., C* **2015**, *54*, 8–13.

(54) Woods, G. L.; Washington, J. A. The Clinician and the Microbiology Laboratory. In *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases*; Churchill Livingstone, 1995; Vol. 1, pp 102-149.

(55) Boomi, P.; Prabu, H. G.; Manisankar, P.; Ravikumar, S. Study on antibacterial activity of chemically synthesized PANI-Ag-Au nanocomposite. *Appl. Surf. Sci.* **2014**, *300*, 66–72.

(56) Poyraz, S.; Cerkez, I.; Huang, T. S.; Liu, Z.; Kang, L.; Luo, J.; Zhang, X. One-step synthesis and characterization of polyaniline nanofiber/silver nanoparticle composite networks as antibacterial agents. *ACS Appl. Mater. Interfaces* **2014**, *6*, 20025–20034.

(57) Deshmukh, S. P.; Mullani, S. B.; Koli, V. B.; Patil, S. M.; Kasabe, P. J.; Dandge, P. B.; Pawar, S. A.; Delekar, S. D. Ag Nanoparticles Connected to the Surface of  $TiO_2$  Electrostatically for Antibacterial Photoinactivation Studies. *Photochem. Photobiol.* **2018**, *94*, 1249–1262.

**58. Review on the applications of internet and computers in chemical sciences**

© 2018 IJRAR January 2019, Volume 6, Issue 1

www.ijrar.org (E-ISSN 2348-1269, P-ISSN 2349-5138)

## Review on the applications of Internet and Computers in Chemical sciences

V. W. Godse<sup>a</sup>, S. S. Rindhe<sup>a</sup>, A. E. Athare<sup>a</sup>, B. H. Zaware<sup>a</sup>, B. S. Narsale<sup>a</sup>, G. A. Tikone<sup>a</sup>  
and Rajendra P. Pawar<sup>b\*</sup>

<sup>a</sup>Department of Chemistry, NACS College, Ahmednagar, 414001, Maharashtra, India.

<sup>b</sup>Department of Chemistry, Deogiri College, Aurangabad, 431005, Maharashtra, India.

**Abstract:**

Use of Internet is essential as per the dawn of twenty first century. In Chemical, sciences there is tremendous transformation occurred due to the use of computer software's and internet. This review predominantly emphasizes on the numerous applications, software and use of computers in chemistry.

In this overview all the aspects of internet and computer software has been discussed.

**Keywords:**

Chemical sciences, software, Internet, use, etc.

**Introduction:**

In current decade every stream has been takeover by the computers in the form of software or technology. Due to this revolution, use of computer and internet makes drastic changes in the field of research. Initially in Chemical sciences, computers are used for writing and drafting of matter and internet was available as the source of references. However, in modern decades, the horizon of chemical sciences has been changed because of new mutation in the field of computer science. Various software and technology has been available in the market. All such information has been overviewed in current review of applications of internet in chemical sciences.

**Internet and computer:**

There are various online and offline software or websites available through the internet search. Some of them has been enlisted below:

- 1] Chems sketch: This software has been used for to draw the structures and calculate some of aspects of molecules.
- 2] Chemdraw: Chemdraw is used as similar to that of Chems sketch.
- 3] Moldraw: Along with drawing the structures, this software gives 3D view of molecules.
- 4] MOPAC: It is nothing but the molecular orbital package.
- 5] Gaussion: This software is utilized in computational chemistry.
- 6] Dock: In drug design such program has been used.
- 7] CP2K: This is widely used in quantum chemistry and solid state chemistry.
- 8] Scifinder: This is online web search available in the field of research.
- 9] DL\_POLY: It is a molecular dynamics simulation software.
- 10] Jaguar: It is used for ab initio and density calculation.

Rather than this number of software and websites are available on internet.

IJRAR1900058

International Journal of Research and Analytical Reviews (IJRAR) [www.ijrar.org](http://www.ijrar.org) | 284

**Conclusion:**

There are many software has been available in few year which assists simplification of data. Also due to them conventional burden of analysis and calculation of data has been avoided. The software tools and more computing data helps us to strengthen the research. This review hopefully includes few of most useful software tools available on internet.

**Acknowledgements:**

The authors are thankful to Dr. B. H. Zaware, Principal New Arts, Comm. & Science, College, Ahmednagar for encouragement and providing necessary facilities.

**References:**

- 1] Bennett, J.; Pence, H. E. J. Chem. Educ. 2011, 88, 761–763.
- 2] Ozanne JL, Davis B, Murray JB, Grier S, Benmecheddal A, Downey H, et al. Assessing the Societal Impact of Research: The Relational Engagement Approach. J Public Policy Mark. 2016; 9156, 14, 121.
- 3] Feldt, J.; Mata, R. A.; Dieterich, J. M. J. Chem. Inf. Model. 2012, 52, 1072–1078.
- 4] Waltman L, Costas R. F1000 recommendations as a potential new data source for research evaluation: A comparison with citations. J Assoc. 2014;
- 5] Perception of the importance of chemistry research papers and comparison to citation rates, R. Borchardt, C. Moran, S. Cantrill, Chemjobber, Matthew R. Hartings, PLOS ONE, March 28, 2018
- 6] Chemistry on the Go: Review of Chemistry Apps on Smartphones, Diana Libman and Ling Huang, J. Chem. Educ, pubs.acs.org/jchemeduc, 2013.
- 7] Williams, A. J.; Ekins, S.; Clark, A. M.; Jack, J. J.; Apodaka, R. L. Drug Discovery Today 2011, 16, 928–939.

## 59. Synthesis and Characterization of Some Benzofuran anchored Heterocycles

[ VOLUME 6 | ISSUE 2 | APRIL- JUNE 2019 ]

E ISSN 2348 - 1269, PRINT ISSN 2349-5138

## SYNTHESIS AND CHARACTERIZATION OF SOME BENZOFURAN ANCHORED HETEROCYCLES

S. G. Kundlikar<sup>a\*</sup>, B. K. Karale<sup>b</sup>, D. R. Thube<sup>a</sup>, H. N. Akolkar<sup>b</sup>, S. D. Mhaske<sup>a</sup> & P. G. Rohokale<sup>a</sup><sup>a</sup>Department of Chemistry and Research Center, New Art's, Commerce and Science College, Parner  
<sup>b</sup>P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar, 414 001, India

Received: February 22, 2019

Accepted: March 29, 2019

**ABSTRACT:** : 7-Bromo-5-chlorobenzofuran-2-carbohydrazide **1** was reacted with different aromatic aldehydes **2** to give benzofuranyl hydrazone derivative **3**. Compound **3** on refluxed with acetic anhydride gave corresponding oxadiazoline derivative **4**. The structures of all the synthesized compounds were confirmed with the help of spectral techniques.

**Key Words:** Benzofuran, Hydrazone, Halogen, Oxadiazoline

## INTRODUCTION

Heteroaromatic compounds have attracted considerable attention in the design of biologically active molecules and advanced organic materials. So in the synthetic organic chemistry different synthetic methods for the preparation of such compounds is of great interest. Oxygen, sulphur and nitrogen containing heterocycles are of great importance due to their broad spectrum of pharmacological activities.

Benzofuran nucleus contributes the core structure of several pharmacologically active natural products and their derivatives are active inhibitors against many diseases, fungus, viruses, enzymes and microbes. Benzofuran derivatives are endowed with various biological activities such as acetylcholinesterase inhibitors<sup>1</sup>, anticancer<sup>2</sup>, allosteric modulators of Hsp90<sup>3</sup>, antibacterial<sup>4</sup> and inhibition of HIF-1<sup>4</sup>.

Oxadiazoline derivatives are endowed with various biological activities like antitubulin<sup>5</sup>, gamma secretase inhibitors<sup>6</sup>, antimicrobial<sup>7</sup>, anti-HIV<sup>8</sup>, as novel potential inhibitors targeting chitin biosynthesis<sup>9</sup> etc.

Encouraged by the biological activities associated with different benzofuran, oxadiazolines as mentioned above we have decided to synthesize benzofuran containing oxadiazolines.

## Experimental Section

Melting points were determined in open capillary tubes in liquid paraffin bath and are uncorrected. Silica gel G TLC plates were used to check the purity of the compounds. The structures of all synthesized compounds were assigned on the basis of instrumental techniques such as IR and <sup>1</sup>H NMR spectrometry.

<sup>1</sup>H NMR spectra were recorded on Bruker Avance II 400 MHz NMR spectrometer in CDCl<sub>3</sub> as a solvent and TMS as an internal standard. IR spectra were recorded on Bruker Alpha Eco-ATR. The schematic presentation of detailed scheme is presented in **Scheme-I** and M.P. and percentage yield data is presented in **Table-I**.

**N'-(4-Chlorobenzylidene)-7-bromo-5-chlorobenzofuran-2-carbohydrazide.**

Acid hydrazide (0.0017 mol) **1** and aldehyde (0.0017 mol) **2** were dissolved in alcohol and refluxed for 2 hrs. After completion of reaction, content were concentrated and allow at room temperature when solid substance was separated out and filtered. It was recrystallized from ethanol to afford compound **3**.

Formation of compound was confirmed by TLC, M.P. and spectral techniques.

**3a:** IR: 3080 (=CH), 1674 (C=O), 1552 (C=N), 1495 (C=C), 1162 (C-O-C) cm<sup>-1</sup>; <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 7.31 (t, 2H, Ar-H), 7.33 (dd, 2H, Ar-H), 7.35 (dd, 1H, Ar-H), 7.62-7.67 (m, 3H, Ar-H), 8.39 (s, 1H, Ar-H), 9.69 (s, 1H, Ar-H); MS: m/z (M+1), 378.

**3b:** IR: 3076 (=CH), 1671 (C=O), 1556 (C=N), 1497 (C=C), 1167 (C-O-C) cm<sup>-1</sup>; <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 7.41 (d, 2H, Ar-H), 7.62-7.67 (m, 3H, Ar-H), 7.76 (d, 2H, Ar-H), 8.39 (s, 1H, Ar-H), 9.69 (s, 1H, Ar-H); MS: m/z (M+1), 413.

**3c:** IR: 3079 (=CH), 1674 (C=O), 1555 (C=N), 1499 (C=C), 1350 (-NO<sub>2</sub>), 1164 (C-O-C) cm<sup>-1</sup>; <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 7.48 (d, 2H, Ar-H), 7.66-7.71 (m, 3H, Ar-H), 7.78 (d, 2H, Ar-H), 8.42 (s, 1H, Ar-H), 9.72 (s, 1H, Ar-H); MS: m/z (M+1), 423.

[VOLUME 6 | ISSUE 2 | APRIL - JUNE 2019]

e ISSN 2348 -1269, Print ISSN 2349-5138

<http://ijrar.com/>

Cosmos Impact Factor 4.236

**3d:** IR: 3072 (=CH), 1668 (C=O), 1552 (C=N), 1494 (C=C), 1162 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  3.52 (s, 3H), 7.38 (d, 2H,Ar-H), 7.60-7.62 (m, 3H,Ar-H), 7.72 (d, 2H,Ar-H), 8.33 (s, 1H,Ar-H), 9.66 (s, 1H,Ar-H); MS:  $m/z$  (M+1), 408.

**3e:** IR: 3076 (=CH), 1671 (C=O), 1556 (C=N), 1497 (C=C), 1167 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  3.50 (s, 3H), 3.53 (s, 3H), 7.0 (d, 1H,Ar-H), 7.1 (d, 1H,Ar-H), 7.3 (dd, 1H,Ar-H), 7.65-7.69 (m, 3H,Ar-H), 8.36 (s, 1H,Ar-H), 9.62 (s, 1H,Ar-H); MS:  $m/z$  (M+1), 438.

**1-(5-(7-Bromo-5-chlorobenzofuran-3-yl)-2-(4-chlorophenyl)-1,3,4-oxadiazol-3(2H)-yl) ethanone**

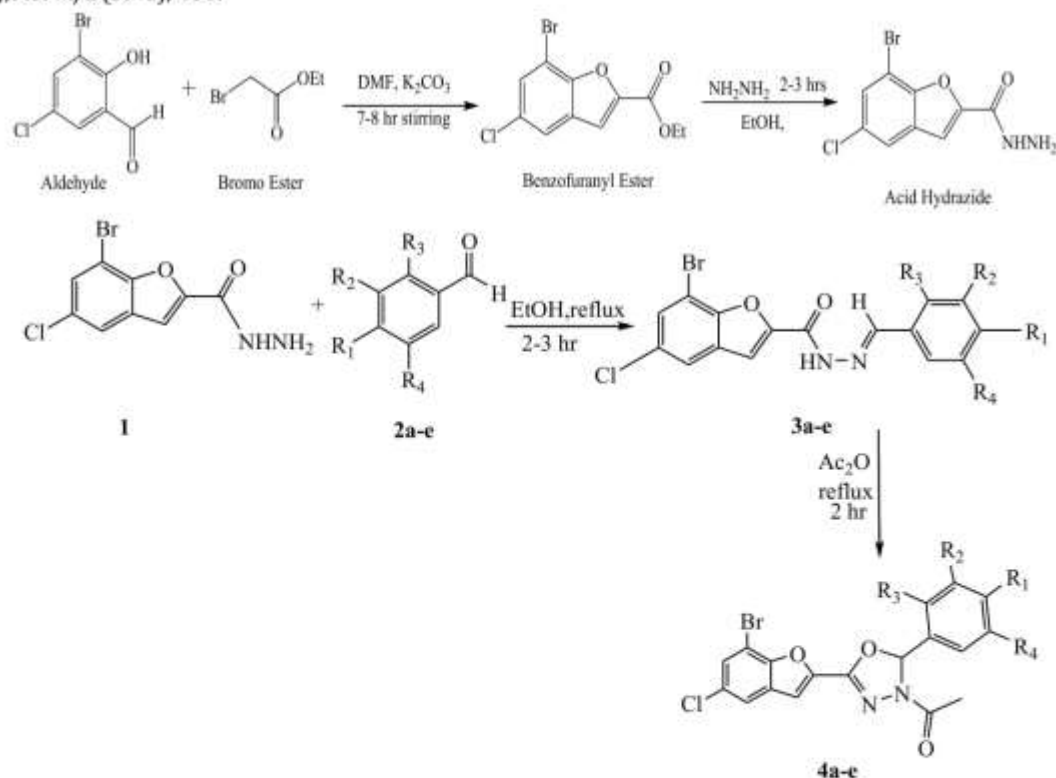
To the compound **3**, acetic anhydride (7 ml) was added and then reaction mixture was refluxed for 2 hrs. Reaction was monitored by TLC. After completion of the reaction it was poured on crushed ice and stirred vigorously until oil became solid, dried and crystallized from dichloromethane to afford compound **4**.  
**4a:** IR: 3104 (=CH), 1679 (C=O), 1518 (C=C), 1168 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.43 (s, 3H), 7.11 (s, 1H,Ar-H), 7.30 (s, 1H,Ar-H), 7.34-7.49 (m, 5H,Ar-H), 7.58 (d, 1H,Ar-H), 7.61 (d, 1H,Ar-H); MS:  $m/z$  (M+1), 420.

**4b:** IR: 3100 (=CH), 1677 (C=O), 1516 (C=C), 1167 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.40 (s, 3H), 7.08 (s, 1H,Ar-H), 7.31 (s, 1H,Ar-H), 7.38-7.44 (m, 4H,Ar-H), 7.57 (d, 1H,Ar-H), 7.59 (d, 1H,Ar-H); MS:  $m/z$  (M+1), 455.

**4c:** IR: 3103 (=CH), 1674 (C=O), 1514 (C=C), 1162 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.42 (s, 3H), 7.06 (s, 1H,Ar-H), 7.34 (s, 1H,Ar-H), 7.32-7.46 (m, 4H,Ar-H), 7.59 (d, 1H,Ar-H), 7.60 (d, 1H,Ar-H); MS:  $m/z$  (M+1), 465.

**4d:** IR: 3105 (=CH), 1675 (C=O), 1512 (C=C), 1165 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.40 (s, 3H), 3.30 (s, 3H), 7.06 (s, 1H,Ar-H), 7.29 (s, 1H,Ar-H), 7.36-7.42 (m, 4H,Ar-H), 7.55 (d, 1H,Ar-H), 7.58 (d, 1H,Ar-H); MS:  $m/z$  (M+1), 450.

**4e:** IR: 3102 (=CH), 1676 (C=O), 1515 (C=C), 1163 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  ( $\text{CDCl}_3$ ):  $\delta$  2.40 (s, 3H), 3.32 (s, 3H), 3.36 (s, 3H), 7.06 (s, 1H,Ar-H), 7.30 (s, 1H,Ar-H), 7.32-7.34 (m, 3H,Ar-H), 7.54 (d, 1H,Ar-H), 7.56 (d, 1H,Ar-H); MS:  $m/z$  (M+1), 480.



Scheme-I

**Table-I Characterization data of synthesized compounds**

Compd	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	M. P.(°C)	Yield(%)
<b>3a</b>	H	H	H	H	H	200-202	65.5
<b>3b</b>	H	H	Cl	H	H	234-236	70.27
<b>3c</b>	H	H	NO <sub>2</sub>	H	H	240-242	82.00
<b>3d</b>	H	H	OMe	H	H	258-260	61.61
<b>3e</b>	OMe	H	H	H	OMe	210-212	50.20
<b>4a</b>	H	H	H	H	H	230-232	66.45
<b>4b</b>	H	H	Cl	H	H	252-254	67.56
<b>4c</b>	H	H	NO <sub>2</sub>	H	H	256-258	68.78
<b>4d</b>	H	H	OMe	H	H	220-222	75.67
<b>4e</b>	OMe	H	H	H	OMe	234-236	67.37

**ACKNOWLEDGEMENT**

S.G. Kundlikar is thankful to the Principal, New Art's Commerce and Science College, Parner for financial support and to the Director, SAIF, Panjab University, Chandigarh for providing spectral information.

**References:**

- 1 Baharloo F, Moslemin M H, NadriH, Asadipour A, Mahdavi M, Emami S, Firoozpour L, Mohebat R, Shafiee A & Foroumadi A, Eur J Med Chem, 93, **2015**, 196.
- 2 Swamy P M G, Prasad Y R, Ashvini H M, Giles D, Shashidhar B V & Agasimundin Y S, Med Chem Res, 24(9), **2015**, 3437.
- 3 Salerno L, Pittala V, Romeo G, Modica M N, Marrazzo A, Siracusa M A, Sorrenti V, Giacomo C D, Vanella L, Parayath N N & Greish K, Eur J Med Chem, 96, **2015**, 162.
- 4 LiuW, Jiang X, Zhang W, Jiang F&Fu L, Organic Chem Curr Res,5 (2), **2016**, 52.
- 5 Yang H, Xiang L, ChenK, YanR, Qing-Shan L&Hai-Liang Z, Bioorg Med Chem, 20 (2), **2012**, 903.
- 6 AslanianR, ZhuZ, GreenleeW &BuevichA, Tetrahedron Lett, 53 (47), **2012**, 6451.
- 7 Rollas S, Gulerman N&Erdeniz H, II Farmaco, 57 (2), **2002**, 171.
- 8 El-Emam Ali A, Al-DeebOmar A,Al-OmarMohamed &Lehmann J, Bioorg Med Chem, 12 (19), **2004**, 5107.
- 9 KeS, LiuF, WangN, Yang Q&Qian X, Bioorg Med Chem Lett, 19 (2), **2009**, 332.

E. 2017-18

1. Sadrudtesathi Yoga

**ISSN 2277-5730**

**AN INTERNATIONAL MULTIDISCIPLINARY  
QUARTERLY RESEARCH JOURNAL**

*Peer Reviewed Referred  
and UGC Listed Journal*

**Journal No. 40776**

**AJANTA**

**IMPACT FACTOR / INDEXING**  
2016 - 4.361  
[www.sjifactor.com](http://www.sjifactor.com)

**Volume-VII, Issue-I**  
**January - March - 2017**

**Ajanta Prakashan**

Scanned by CamScanner



NATIONAL CONFERENCE - 2017  
AJANTA - ISSN - 2277-5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

## CONTENTS

Sr. No.	Name & Author Name	Page No.
27	Awareness and Practices of ICT in Physical Education - A Survey Based Study <b>Mehmood G. Sayyad</b> <b>Dr. Aiyaz Hussain Shaikh</b>	130-138
28	Environmental Pollution and Health Education <b>Shantaram Salve</b>	139-141
29	The Use of ICT in Physical Education <b>Prof. Shinde Ranjit Arun</b> <b>Prof. Sunita Sadashiv Thube</b>	142-150
30	Use Technology in Sports <b>Mr. Rohit Bhairvanath Adling</b>	151-155
31	A Comparative Study of the Selected Physical Fitness Components of Baseball Players Based on the Positions Achieved by their Respective Teams in Inter Zonal Baseball Tournament <b>Yogesh Avhad</b> <b>Aniruddha Joshi</b>	156-160
32	खेळ, जखमा आणि त्यांचे पुनर्वसन <b>प्रा. शकुंतला फाटक</b>	161-167
33	आधुनिक जीवनात योगाचे महत्त्व <b>सहा. प्रा. गागरे सुजाता विष्णु</b>	168-170
34	सुदृढतेसाठी योगा <b>डॉ. वैशाली भालसिंग</b>	171-172
35	क्रीडा क्षेत्रातील करिअर <b>Dattatray Londhe</b>	173-179
16	खेळाडू व त्याचा आहार <b>डॉ. लीला बनसोडे</b>	180-182
7	सामाजिक और व्यक्ती स्वास्थ्य तथा मुल्योपर योग का असर <b>डॉ. अजितकुमार कदम</b>	183-186

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

## 34. सुदृढतेसाठी योगा

डॉ. वैशाली भालसिंग

न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर.

आजच्या धकाधकीच्या गतिमान यांत्रिक युगात आपण राहतो आहे. ह्या यंत्रयुगात पारिस्त्रिक श्रम खूप कमी झाले आहेत. पधरी जीवनाचा झपाट्याने विकास होत आहे. यंत्र-तंत्र युगात माणूस सुखासिन झाला आहे. यामुळे पारिस्त्रिक हालचालीचे प्रमाण पूर्वीपेक्षा खूपच कमी झाले आहे. त्यामुळे अनेकजणांत झालेला पारिस्त्रिक ऱ्हास हा एक सामाजिक प्रश्न बनला आहे. तहान, भूक आदी नैसर्गिक गरजांप्रमाणे व्यायामाची गरज पूर्ण करणे आवष्यक आहे. परीराची हालचाल न झाल्यास माणूस पारिस्त्रिकदृष्ट्या दुर्बल होतो.

'समर्थ रामदासस्वामी माणसाच्या ह्या धकाधकीच्या जीवनाविषयी म्हणतात ते अगदी योग्य आहे.

'धकाधकीचा मामला । कैसा घडे अषक्ताला ।'

खरच ह्या धकाधकीच्या जीवनात परीर सदृढ, स्वस्थ व निरोगी ठेवण्यासाठी व्यायाम, खेळ, योगासन, पोहण इत्यादीपैकी कोणतीही एखादी गोरट आपण आपल्या दिनचर्येत समाविष्ट करायलाच हवी. आपण योगाचे मानवी जीवनातील स्थान समजून घेवू.

भारताच्या प्राचिन षास्त्रात मानाचे स्थान मिळवणारे षास्त्र म्हणजे 'योगषास्त्र' होय. योगषास्त्राचे आद्य प्रवर्तक आदिनाथ भगवान पंकर आहेत. हजारो वर्षांपूर्वी पतंजली मुनींनी आदिनाथांकडून प्राप्त केलेले व अक्षरबध्द केलेल्या या संपन्न षास्त्रामध्ये मानवी जीवनाचा सांगोपांग व साकल्याने विचार केला आहे. योगविद्या ही स्वतःला ईश्वरापर्यंत नेण्याची एक विद्या आहे. आरोग्यप्राप्ती बरोबरच आत्मसंषोधन आणि मोक्षप्राप्ती हेच योगाभ्यासाचे मूळ प्रयोजन आहे.

योग हा षब्द 'युजू' ह्या संस्कृत धातूपासून तयार झाला आहे. युजू म्हणजे जोडणे, संयमन करणे. योगाचे दोन प्रकार आहेत. एक हठयोग व दुसरा राजयोग. यांचा वापरही निरनिराळ्या कारणांसाठी केला जातो.

परीराच्या संयमनासाठी हठयोग आणि मनसंयमनासाठी राजयोग केला जातो. पण हठयोगाविषय राजयोग षक्य नाही म्हणजेच हे दोन्ही परस्परंवर अवलंबून आहेत. महर्षी व्यास योगाबाबत म्हणतात,

'योगधित्तवृत्तिनिरोधः ।'

मनातील विचारांना शांबवणे म्हणजे योग म्हणजेच समाधी होय. परीर-मन-आत्मा यांच्या षक्ती ईश्वराशी जोडणे असाही त्याचा अर्थ होतो. योगाचा मुख्य उद्देश आत्मतत्त्व परमतत्वाशी जोडणे. हे साध्य प्राप्त करण्यासाठी योगषास्त्राचे आद्यप्रणेते श्री पतंजली ऋशींनी 'योगसूत्रे' ह्या ग्रंथात योगषास्त्राच्या आठ अंगांचे वर्णन केले आहे.

'यमनियमानस - प्राणायम - प्रत्याहार  
धारणा - ध्यान - समाधयोदश्टावठःगानि ।'

171

Modern Trends in Physical Education & Sports Sciences

Scanned by CamScanner

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

यम—नियम—आसन—प्राणायाम—प्रत्याहार—धारणा—ध्यान—समाधी ही योगाची आठ अंगे यालाच 'अष्टांग योग' म्हणतात.

आज योगाचे पुनरुज्जीवन झाल्याचे दिसते. भारताची प्राचीन धरोहर असणाऱ्या योगाने महत्त्व आधुनिक काळात संशोधनांनी सिध्द झाले आहे. म्हणूनच घालेय शिक्षणापासून योगाचा अंतर्भाव सर्वत्र झालेला दिसतो. एवढेच नव्हे तर २१ जुलै हा दिवस 'योग दिन' म्हणून जगभर पाळला जातो.

आजच्या बहुसंख्य प्राकृतिक रोगांचे मूळ हे मानसिक ताण हेच असल्याचे दिसते. हा ताण कमी करण्यासाठी योगाचा उपयोग होतो. निरोगी शरीर व संस्कारक्षम नियंत्रित मन या दोन गोष्टी सुखी व समृद्ध जीवनाकडे आपल्याला नेतात. अरी हे योगाचे अंतिम साध्य नसले तरी हा एक अतिशय महत्त्वाचा फायदा आहे. त्यामुळेच पाश्चात्य देशांत त्याचा प्रसार मोठ्या प्रमाणावर होत आहे, नव्हे झाला आहे.

योगाच्या अभ्यासाने खालीलप्रमाणे लाभ प्राप्त होतात —

१. योगाभ्यास नियमित केल्यावर आसनांद्वारे स्थूल शरीरावर प्रभाव निर्माण होऊन शरीर लवचिक होऊन ग्रंथींचे कार्य व्यवस्थित चालून शरीर बलवान बनण्यास मदत होते.
२. योगीक क्रियांमुळे पचनसंस्था सुधारते. पर्यायाने उत्सर्जन संस्थेचे कार्य सुरळीत होते.
३. योगाभ्यासातील प्राणायामामुळे शरीरातील विविध अवयवांवर उत्कृष्ट प्रभाव पडतो.
४. शरीरातील सर्व संस्थांचे कार्य व्यवस्थित चालते त्यामुळे शरीर निरोगी बनते.
५. निरोगी शरीरात स्वस्थ मन निवास करते.
६. योगाभ्यासाने शरीर व मनाचे आरोग्य राखले जाते.

नियमित योगाभ्यास सर्वांसाठी आवश्यक आहे. मात्र वय वर्षा दहा पूर्ण असणारी कोणतीही व्यक्ती योगासनांचा अभ्यास करू शकते. वयाच्या दहाव्या वर्षापर्यंत आसन करू नयेत कारण तोपर्यंत शरीराची वाढ व आंतरेंद्रियांची रचना पूर्ण झालेली नसते. सर्व अर्थींची वाढ पूर्ण झालेली नसते.

प्रत्येकाच्या शरीराची ठेवण ही भिन्न असते. म्हणून स्वतःच्या मर्यादा ओळखून, तज्ञ मार्गदर्शकाच्या सल्ल्याने, साहाय्याने सुरुवातीस सराव होईपर्यंत आसन करावीत. योगासनांचे फायदे जर आपणास हवे असतील तर नेमार्ण ठराविक वेळी, ठराविक जागी व ठराविक काळ आसनांचा सराव केला पाहिजे. आपलं शरीर व मन निरोगी राहण्याकरिता रोज किमान पाऊण तास सराव करणे फायद्याचे ठरते.

सहाय्यक ग्रंथ

१. 'स्त्रियांसाठी योगासने', सी.भारती जोषी उत्कर्ष प्रकाशन, पुणे ४११००४, चौ. आ. ऑगस्ट २००८ (प. आ.ऑक्टोबर १९९३)
२. 'योगासने', आत्मानंद प्रकाशन, आरोग्यमंदीर, गोरखपूर.
३. 'योगासन और स्वास्थ्य', योगाचार्य आनंद स्वामी, मनोज पॉकेट बुक्स दिल्ली ११००६४.
४. 'खेळा व योगासने', भारत वा. औटी, जानकी प्रकाशन, अहमदनगर, जानेवारी २००७.

## 2. Gandhiwad Ek Vivechan

ISSN: 2394 5303	Impact Factor 1.002111111	Printing Area International Research Journal	ry 2017 Vol-01	05
16) Medicinal plants used for the treatment of Ear problem Eanguwar Srinivas Reddy, Shivraj Kashinath Bembreka			and tribal .....	64
17) डॉ. बाबासाहेब आंबेडकर आणि लोकशाही सुबंशी राजेद हिराषण, जि.तातूर				68
18) बंगारा जघतीचा इतिहास फड ज्ञानोबा दशरथ				70
19) प. गवहरनाल नेहरूचे वाचन डॉ. घ. ना. पांचाळ, जि. परभणी				72
20) सुफी संत परंपरा आणि भाग सचिन गुंडीराम डेंगळे, जि. तातूर				73
21) भूपुढनितो किंवा भूशास्रकता (Geostrategy) प्र. डॉ. संजय प्रभाकर डाके., जि. धुळे				76
22) महाविद्यालयाचे युवक-युवतींचा पर्यावरणविषयी जाणोवेचा अभ्यास डॉ. एस. जे. शोख, चांपडा				79
23) दया पवार यांची कविता : एक आकलन प्र. विठ्ठल भानुसे, जि. बुलडाणा				81
24) तातूर जिल्ह्यातील साक्षरता एक भौगोलिक आवलोकन प्र.डॉ.जनाधन केशवराव वाघमारे, जि.तातूर				85
25) भारतातील महिला सशक्तिकरण चळवळी : एक समीक्षणत्मक विश्लेषण प्र.डॉ. ललटे रत्नाकर बाबूराव, जि.नांदेड				87
26) अलग-अलग वेतरणी मे जीवन मूल्य संक्रमण प्र. अशोक डॉ. तायडे, जि. नंदुरबार				96
27) प्रष्टाचार एक समस्या : कारण एवं समाधान डॉ. सन्जू सजवाण नेगी, बादशाहीपौल (डि.ग.)				98
28) हिन्दी साहित्य और वैश्विक चेतना डॉ. रजेश कुमार सिंह, वृंदावन मधुरा				101
29) भीष्म साहनी की प्रसंगिकता रणजीत कुमार सिन्हा, पश्चिम मेदिनीपुर				103
30) भूगण्डलीकरण के दौर में विद्यालयी शिक्षा व्यवस्था में परिवर्तन डॉ. रुक्मिणी चौधरी, गोरखपुर				106
31) गांधीवाद परके विवेचन - डॉ. विजयकुमार लाल				109

⊗ **Printing Area : Interdisciplinary Multilingual Refereed Journal** ⊗

ISSN: 2394 5303

Impact  
Factor  
4.002111111Printing &  
International Research

February 2017

0109

Issue-26, Vol-01

31

## वाद एक विवेचन

विजयकुमार राऊत

अध्यापक, हिंदी विभाग,

न्यू आर्ट्स, कॉमर्स अण्ड सायन्स कॉलेज,

पारनेर, जि.अहमदनगर, महाराष्ट्र

दिले जा सकें। देश की शिक्षा व्यवस्था का निजीकरण भूतकाल में शिक्षा की व्यवस्था से जुड़ा हुआ है, जो भारत में शिक्षा की व्यवस्था को सुधार भी सकता है और अधिभावकों को भार को कम भी कर सकता है। लेकिन इसके लिए सरकार को एक ऐसी लचीली व्यवस्था अपनानी होगी। शिक्षा में निजीकरण का समर्थन तभी किया जा सकता है जब अधिभावकों पर शिक्षा के लिए अत्यधिक भार न पड़े और राज्यों को ऐसी गुणवत्ता युक्त शिक्षा प्राप्त हो जो उनके कौशलों और क्षमताओं को इस प्रकार विकसित कर दे कि उन्हें शिक्षा प्राप्त करने के बाद बेरोजगारी का सामना न करना पड़े। कौशल आधारित शिक्षा प्राप्त करने वाले लोगों को बैंकें आर्थिक मदद भी करें। इससे एक ओर एक अपने भविष्य को लेकर निश्चिन्त रहें तथा दूसरी ओर विद्यालय या संस्थान भी अपनी प्रतिष्ठा बनाये रखने के लिए गुणवत्ता युक्त तथा रोजगार परक शिक्षा प्रदान करने के लिए बाध्य होंगे तभी निजीकरण मजतनापूर्वक कार्य कर सकता है और राष्ट्र के लिए उपयोगी हो सकता है।

संदर्भ सूची

1. पाठक, पी.डी. एवं त्यागी, जी.एस.डी. (2014). 'शिक्षा में प्रयोग और चिन्तन' आगरा : विनोद पुस्तक मन्दिर।
2. सिंह, राणा बलवन्त (2014). 'शिक्षा में नवीन प्रवृत्तियाँ', आगरा : विनोद पुस्तक मन्दिर।
3. पाठक, पी.डी. एवं त्यागी, जी.एस.डी. (2014). 'शिक्षा के सामान्य सिद्धान्त' आगरा : विनोद पुस्तक मन्दिर।

□□□

महत्त्वा गांधी भारत ही नहीं तो विश्व की महान विभूतियों में से एक थे। उन्होंने भारत के राष्ट्रीय आंदोलन का संचालन कर विदेशियों का भारत में खदेड़ दिया। उन्होंने सामाजिक, आर्थिक और राजनीतिक क्षेत्र में विश्व के सामने अपने मौलिक विचार रखे। उनका पूरा जीवन एक सपना थी। वे संक्रमणकालीन भारत के एक शलका पुरुष थे। उन्होंने अपने प्रत्यक्ष आचरण से जो चिंतन सामने रखा वही गांधी दर्शन या गांधीवाद है। गांधी दर्शन या गांधीवाद अन्य वादों से बिल्कुल पृथक है। मूलतः यह एक जीवन पद्धति है। इस पद्धति में गांधीजी ने जीवन प्रयोग से प्रत्येक तत्त्व का परीक्षण किया। उन्होंने प्राचीन तत्त्वों को अपनाकर उसे नये अर्थ से संपृक्त कर दिया अपितु उसे व्यावहारिक रूप देने का प्रयास किया। गांधीजी के चिंतन का लक्ष्य मानव था। वे समग्र मानव जाति के लोकमंगल को कामना करते थे।

मूलतः गांधीजी के चिंतन में समाजवादी व्यवस्था का समर्थन मिलता है। उनके चिंतन का आधार सत्य, अहिंसा और सत्याग्रह था। सर्वोदय उनका लक्ष्य था। उन्होंने सत्य को ही ईश्वर माना। उनकी राजनीति तक सत्य की उपासना थी। गांधीजी की अहिंसा की कल्पना व्यावहारिक और व्यापक थी। उनकी अहिंसा में पल्लयनवाद नहीं था। वह तो साहसी और कर्मनिष्ठों का द्रव है। उसमें असीम सामर्थ्य है। वह भय से नहीं तो प्रेम से जन्म लेती है। उनकी अहिंसा में चराचर के प्रति प्रेम भावना तथा निष्काम भावपूर्णता थी। रामधारी सिंह 'दिनकर' के शब्दों में, "अहिंसा यह शब्द गांधी

© Printing Area : Interdisciplinary Multilingual Refereed Journal ©

ISSN: 2394 5303

Impact Factor  
1.00211111

Printing Area  
International Research Journal

February 2017  
Issue-26, Vol-01

0110

— धर्म का निरोध है, तथा हिमा से पूर्ण विश्व में वह एक एक गांधीजी का जितना व्यापक प्रतिनिधित्व करता है उतना उनके और छोटे उपदेश मिल कर भी नहीं कर पाते। और यह ठीक भी है क्योंकि गांधीजी को अहिंसा केवल अनापान का ही पर्याय नहीं है, परन्तु, वह जीवों के प्रति आनंदिक भावन और प्रेम को भी अभिव्यक्त करती है।”

सत्याग्रह गांधीवाद का एक मुख है। गांधी का सत्याग्रह युग के विरुद्ध अहिंसात्मक प्रतिरोध का नम है। इसमें आत्मपोषण से परमन पत्नित्व पर बल दिया जाता है। गांधीजी के अनुसार मुक्त व्यक्ति युग नहीं के पाप से करने चाहिए। गांधीजी 'चेज इन हार्ट' पर विश्वास रखते थे। गांधी के सत्याग्रह को युग के विरुद्ध प्रतिरोध का वैदिक अतिष्ठान है। यह एक तरह से अहिंसात्मक युद्ध का प्रतीक है। इसमें अहिंसात्मक विरोध के द्वारा स्वयं किया जाता है। सत्याग्रह में स्वयं पीड़ा सहकर विरोधी के उद्धार की कामना की जाती है। सत्याग्रह में सत्य, अस्मेय, अहिंसा, ब्रह्मचर्य, अन्न, आच्छाद, अपरिग्रह, परीश्रम, स्वदेशी, अयहकार उद्योग आदि को महत्त्वपूर्ण माना है। सचिनय प्रतिकार का यह मार्ग आत्मबल पर आधारित है। इन्हीं के आधार पर गांधी ने सर्वोदय का सपना देखा था।

सर्वोदय गांधीवाद का सामाजिक आदर्श है। गांधीजी टॉल्स्टॉय, थॉम, रस्किन से प्रभावित थे। रस्किन के 'अन टू दिम लास्ट' से प्रभावित होकर ही उन्होंने 'सर्वोदय' को प्रस्तुत किया। सर्वोदय समाज के सभी वर्गों को भरपूर तथा विकास की कामना करता है। इसमें आर्थिक समानता, समाजवाद, अध्यात्मवाद पर बल दिया है। अर्थोदय में सर्वोदय तक पहुँचना गांधी के सर्वोदय का लक्ष्य था।

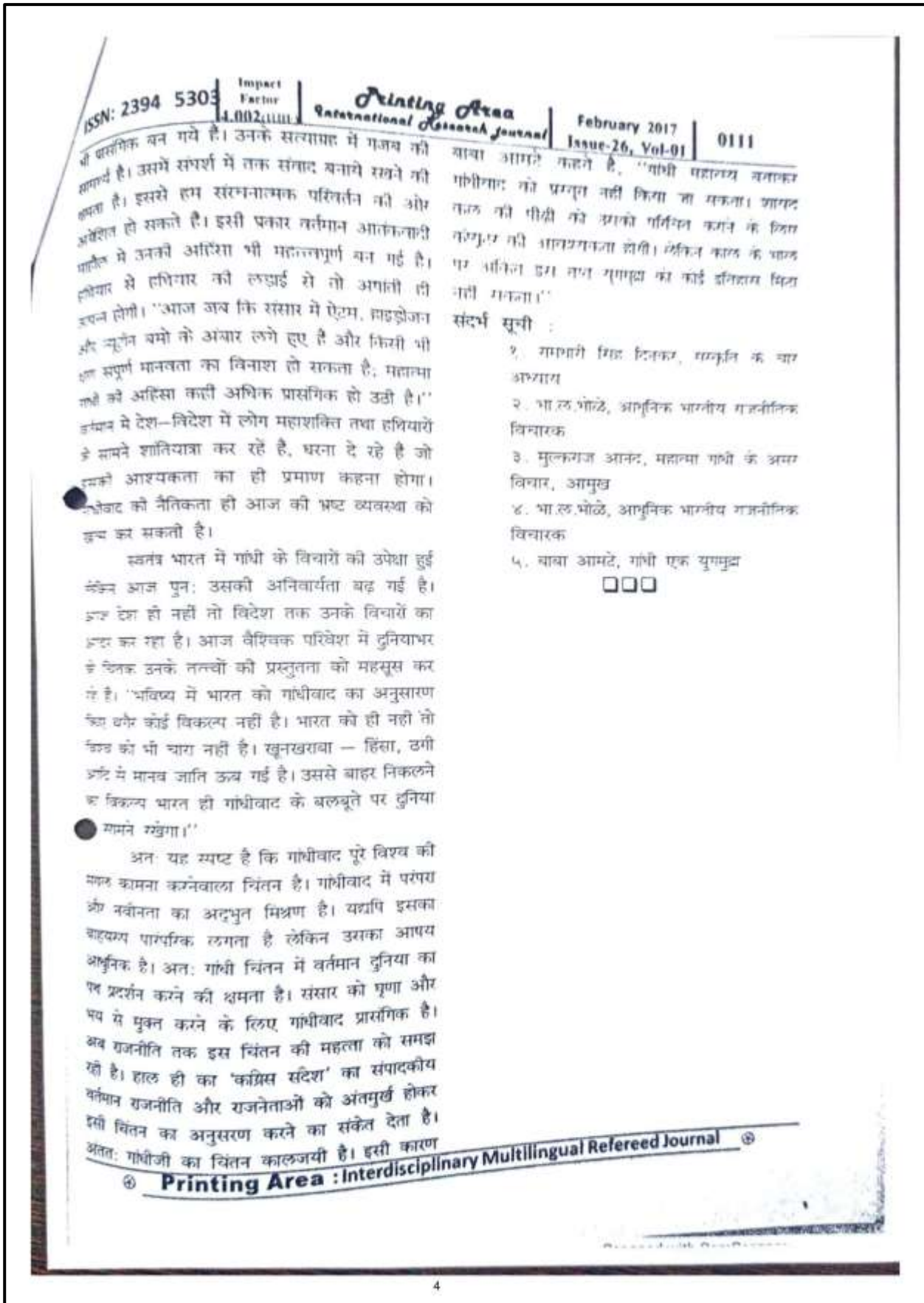
समाज: गांधीवाद एक सर्वव्यापी चिंतन है। महात्मा गांधी ने यथासमय धर्म, नीति, राजनीति, समाज, अर्थ, शिक्षा, स्वास्थ्य, कानून, कृषि सभी क्षेत्र में अपने मौलिक विचार प्रस्तुत किए हैं। बशर्ते इसमें सुसंगति नहीं लेकिन सत्यता है। इसमें आत्मशांति से विश्वशांति तक का विस्तार मिलता है। गांधीजी का चिंतन आयातीत नहीं तो मौलिक है। उनका चिंतन अंतिम लक्ष्य के रूप में मानवतावाद की स्थापना करना चाहता है। अर्थात्

गांधीवादी चिंतन 'सर्वोदय' है।

गांधीवाद महात्मा गांधी की एक निराल विवेक जीवनप्रणाली थी। इसे कंगड़ी भारतीयों ने खोजा किया। विश्व का युद्धवादी वर्ग तक इसमें प्रतीक हुआ। गांधी की मृत्यु के परमाणु मात्र सहस्रक 3 केवल गांधीवाद का नकार नहीं। "दुर्भाग्य से इस विभाग की व्यावहारिकता को दुर्भाग्य रूप से 'अध्यवहार्य' स्वतंत्रता-संग्राम पर ही भारतीय 3 लक्ष्य केंद्रित किया जिसमें उनका विचार और जीवन की सुरंगिण पर ध्यान नहीं दिया गया" सत्य से बल होनेवाली कई विधुनियों ने मात्र इस विद्यमान का उद्घाटन में पाठन किया। गांधीवाद के आधार पर उद्योग को वर्तमानपक्ष समस्याओं का समाधान किया। इसी कारण पुनः गांधीवाद की प्रासंगिकता पर विमर्श का दौर चला हुआ है। वर्तमान भारतीय परिस्थिति में गांधीवाद का परखना समय की मांग है। हमारा वर्तमान भयंकर उद्वेग है। देश को 'स्वराज्य' तो मिला लेकिन वह 'सुजात' नहीं बन गया। गांधी का सपना आज से अधूरा ही रहा है। आज हमारी राजनीति का चेहरा विकृत बन गया है। देशी उद्योग संकट में गुजर रहे हैं छोटे उद्योगों का काम हुआ है। मात्र उद्योग रहे हैं नगर असीम को तरह फेंक रहे हैं। ऐसे में गांधी का 'गाँव की ओर चलो' का नारा दुबारा पुकारना आवश्यक है। गांधी ने नगरों की नगण्यता की बात का भी जिक्र दिया था। महानगरीय संस्कृति से कई संज्ञक रूप की बीमारियाँ फैल रही हैं। भोगवाद और भौतिकता का शक्ति बढ़ता जा रहा है। विषमता बढ़ रही है। किमान मजदूर आत्महत्या कर रहे हैं। गल्लों से लेकर दिल्ली और विदो में भी आतंकवाद बढ़ गया है। व्यक्ति का जीवन असुरक्षित बन गया है। पहली आजादी जहाँ आम आदमी तक पहुँची ही नहीं वहीं वह दूसरी गुलामी का शिकार बन रहा है। भूमंडलीकरण ने नई समस्याएँ उपस्थित की हैं। बहुराष्ट्रीय कंपनियों देश को लूटने के लिए घात लगाये बैठी हैं। व्यक्ति को बस्तु में तब्दील करनेवाली व्यवस्था पनप रही है। योजना और विकास भ्रष्टाचार के रांगुल में फँस गया है। अपनी अस्मिता तक धुंधली हो रही है।

इस परिस्थिति में आज गांधीवादी विचार और

© **Printing Area : Interdisciplinary Multilingual Refereed Journal** ©



## 3. Nasir Sharma Ke Upanyaso ki Bhasha Shaili

ISSN: 2394 5303	Impact Factor 4.002,0003	Printing Area International Research Journal	Issue-25, Vol-01	08
40) महादेवी तर्मा की 'बखला की कहियाँ' में नारी अस्मिता डॉ. मानवेश नाथ दास, दिल्ली				160
41) छायाकार की राष्ट्रीयकृत के पूल स्थान श्री गान्धनन्तान गान्धेदी के साहित्य में राष्ट्रीयता डॉ. अशफ़ाक़ इम्राहिम सिकसगर, देवपुर, मुने (महाराष्ट्र)				163
42) रिश्ते के बदलते माफ़रंड समकालीन हिन्दी उपन्यास के परिप्रेक्ष्य में डॉ. आरिफ़ शौकत महात, कोल्हापुर।				166
43) श्रमिकों की पन्वसी प्रकृति का अर्थव्यवस्था पर प्रभाव डॉ. पुष्पा सेमवाल, हरिद्वार, उत्तराखण्ड				169
44) विभाजन के अंधकार का "तमस" डॉ. नीना आर शर्मा, आनंद				173
45) माध्यमिक शिक्षा और शिक्षक दायित्व सुदर्शन सिंह—डॉ० (श्रीमती) स्वीटी श्रीवास्तव, कानपुर				177
46) मनु शर्मा की कहानियों में नारी चिंतन के विविध आयाम डॉ. संजय विक्रम डोडरे-क्रांती वासुदेव सोनवणे				181
47) शासकीय एवं अशासकीय उच्च माध्यमिक विद्यालयों के छात्र एवं छात्राओं के कक्षा-कक्ष..... निधिलेश तोमर				187
48) हैदराबाद राज्य का विलय और सरदार वल्लभभाई पटेल डा० विनोद कुमार चौधरी—कुलदीप शर्मा				189
49) नसिरा शर्मा के उपन्यासों की भाषा—शैली विजयकुमार राऊत, पारनेर				196
50) सरकारी एवं गैर सरकारी प्राथमिक विद्यालयों में कार्यरत अध्यापकों में विद्यालय.... डा० श्याम सिंह गौर—नीलम सिंह परिहार, चित्रकूट, सतना (म०प्र०)				200

Printing Area : Interdisciplinary Multilingual Refereed Journal



ISSN: 2394 5303

Impact Factor  
4.002111111Printing Area  
International Research Journal

January 2017

Issue-25, Vol-01

0196

49

## नासिरा शर्मा के उपन्यासों की भाषा—शैली

विजयकुमार राऊत  
अध्यक्ष, हिंदी विभाग,

न्यू आर्ट्स, कॉमर्स अण्ड सायन्स कॉलेज, पारनेर

\*\*\*\*\*

नासिरा शर्मा की भाषा उनके भवों और उद्देश्यों की वाहिका है। उन्होंने अपने उपन्यासों में पात्रों का स्तर एवं उनकी परिस्थिति के अनुरूप ही भाषा का अवलंब किया है। उनको शिक्षा फारसी में होने के कारण अरबी और फारसी शब्दों की भरमार दिखाई देती है लेकिन पाठकों को कहीं भी इसकी आस-पास बोली जानेवाली अवधि के रंग की क्षेत्रीयता, इलाहाबादी सभ्यता की मिठास और बोलचाल की साधारण गली मोहल्ले की भाषा से लेकर शिक्षित वर्गों की विविध स्तरीय भाषा के साथ कहीं ब्रज का फुट देने में नासिरा शर्मा अद्भुत क्षमता रखती हैं। नासिरा शर्मा के उपन्यासों में भाषा के निम्नलिखित रूप मिलते हैं—

### लोकभाषा

'जिंदा मुहावरें' उपन्यास की कथा उत्तर प्रदेश के फैजाबाद गांव में घटती है अतः उपन्यास में वहाँ की लोकभाषा के दर्शन होते हैं। लेखिका ने अथवा भाषा का प्रयोग कर पाठकों के लिए भाषा में लोकगंध की मिठास चखाई है— "बरखत से पहले ससुरे को गधा पच्चीसी सवार होय गई है। इ दिन बाद, घूम टहल कर मुंह मा कालिख पोत इ मरदुदवा लीट अइहै। नया जोस, नई जवानी है। करे देव जी भर कर मनमानी। जाए देव सब लोगन एका। आखिर भोर का भूला सांझ गए तो घर लौटत है।"

### ईरानी भाषा

नासिरा शर्मा के उपन्यासों में ईरानी शब्दों का प्रयोग अधिक मात्रा में दिखाई देता है। इनकी क्लिष्टता से बचने के लिए उन्होंने उपन्यासों में पृष्ठों के नीचे

पाठिकाणी के रूप में शब्दों के अर्थ दिए हैं। कहीं-कहीं ईरानी भाषा के वाक्यांश भी आए हैं। 'सात नदियां एक समंदर' उपन्यास ईरानी क्रांति पर आधारित होने में इसमें ईरानी शब्दांश आए हैं। लेखिका ने कहीं कहीं ईरानी वाक्यांश भी दिए हैं—

"सूराया! सूराया! सूरीनी ग निगहदार ना इनकलदाय गेहती।"

"सूरीनी अजीजम वेगु कि खुन वेगेजम।"

पाठकों की सुविधा के लिए लेखिका ने इन वाक्यांशों के अर्थ भी दिए हैं।

### अंग्रेजी भाषा

आलोच्य उपन्यास में पाशानुकूल कहीं-कहीं अंग्रेजी शब्दांशों का भी प्रयोग किया है, जो सर्वथा योग्य है। इसमें पात्रों के चित्रण में स्वाभाविकता आई है।

'सात नदियां एक समंदर' में अंग्रेजी वाक्यांशों का प्रयोग देखिए—

"यू आल आर केनेटिक्स नाट ओनली खुमैनी।"

"हो इज कुवेल, मैडम! वीग मर्डर।"

### शब्द के प्रयोग के विविध रूप

आलोच्य उपन्यासों में शब्द प्रयोग के विविध रूपों के दर्शन होते हैं। लेखिका ने नये-तुले शब्दों द्वारा बोलचाल की भाषा में विचारों की अभिव्यक्ति की है। उनके उपन्यासों में विदेशी शब्दांतर्गत अरबी, फारसी, उर्दू, ईरानी तथा अंग्रेजी शब्द प्रचुर मात्रा में मिलते हैं।

### विदेशी शब्द

नासिरा शर्मा ने अपने उपन्यासों में विदेशी शब्दों का प्रयोग बड़ी सहजता से किया है। उनको शिक्षा फारसी भाषा में होने के कारण इन शब्दों की भरमार दिखाई देती है। परंतु अरबी, फारसी और उर्दू शब्दों की ज्यादाती होने के बावजूद उनके उपन्यास की भाषा कहीं भी बोझिल नहीं हुई है। इन शब्दों के कारण उनकी रचना में भी स्वाभाविकता आई है। अरबी, फारसी, उर्दू के अलावा उनके उपन्यासों में अंग्रेजी के साथ-साथ 'सात नदियां एक समंदर' उपन्यास में ईरानी शब्द प्रचुर मात्रा में मिलते हैं।

Printing Area : Interdisciplinary Multilingual Refereed Journal

## शब्द

'सात नदियां एक समंदर' उपन्यास में— कीमत, किम, हुजूर, खबर, कदम, गम, खत्म, खाक, कबर, मरीब, मौत, मुजस्से, मंजिल, भाशा—अल्ला, फगर, बाग, इश्क, फल किस्मत आदि अरबी शब्द दिखाई देते हैं। जिंदा मुहावरे' उपन्यास में—निजाम, ताफिज, दिमाग, कदम, यकीन, कीमत, गजल, रुखत, मरजा, जायज, अल्पाज, खफर, अलनकब, मयास, ताफिक जन्नत, ताजिर, फिक, खयाल, लफज, शरख, जमला, हुआ, अजना आदि अरबी शब्द प्रयुक्त हुए हैं।

## फारसी शब्द

नासिर शर्मा के उपन्यासों में अरबी शब्दों के साथ-साथ फारसी शब्दों का भी प्रयोग हुआ है। 'सात नदियां एक समंदर' उपन्यास में— खामोशी, बाल, नोरोज, खुदा, फैर, मादरकवाहे, समंदर, गोसे, तुखे, आगोस, कब्रिस्तान, खैरियत आदि शब्द प्रयुक्त हुए हैं। तो जिंदा मुहावरे' उपन्यास में— जंग, ख़ाब, चीज़, ज़बान, परवाह, दोख, जानमाज़, खफगी, सिपाही, आवाज़, चीज़, कामयाबी, आयाद, दुश्वार, कनीज़ आदि फारसी शब्द दिखाई देते हैं। उनके 'टीक्रे की मंगनी' उपन्यास में खैर, रोज, ज़बरदस्ती, खुशी, खुदा, खामोश, खैरियत, आवाज़, गुज़र आदि फारसी शब्दों का प्रयोग हुआ है। उनके शात्मली उपन्यास में अरबी, फारसी शब्दों का प्रयोग नहीं हुआ है।

## उर्दू

नासिर शर्मा ने अपने उपन्यासों में अरबी-फारसी शब्दों के साथ ही उर्दू शब्दों का भी प्रचुर मात्रा में प्रयोग किया है। 'सात नदियां एक समंदर' उपन्यास में— हुलिया, इलाका, खतरा, कागज़, शिकवा, गिरफ्त, इरफान, काज़ार, फ़तेहा, ज़नाज़ा, खादमखाह, सिजदा, ससरीक, ज़नानी, नकली, हुक्का, फिजा, पाकीज, पाज़ी, दाबत, काफिला, वज़ूद, जिन्दा, ज़दा, ज़रूरत, नहर, गुज़ार, इन्तजाम, सिक्का, कबीला, ज़नीना, फसरूक आदि उर्दू शब्दों का प्रयोग हुआ है। तो 'टीक्रे की मंगनी' उपन्यास में— दीदार, सितार, तादाद, सितार, तखलीफ, कब्ज़ा, तजरबा, माफ, फिकरा, सितार, गज़ाला, पुरज़ा, माफ, गुज़ारना आदि उर्दू शब्द दृष्टिगोचर होते हैं।

## ईरानी शब्द

'सात नदियां एक समंदर' यह उपन्यास ईरानी क्रांति पर आधारित है। इस उपन्यास की पृष्ठभूमि ईरान होने से इरानी— खान, गैक, तख्तीनी, नकहाली, इजाल, कागी, शयेगन्दा, पिगाल, अकर्मियन्, अकलियत, बल्लै, फाफ़ीफ़ीन, मवीले, सीगा, लीमी, साजिगी, तागुनी, शाहगार, मशहद, मूहक, पहलूम, हमजाद, शाहगार इन ईरानी शब्दों का प्रयोग हुआ है।

## तुरकी भाषा

'सात नदियां एक समंदर' उपन्यास में— फालीन इस एक मात्र तुरकी भाषा के शब्द का प्रयोग हुआ है।

## अंग्रेजी शब्द

'सात नदियां एक समंदर' उपन्यास में— पेस्टरी, प्रोफेसर, मिनिस्ट्री, पिज्जा, मिमिज, फैंट, डोटॉल, क्रीम, प्रोग्राम, लिफ्ट, एजेंट, चैक पोस्ट, लिपिस्टिक, मनीकपूर, ड्यूटी आदि अंग्रेजी शब्दों का प्रयोग हुआ है। 'टीक्रे की मंगनी' उपन्यास में एमरजेंसी, ऑफिस, वारंट, ब्लैक बोर्ड, एजुकेशन, फॉरन सेक्रेटरी, मिमिज आदि अंग्रेजी शब्द दृष्टिगोचर होते हैं। तो 'जिंदा मुहावरे' उपन्यास में टेक इट इजी, डायरेक्टर, एम्बेसडर, ड्राइंग रूम, फोन आदि अंग्रेजी शब्दों का प्रयोग हुआ है।

## भाषा सौंदर्य के साधन

किसी भी रचना की सार्थकता उसमें व्यक्त विचार और भावों को सहज, सुंदर और आकर्षक ढंग से अभिव्यक्त करने में होती है। नासिर शर्मा ने अपनी अभिव्यक्ति को सुंदर और आकर्षक बनाने के लिए आलंकारिक भाषा, मुहावरे, कहावतें, लोकोक्तियों, वाक्यविन्यास, बिंब, प्रतीक आदि के प्रमुख उपकरणों का सार्थकता के साथ प्रयोग किया है।

## मुहावरे लोकोक्तियों और कहावतें

मुहावरों और लोकोक्तियों का प्रयोग रचनाकारों के बुद्धि और अनुभव की विशेष पहचान होती है। ये हमारे दैनिक जीवन में सहज ढंग से व्यवहृत होते हैं। इनका प्रयोग वाक्य को रोचक और प्रभावशाली बनाता है। नासिर शर्मा के उपन्यासों में मुहावरों और लोकोक्तियों का प्रयोग अर्धपूर्ण और स्वाभाविकता से हुआ है।

ISSN: 2394 5303

Impact Factor  
4.002 (2017)Printing Area  
International Research JournalJanuary 2017  
Issue-25, Vol-01

0198

मुहावरे

नासिरा शर्मा ने अपने उपन्यासों में मुहावरों का प्रयोग हुआ है। 'सात नदियाँ एक समंदर' उपन्यास में — माथे पर बल पड़ना, जान निव्वर करना, पाँते उगलियाँ, भी मे होना, गोलियों से छेड़ देना, कालेजा धामकर रहना, कम्मर के टाके टूटना, साँप सूँघना, भूँगर ताल्य डालना आदि मुहावरें दिखाई देते हैं। 'जिंद मुहावरें' उपन्यास में — दिल केले के पत्ते की तरह चोरना, तारिकों के पुल बांधना, कटी पतंग की तरह झोलना, हमदर्दी का इजाहार करना, तहलका मनाना, आरमान धरा—का—धरा रहना, छफ़्दर के सर में चमेली का तेल लगना आदि मुहावरें दृष्टिगोचर होते हैं। तो 'ढोकरे की मंगीन' उपन्यास में मुँह की बात छीनना, जवान पर ताले पड़ना, तिल का पहाड़ बनाना, दाने—दाने को मोहताज होना, भ्रम टूटना, लहू के घूँट पीना, लकवा मारना, घोड़े बेचकर सो जाना आदि मुहावरों का प्रयोग हुआ है।

लोकोक्तियाँ—कहावतें

लोकोक्तियाँ और कहावतों का प्रयोग भी उपन्यासों में अधिक मात्रा में हुआ है। उनके ठिकरे की नंगनी' उपन्यास में — 'हाथ कंगन को आरसी क्या', 'जैसे सांपनाथ जैसे नागनाथ', 'दूर के दोल सुहाने', 'रूपया परखें बार—बार आदमी परखे एक बार', 'बगल में झूठी मुँह में गम', 'जब चिड़ियाँ चुग गई खेत', 'ओखली में सिर डाला तो मूसखा का का डर?', 'दिल गम में आशना न हो वह दूसरों का दर्द क्या जाने?' आदि लोकोक्तियाँ और कहावतों का प्रयोग हुआ है। तो मान नदियाँ एक समंदर' इस उपन्यास में — 'मुल्ला की दीड मस्जिद तक' इस एक मात्र लोकोक्ति का प्रयोग दिखाई देता है।

'जिंद मुहावरें' उपन्यास में — 'चढ़ते पानी को और ढलने मुरज को कोई नहीं रोक सकता', 'जंगल में मोर नाच किसने देखा', 'भाँधी का कुत्ता न घर का न घाट का', 'आँखें ने कटोरा पाया, पानी पी—पी पेट फूलया', 'भोर का भूल साँझ गए मो घर लौटत है', 'आम खाय तो अंगार हगै की जरूरत नहीं है' आदि लोकोक्तियाँ और कहावतों का प्रयोग हुआ है।

लोकगीत

Printing Area : Interdisciplinary Multilingual Refereed Journal

लेखिका ने अपने उपन्यासों में लोकगीतों का

प्रयोग किया है। 'सात नदियाँ एक समंदर' उपन्यास में लेखिका ने ईगनी लोकगीत के दर्शाए कए है—

"ओ शिगती हयीना,

आंखि है नेमी या कागती बादाम?"

"बादाम का नाम मन लेना,

बाजार में है बहुत मर्हणा।"

"ओ शिगती हयीना, नेंग जेंट है या शहद?"

"शहद का नाम मन लेना,

बाजार में है बहुत मर्हणा।"

इस लोकगीत द्वारा लड़की के सौंदर्य का वर्णन किया है।

शैली

नासिरा शर्मा ने औपन्यासिक शिल्प के आकर्षण को द्विगुणित करने के लिए अनेक शैलियों का प्रयोग किया है। वे किसी एक शैली से बंधकर नहीं रहीं हैं। लेखिका ने अपने उपन्यासों में प्रयुक्त की हुई प्रमुख शैलियों का विवेचन निम्नानुसार है— वर्णनात्मक शैली

प्रस्तुत शैली में उपन्यासकार कथावस्तु, पात्र तथा स्थितियों का वर्णन तृतीय पुरुष के रूप में करता है। "बाह्य दृश्यों और घटनाओं को इस शैली में प्रस्तुत करके यथार्थ का सम्यक् बोध भी करया जात है।" इसमें लेखक अपने चरित्रों और उनसे जुड़ी घटनाओं का इतिवृत्तात्मक वर्णन करता है, जिसमें लेखक की कल्पना व अनुभूति भी रहती है। विवेच्य उपन्यासों में वर्णनात्मक शैली का सुंदर निर्वाह हुआ है।

लेखिका ने 'शाल्मली' उपन्यास में प्रकृति चित्रण के लिए वर्णनात्मक शैली का सहारा लिया है। जैसे — "जाड़े की ऋतु खिली धूप में खड़े शिरीष के वृक्षों की नगी शाखाओं में सुनहरी फलियों का बादामी सुनहरा रंग नीले साफ आसमान पर एक विचित्र सौंदर्य बिखरे रहा था। हवा के साथ फैलियों का हिलना और उनके अंदर बीजों का बजना किसी एक मद्धिम संगीत की तरह सुनाई पड़ रहा था। यहाँ से वहाँ तक फैले सफेद बादामी सुनहरे रंग के शिरीष के वृक्ष वातावरण में एक उजाला फैला रहे थे। हरियाली के बीच जैसे किसी ने पिछला सोना फैला दिया हो।"

SN: 2394 5303

Impact Factor  
4.002(IIHF)Printing Area  
International Research Journal

January 2017

Issue-25, Vol-01

0199

'ठीकरे की मंगनी' में लेखिका स्कूल से संबंधित बातें वर्णनात्मक शैली में इस प्रकार प्रस्तुत करती है— "स्कूल की इमारत पर जब से पताई हुई थी, वह दूर से चमकने लगी थी। मरम्मत के बाद अच्छी-खासी शकल निकल आई थी कमरे की। मैदान में भी अशोक के कई पेड़ लगवा दिए गए थे। सुलताना और किरण को आ जाने से स्कूल में खारी बहल-पहल आ गई थी। पाँच लोगों ने मिलकर दीपावली पर छोड़ा—सा कार्यक्रम भी रखा दिया था, जिससे बच्चों और गाँव वालों में एक संबंध—सा बन गया था।" लेखिका ने प्राकृतिक चित्रण और स्थलों का चित्रण करते समय इस शैली का अधिक प्रयोग किया है।

'जिदा मुहावरे' में भी वर्णनात्मक शैली दिखाई देती है।

#### पूर्वदीप्ति शैली

अतीत से जुड़ी घटनाओं का वर्णन इस शैली में किया जाता है। "पात्रों के मानसिक संघर्ष को दिखलाने के लिए हानिकारक उन्हे अतीत की स्मृतियों से जोड़ता है और वर्तमान परिवेश के प्रति व्यक्ति प्रतिक्रियाओं का आकलन करता है।" वस्तुतः विगत की ओर उन्मुख होना ही पूर्वदीप्ति का लक्षण है। विवेच्य उपन्यासों में यह शैली द्रष्टव्य है। 'सात नदियाँ एक समंदर' उपन्यास में परी अपने पति खालिद को अतीत के बारे में बताती है, "आज से लगभग आठ-नी वर्ष पहले की बात है, जब हम बी.ए.में थे। छुट्टी में शिराज गए थे। हमस... ही सहेलियाँ थीं। एक दिन उर्दू बाजार गए, फिर वहीं से कहवाखाना चले गए।...इसी बीच जाने कहीं से एक फलंगीरन आ गई। हम लोगों ने तफरीह में आकर उसे बुलाया। तच्बया उल्टे इमकी खिंचाई कर रही थी।" यहाँ परी ने तच्बया के बारे में अपने अतीत में घटित एक प्रसंग का वर्णन किया है। उनके इस उपन्यास में पूर्वदीप्ति शैली का प्रयोग सुंदर बन पड़ा है।

#### चित्रात्मक शैली

चित्रात्मक शैली द्वारा लेखक विगत दृश्यों का चित्रण शब्दों के माध्यम से संक्षेप में प्रस्तुत करता है। "इस शैली में छोटे-छोटे दृश्यों के माध्यम से वातावरण और पृष्ठभूमि के साथ-साथ पात्रों की रूपाकृति एवं कार्यों का सजीव चित्र खींचा जाता है।" इस शैली में

प्रस्तुत किए जानेवाले दृश्यों, प्रसंगों के साथ पाठकों का साक्षात्कार होता है।

नायिग शर्मा के उपन्यासों में इस शैली का प्रयोग साफल्य के साथ हुआ है। 'सात नदियाँ एक समंदर' उपन्यास में चित्रात्मक शैली का एक उदाहरण दफ्तव्य है— "मुग्धा पत्थर चढ़ा। गाँवों की हनुडियाँ उभरी हुई थीं। छोटी पर पगड़ी चमा थी। कर्ज पर चूने पेट की ओर मोड़े—दोनों हाथों का तर्किया बनाए दाहिनी करवट से रखा था।" लेखिका ने जेठ में रह रहे हुसैन का चित्रण किया है जो हुसैन की कथा होने जा रहे देह के दर्शन करवाता है।

शात्मली और ठीकरे की मंगनी इन उपन्यासों में भी चित्रात्मक शैली का प्रयोग सुंदर बन पड़ा है।

#### स्मृतिपरक शैली

इस शैली में कथावस्तु का चयन वर्तमान से आरंभ किया जाता है और फिर किसी पात्र की स्मृति को अतीत में लीटाकर विगत जीवन को कथा प्रस्तुत की जाती है।

लेखिका ने उपन्यासों में स्मृतिपरक शैली का सुंदर प्रयोग किया है, जो सुंदर बन पड़ा है। 'सात नदियाँ एक समंदर' में स्मृतिपरक शैली का उदाहरण देखिए— "ससुत का अपना बचपन, जवानों, फिर इनकलाब का समय, उसकी महत्त्वपूर्ण घटनाएँ... शाहयाद के सामने कभी—शाही जरन मनाए जाते थे। हजारों की संख्या में लोग इस इमारत को देखने आते थे।...जुलूस, भाषण, गोली इन सारी आवाजों से ईंगन भरता गया और... टैक्सी हवाई अड्डे की पर जाकर रुक गई। सूसन चौक पड़ी।" सूसन और उनके पति अब्बास हवाई अड्डे की तरफ टैक्सी से जा रहे थे तब तच्बया के मन में अपने बिताए हुए जीवन के चित्र आने लगते हैं। स्मृतिपरक शैली का प्रयोग लेखिका ने अपने 'शात्मली' और 'ठीकरे की मंगनी' इन उपन्यासों में भी किया है।

#### पत्रात्मक शैली

पत्रात्मक शैली उपन्यास की कथावस्तु को भावुक बनाती है। "पात्रों के माध्यम से औपन्यासिक पात्रों को भावविषयक में यह सुविधा रहती है कि वे उन बातों की भी सहज रूप से प्रकट कर देते हैं, जो

Printing Area : Interdisciplinary Multilingual Refereed Journal

ISSN: 2394 5303

Impact Factor  
4.002(IJRF)Printing Area  
International Research JournalJanuary 2017  
Issue-25, Vol-01

0200

50

जिन्हे प्रत्यक्ष रूप में कहने में उन्हें संकोच होता है।" पात्र के हृदय में होनेवाली हलचल तथा पात्रों के मन की गूढ़तम बातों को सुगमता से व्यक्त करने में यह शैली विशेष रूप से उपयोगी होती है।

नासिर शर्मा के उपन्यासों में इस शैली का प्रयोग अत्यंत कम मात्रा में मिलता है। 'सात नदियां एक समंदर' उपन्यास में पत्रात्मक शैली दृष्टिगोचर होती है। परी अपनी सखी महनाज को पत्र लिखती है— "महनाज जान! छुट्टियों में हम लोग नहीं निकल पाएंगे।... अच्छा है! फिर खत डालूंगी। जवाब जल्द देना। सुलेमान को सलाम, बच्चों को प्यार। तुम्हारी — परी।"

आलोच्य उपन्यासों में विविध भाषा-शैली का प्रयोग करके उपन्यासों को भाषा-शैली की दृष्टि से सरस बनाया है। औपन्यासिक शिल्प के आकर्षण को द्विगुणित करने के लिए भाषा-शैली का प्रयोग सफल बन पड़ा है।

#### संदर्भ-संकेत

1. नासिर शर्मा, जिंदा मुहावरें, पृ. १०
2. नासिर शर्मा, सात नदियां एक समंदर, पृ. ३३३
3. वही, पृ. ३३४
4. वही, पृ. ३०६
5. नासिर शर्मा, सात नदियां एक समंदर, पृ. ४७
6. प्रो.सतीश पाण्डेय, कथा शिल्पी देवेश ठाकुर, पृ. ११३
7. नासिर शर्मा, शाल्मली, पृ. ३७-३८
8. नासिर शर्मा, डीकरे की मंगनी, पृ. ६४
9. डॉ. इंदु रश्मी, नई कहानी का स्वरूप विवेचन, पृ. १६९
10. नासिर शर्मा, सात नदियां एक समंदर, पृ. १६१
11. प्रो.सतीश पाण्डेय, कथाशिल्पी देवेश ठाकुर, पृ. १२७
12. नासिर शर्मा, सात नदियां एक समंदर, पृ. ३२१
13. वही, पृ. ३२०
14. डॉ. दुर्गाशंकर मिश्र, अज्ञेय का उपन्यास साहित्य, पृ. २३७
15. नासिर शर्मा, सात नदियां एक समंदर, पृ. ३२५

□□□

## सरकारी एवं गैर सरकारी प्राथमिक विद्यालयों में कार्यरत अध्यापकों में विद्यालय के प्रति निष्ठा और समर्पण की भावना का अध्ययन।

डा० रयाम सिंह गौर

सहायक प्राध्यापक, शिक्षा विभाग,  
महात्मा गाँधी चित्रकूट प्रामोदय विश्वविद्यालय,  
चित्रकूट, सतना (म०प्र०),

नीलम सिंह परिहार

शोध छात्रा, शिक्षा शाखा,  
महात्मा गाँधी चित्रकूट प्रामोदय विश्वविद्यालय,  
चित्रकूट, सतना (म०प्र०)

#### सारांश

प्रस्तुत शोध का उद्देश्य प्राथमिक विद्यालयों में अध्यापन करने वाले अध्यापकों में विद्यालय के प्रति निष्ठा एवं समर्पण की भावना का अध्ययन करना है। "किसी भी देश का भविष्य उसकी कक्षाओं में निर्मित होता है।"— डॉ० एस० रामकृष्णन। उपरोक्त कथन अपने आप में बहुत महत्वपूर्ण है क्योंकि किसी भी देश का भविष्य उसके विद्यार्थियों पर निर्भर करता है और विद्यार्थियों के भविष्य का निर्माता अध्यापक होता है। अध्यापक ही राष्ट्र निर्माता भी होता है, ऐसे में अध्यापकों को पूर्ण निष्ठा एवं समर्पण की भावना के साथ शैक्षिक कार्यों तथा अपने कर्तव्यों का निर्वहन करना अत्यन्त आवश्यक हो जाता है। प्रस्तुत शोध का उद्देश्य अध्यापकों में अध्यापन के प्रति रूचि, व्यवसायिक प्रतिबद्धता एवं कार्य के प्रति समर्पण की भावना को मजबूत बनाना है। इस शोध में स्वनिर्मित प्रश्नावली के माध्यम से सरकारी एवं गैर सरकारी विद्यालयों के अध्यापकों की विद्यालय के प्रति निष्ठा एवं समर्पण की भावना का

Printing Area : Interdisciplinary Multilingual Refereed Journal

4. Adivasi Kavitaon me Paryavaran Chetana

### Speil दर्पण

Speil er et flekkulturell ågaxin på norsk og hindi i presenteret viktige bheter bhale fru bhaba og vorge fou vâre lesere

ârmâlet vârt et â ôke vâstâhelse og kontakt telhom mennesket og ulthret

peil er et talebry for ulthraarbeidere i Norge, ansett emisk bhagrinn Vi nsket alle velkommen til â kose i Speil-ârpâ. Har du ã bhâra med, spâsmâl, leet eller lignende? Ta ontakt med oss på peil.nett@gmail.com

totteatsbnnement for Speil t 100,- pr år

essalsgeprts 25 kt

bankgirtv 60720514969

### I dette nr. 4 ut åk m

#### हिन्दी Hindi

- वसुधैव कुटुम्बकम्  
सम्पादकीय ३  
सम्पादक के वार्त पत्र ६
- लेख और सम्पादन  
हिन्दी आधुनिकी कविताओं में पर्यावरण भेतना ३१  
हिन्दी भाषा एक जलपूर्ण भाषा है  
डॉ. सुधं प्रसाद वीरसिंह ३१  
जलशोका संस्कृति के परिधीय में मातृत्व की भूमिका डा. अमरनाथ ३२  
सुधं कुमार पाण्डेय की कला में ३३  
डॉ. कुमार 'बैरीन' के पीछे 'वर्षा' के वंश और सन्तान की सुरभि डॉ. अलका पाण्डेय ३७  
लक्ष्मण की पारसी महिला मेयर बनने पर संवत्स शक्ति का बर्दा ३६  
श्रीमं की भारत देश की कविता  
सहित सुरजन ३६  
एवरेस्ट विजेता पूर्ण मतवय २०  
लोक साहित्य, संस्कृति का जीवन दस्तावेज डा. स्वता दीपि २१  
कलुजी शिगोरो को साहित्य का नोबेल सुरेशचन्द्र शुक्ल 'शरद आलोक' २३
- कथा-नी  
प्रायश डॉ. विभूचननाथ शुक्ल ८  
आकाशी की दुनिया इला प्रसाद १४  
डा. अयशंकर शुक्ल की दो लघुकथाएँ २४
- कविताएँ  
कला अमरवील 'अज्ञान, जोन्नी, वार्न' ३४  
पार वेणु मातंगी डू. डी. कलगा पाण्डेय २५  
शिवपुरा किलगरी की कला में २५  
सुधं दीपवती अमरवील ३५  
मंगल मंगल होने दो डा. विजितरम शर्मा 'दोष' २५  
सुरजम मनमथ सिंह २६  
कंस पूनम उन्मूलन ३६  
आकाशी की सतरंगी जगती शरद आलोक २६  
पुनम इरा डाकूर ३६  
आकाशीत अनुसूत 'अनुसू' २७  
कविताएँ दास आम्बी ज्ञानद २७  
भयम होती भय की पारम्परिक योगिनी  
ज्योति तिवारी २७  
जिन्दगी में सवाल पत करना आशा पाण्डेय २८  
कुमार तरल की शक्ति २८  
कोहरे में नुप होती जाकृतिवी में अनुसूत पादक २८  
दो और उनका व्यक्तित्व - अशोक प्रवन्धी २८  
कैसे कैसे में लोग मंजु शुक्ला २८  
सुधा राजे की वार्त कविताएँ २८
- फिल्म  
कंपना को लेकर फिल्म बनाना वाहता डू.  
सुरेशचन्द्र शुक्ल ३०  
देव ट्रेप का मंचन १६ दिसम्बर ३२  
सिमरन - फिल्म समीक्षा ३२
- खेल  
विद्या कोहली ३३  
भारतीय महिला हॉकी टीम ने एशिया कप जीता ३३  
मैरी डॉम ने एशियाई मुक्केबाजी चैम्पियनशिप में अपने पाँचवे स्वर्ण पदक जीता ३३

### Norsk (Norwegian) नार्वेजीय

- Faste spalter  
Leder 5  
Leserbrev 6
- Artikler og informasjon  
Kazuo Ishiguro får nobelprisen i litteratur 34  
Kan vinne Nordens største bokpris 35  
- Vi må kunne beskytte barna våre mot overgrep på nett 36  
Evaluering av tilbudd til amatørteater 37  
Viktig enighet i kampen mot korrupsjon 37  
Vil ha Europa med på akrim-samarbeid 38  
Vil du bli med i mentorsendinga i landbruket? 39  
Øker kunnskapen om klimagassutslippet i jordbruket 39  
Kulturministeren vil løfte samisk kultur som en viktig del av Norges kulturarv 38  
Nært og omfattende samarbeid med Brasil 39
- The Nobel Peace Prize 2017 42  
The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2017 43  
The Nobel Prize in Physiology or Medicine 2017 43  
The Nobel Prize in Chemistry 2017 44  
The Nobel Prize in Literature 2017 44
- Dikt  
Den vinteren av Paal Helge Haugen 44  
Dikt mot Krig av Nirmal Brahmachari 44  
Tanka av Nuri Rosegg 45  
Fire dikt av Inger-Marie Lilleengen 45  
Slik jeg hørte det ... fra av Sigrud Marie Refsum 46  
Om å skrive av Britt Bekkedal 46  
Menneskets fred! av Inger Marie Lilleengen 46  
Alt for penger av Suresh Chandra Shukla 46

AJMVPS, New Arts, Commerce & Science College, Parner | Research Publication and Awards

Page | 1190

## हिन्दी आदिवासी कविताओं में पर्यावरण चेतना

डा. विजय कुमार राऊत



आदिवासी शब्द सुनते ही हमारे आँकों के सामने विकसित तस्वीर निर्माण हो जाती है। एक ऐसा मनुष्य जो सदियों से अपनी स्वतंत्र परंपरा में, समूह के साथ झगड़ें, गाँवों, देहातों से दूर घने जंगलों में रहने

माला, बरला रंग, कपूर को पेड़ के फले लगाए, सिर पर सींग और हाथ में धनुष, भाला लिए है। आदिवासी को जानना एक गहन अध्ययन है। भारत में आदिवासी कुल आबादी का ८-१४ प्रतिशत भाग है। उनकी संख्या भारतीय जनगणना २००१ के अनुसार ८.४५१ करोड़ की देश के क्षेत्रफल के करीब १२ प्रतिशत में निवास करते हैं।

घसल में आदिवासी साहित्य आंदोलन के पीछे विभिन्न सामाजिक, राजनीतिक, धार्मिक परिस्थितियों ने प्रत्यक्ष और अप्रत्यक्ष रूप में अपनी भूमिका निभायी है। आदिवासी लेखन और विमर्श को सन १९६९ के बाद से मान सकते हैं। आदिवासी साहित्य लिखने की प्रेरणा या उसकी आवश्यकता को जाने के लिए वादरू मोनबने की 'मंच' (Stage) कविता सटीक है।

आदिवासी साहित्यिक मौखिक परम्परा का साहित्य है। जिसमें गीत, शौर्यगाथा, लोककथा तथा विविध लोककथाओं में ध्रुव है। आदिवासी साहित्य को परिभाषित किया जाये तो उसका अर्थ और स्वरूप बहुत आसानी से स्पष्ट हो जाता है। प्रसिद्ध आदिवासी विमर्शकार डा० विनायक तुमरान के अनुसार-

"आदिवासी साहित्य एक संस्कृति में सम्बन्धित साहित्य है। वह वन, जंगलों में रहने वाले वंशियों का साहित्य जिनके प्रश्नों का उत्तर अतीत में कहीं भी नहीं दिया गया। वह ऐसे दुर्लभियों का साहित्य है जिनके आक्रोश व मुख्यधारा की समाज व्यवस्था में कभी काम ही नहीं बरे। वह गिरि कदराओं में रहने वाले अन्याय प्रन्धों का क्रांति साहित्य है। सदियों से जारी कूट और कटोर न्याय व्यवस्था ने जिनकी सैकड़ों पीढ़ियों को आजीवन हलकान किया, उस आदिम समूह की मुक्ति का साहित्य है आदिवासी साहित्य।"

आदिवासी सदियों से जल, कपास, जमीन के लिए लड़ता आया है। पर्यावरण का समतोल समानता रखता है। अनेक समस्याओं के बावजूद उसने अपना मूल धान सदियों से लोककथाओं, कलाओं और गीतों के द्वारा संजोये रखा है। जब यह पर्यावरण में कार्य करता है, नाचता और गाता है तो वह उन गीतों को गाता है

उनके पास आयुर्वेद, भूगर्भशास्त्र, दनस्पतिशास्त्र, प्रकृतिशास्त्र और पर्यावरण का अमूल्य ज्ञान भंडार है। इसलिए आज आदिवासी साहित्य कई दृष्टियों से महत्वपूर्ण है।

निर्मला कुसुम अपनी कविताओं में जंगल पशु, पक्षी, पौधे, फूल नदी आदि का प्रतीक के साथ प्रयोग करती है। निर्मला कुसुम के दोनो कविता संग्रह 'अग्ने घर की लताश में' और 'नगाई की तरह बजाते शब्द' अगर हम देखेंगे तो दोनो में मानवीय संवेदना उसकी पीढ़ी के साथ-साथ पर्यावरण चेतना को स्वर देने का काम किया है। विशेषकर आदिवासी स्त्री और पुरुष को पर्यावरण के केन्द्र में रखकर स्वाभाविकता के साथ प्रस्तुत किया है। यह अपनी कविता पहाड़ी पुरुष में कहती है-

"पहाड़-सी देह  
पहाड़-सी छली

पहाड़-सा रंग

पहाड़ पर गुनगुन डैटे

पहाड़ी आदमी के चेहरे पर दिख रहा है

पहाड़ का भूगोल"

कवि का विचार करने की प्रविन्ना यहाँ पर बहुत तेज और अनुत्पन्न है। किस प्रकार वह अपने आदिवासी व्यक्ति को पर्यावरण का एक भाग पहाड़ से जोड़ती है। आदिवासी जन्मा। पर्यावरण के साथ जुड़ा है इसलिए वह अपने आपको उसका एक अंग मानता है।

आदिवासी युवा कवि अमूक सुगुन एक आदिवासी होते हुए आधुनिक कवि है। वे अपनी कविता अधोपिहित के माध्यम से आधुनिकता और परम्परा के संक्रमण के साथ-साथ समूह मनुष्य के उनाड़ने से अगर आधुनिक राष्ट्र को निर्मित करते हैं तो यह आदिवासी कवि को कतई मंजूर नहीं। उनकी कविताएँ आदिवासी के अस्तित्व के भिन्न जाने की चिन्ता से लिखी गयी कविता है। माफियाओं और डाकुओं की कुल्हाड़ी से जंगल, पेड़ ही नहीं कटते बल्कि उनमें निवास करने वाले और जीवन घापन करने वाले आदिवासियों का भी अस्तित्व भिन्न जाता है। अखिर दाँड़ जाये तो कहीं? वह वैश्वीकरण के आगे का सवाल है। अनुज तुगुन आदिवासियों के अस्तित्व के प्रश्न को अपनी इस कविता के माध्यम से स्पष्ट करते हैं-

"लड़ रहे हैं आदिवासी

अधोपिहित उलगुलान में

कट रहे हैं वृक्ष

माफियाओं की कुल्हाड़ी से और

बड़ रहे हैं कब्रिस्तानों के जंगल

दाँड़ जाये तो कहीं जाए?

कटते जंगल में वा बढ़ने जंगल में।

आज आदिवासियों की पहचान के साथ-साथ या जीवन ही संकट में है। सरकार और टेकेदारों का जंगल को नष्ट किये जाने के कारण जंगलों, घाटियों रहने वाले आदिवासियों का जीवन विध्वंसित हो चुका है। जंगल कटाई के कारण कट, मूल शिकार नष्ट रहे है जिसके कारण उनके जीवन का अन्त नष्ट रहा है। आदिवासी अपना गीत कविता खेड़कर जोर की ओर दौड़ लगा रहा है। उसके जीवन मूल्य का होते का रहे है। इतना ही नहीं कुछ आदिवासी कबीले कवियों को पैरकानूनी कारण देकर बन्दूक के बल से हत्या-धमकाया जाता है। महाराष्ट्र का हुने कि इसकी जिंदा गिमान है। आदिवासियों के जन, जंग और जमीन इन पहलुओं की जान करने हुए वन्य प्रायकहाड कहते हैं-

"जंगल के बिना आदिवासी कोई अस्तित्व नहीं है। जब अग्ने भाग आए अ विकास के नाम पर इनको जंगल के छत्रों को काट शुरू किया तो आदिवासियों ने बगावत की। जब संघर्ष आरम्भ हुआ तो कुछ आदिवासियों ने मांग ब हमें काटी लेकिन हमारे जंगल मत काटो। मैका हजारों वर्षों में जिन जंगलों को हमने सम्भाला जिसके सहारे हम जी रहे हैं, उसे बर्बाद मत करो।"

आदिवासी का जीवन प्रत्यक्ष और अप्रत्यक्ष रूप जंगल से जुड़ा है। जंगल के हर एक पेड़, पशु, प मिट्टी की गंध, शिकार के इन्धकार वनस्पतियों परिचित है। औद्योगिकरण और वैश्वीकरण कारण आज वह शहरों में तब्दील होता जा रहा जंगलों में शहर घसते जा रहे हैं। पेड़ों को काट इमारते बनाई जा रही है। खेती योग्य जमीन कारखाने बनाए जा रहे हैं। बड़ते प्रदूषण से वनस्प और पशु-पक्षी अपनी जान बचाने की धातिर भाग है। महाराष्ट्र के प्रमुख आदिवासी कवि श्री बा मोनबने अपनी कविता हरिचन जंगल में उपरो समस्या को प्रस्तुत करते हैं, वे कहते हैं-

"हरे- जंगलों में / झारे हुए/सागौन के पत्तों सरी टूटी-फूटी वे झोपड़ियाँ/जंगल के जग आदमी/कंदमूल खानेवाले/पर न बच्चा कमा और बचा मूल"

हरिराम भीष्म ऐसे कवि जो आधुनिकता से जुड़े हैं।

उन्होंने अतिक्रमण कविता के माध्यम से तथाकथित

सभ्य कहे जाने वाले समाज द्वारा विमर्श पर किए ग

अतिक्रमण और उनके आदिवासी जगत पर हुए अल

को बड़ी धृवी के साथ प्रस्तुत किया है। जब स

लेख पृष्ठ २२ पर.

लेख

एक राजस्थानी गीत में भी देखने को मिलती है-  
भीतणी, हे भीतणी, / राव जी बुलावै, महारा आवा  
न जिवाप, मोटा रावरो । / मोटा राव जी हो राव  
नही है बात सु प्यारे कप, / टुकड़ा भला ही फारे  
।।

ज, भाई-बहन का प्यार तो है ही, सास-बहू के  
। सौतिपा डाह इन सबका जीवन विषण लोक  
ए में मिलता है। बहन भाई से अपने ससुरात का  
प्यार करती है-

मन हूटी भदपा, कई मन पीसीलां हो ना  
इया कई मन रीन्दी ला रसोइया हो ना,  
इया पनिपा फालात से भरवैसी हो ना ।

। साहित्य में वर्ग विभक्तता और सामाजिक सम्बन्धों के  
रिक्त आर्थिक उदल पुष्ट, धार्मिक विश्वास,  
परामर्श और लोकचार आदि का सुन्दर चित्रण मिलता  
कहें। इनका वास्तविक सौन्दर्य परिवर्तित होता चला  
रहा है। फिर भी यह अपने नए रूप के साथ आज भी  
रे सम्मान में विद्यमान है। पूजापाठ, व्रतविधान,  
देवता के अनुष्ठान में वे गुंजते हैं। ग्रामीण महिलाएँ  
न, छठव्रत, तुलसी, मैरी, काली शीतला आदि के गीत  
श्रद्धा में गाती हैं और अपने परिवार के कल्याण की  
न करती हैं-

। 'जे तोहरा आहो मतिनिया, हिरदय समाय हो,  
ने माँगले मइया अनुघन लक्ष्मी हो।  
'मिरका के सेनुरवा ए मइया सेहो विह धान,  
गाद भरल बेटा माँग, रउवे खेलावना हो ।  
। गीतों में बेटियों का बहुत ही मार्मिक चित्रण हुआ है  
नके अन्य को लेकर, ब्याह को लेकर जो विभेद व्याप्त  
मात्र में, उसका वर्णन किया गया है। बेटों के जन्म की  
' देखे-

। 'आहे बेटा तोहें अवतरलै/ताहि दिन भेल  
नार/घन्ना नीन्द हरित भेल बेटा, /घिर नहीं रहल  
न ।  
। बेटों के पैदा होने पर विषाद छा जाता है वहीं बेटे के

जन्म पर - पुत्र न होवो बेटी, बाजैत बचाया ।  
पुत्री के तिग तर खोलने की पीड़ा भी कृम कप नहीं है।  
दिनका होसु हे बेटी भुषिया रे पिगसिया  
रतिपा होसु हे बेटी बाबा ओषि के निदिया ।

यह हमें मानना होगा कि किसी भी शिष्ट साहित्य का  
उद्गम क्षेत्र लोक का प्राय साहित्य ही होता है। हिन्दी,  
अंग्रेजी, उर्दू, संस्कृत आदि सभी भाषा साहित्य का  
विकसित एवं परिष्कृत रूप का स्रोत लोक भाषा ही माना  
जाता है। जनजागरण और देशभक्ति की भावना से  
अंतर्गत लोक साहित्य में वीर, बलिदान, महान पुरुषों  
द्वारा महान कार्य करने की प्रेरणा रही है। होली, आला,  
चौला, कजली, झूमर आदि इसके उदाहरण हैं। एक  
उदाहरण चौला का-

ए रामा सीमा के कमरिया  
ले आएव लसकरिया एक रामा, चाउ तोहारी ।  
आरे फारि देइव धरके टंगरिया ए रामा,  
भाऊ तोहारी । लोकगीत को ही दो भागों में विभक्त किया  
है, एक जो जो छोटा है और जिसमें कथा का अभाव है  
और दूसरा वह जो अपेक्षाकृत लम्बा है और जिसमें  
कथानक और गेयता भी है। संस्कार तथा ऋतु सम्बन्धी  
गीत प्रथम श्रेणी में आते हैं और तोरकी, विजयमल,  
नयकवा बनजारा, भरधरी, सोरठी, हीरारोझ, दोला मारु,  
राजा रसावू आदि के गीत दूसरी श्रेणी में आते हैं। इन्हें  
लोकगाथा कहते हैं,

लोक साहित्य का एक महत्वपूर्ण हिस्सा है लोककथा ।  
लोककथा की परम्परा बहुत प्राचीन रही है। ऋग्वेद में  
बहुत से ऐसे सूक्त हैं जिन्हें एक से अधिक पात्र के द्वारा  
कहलवाया गया है। इन सूक्तों को संवाद सूक्त कहा गया  
है। शुन-शेष का प्रसिद्ध आख्यान, अचला अनेयी का  
आदर्श चरित्र चित्रण, च्यवन भार्गव, और सुकन्धा मानवी  
की कथा आदि वेदों में वर्णित हैं। शतपथ ब्राह्मण की  
उर्वशी और पुरुवा की कथा अत्यन्त प्रचलित कथा है।  
उपनिषद्, बृहत्कथा, बृहत्कथा मंजरी, कथा सरित्सागर,  
पंचतंत्र, हितोपदेश, वैताल पंचविंशतिध आदि ग्रंथ

लोककथाओं का स्रोत है। इसी तरह लोकनाट्य का  
अपना महत्वपूर्ण स्थान है लोक साहित्य में। भारत  
विभिन्न प्रदेशों में अलग अलग लोकनाट्य प्रदर्शन  
उत्तरभारत में गुग्गीला, गुग्गीला, मध्यभारत में का  
राजस्थान में ख्याल, गुग्गीला में बलाई, बंगाल की का  
महाभारत की नमस्त्रा प्रारंभ की प्रदर्शन है और का  
महा विश्वर ग्रे है। लोकसाहित्य के प्रदर्शन की नं  
सुधारित का भी स्थान प्राप्त है। ग्रामीण जनता का  
दैनिक व्यवहार में अनेक लोकगीतों, पुराणों, गाँव  
गुक्तियों का प्रयोग करने है। वह इनकी काकु कल्पना  
दर्शाते हैं। इन्हें ही लोक सुचर्चित कहा गया है। नं  
साहित्य में लोक संस्कृति का अद्भुत चित्रण मिलता  
इसलिए इसे लोक संस्कृति का जीवन दर्शाकर म  
जाता है। ग्रामीण चर्चे में समाज के हर पहलू का उ  
किया और जैसा देखा वैसा ही चित्रण किया। 'गणित'  
जीवन का जो अद्भुत चित्रण यहाँ मिलता है वो और न  
नहीं मिलता। जिनकी कुशलता में सुन्दरता वर्णन हुई  
उतनी ही कुशलता से समाज के बौद्धिक को भी उभ  
गया है। जहाँ आदर्श पवित्रता नाशियों का उन्मेष है।  
कर्मशा औरतो का भी चित्रण है। इनके गिनतों को कानं  
से उकेरा गया है। लोक साहित्य में जनजीवन के उ  
पक्षों, सुन्दर-असुन्दर को हमारे सामने प्रस्तुत किया  
है। इसीलिए वह समाज के सच्चे दर्पण को स्वाभाविक  
में प्रस्तुत करने में सफल हो सका है।

सहायक पुस्तक :  
लोक साहित्य को भूमिका, डा.कृष्णदेव उपाध्याय,  
साहित्य भवन, इलाहाबाद  
लोकधर्म, भगवान सिंह भास्कर,  
भास्कर साहित्य भारती, सिवान  
लोक साहित्य, जगदम्बा प्रसाद पाण्डेय,  
प्रकाशन केन्द्र, लखनऊ  
सूरकाव्य में लोक साहित्य,  
डा.माधुरी राजक, सत्यम पब्लिशिंग हाउस, नई दिल्ली

गृष्ठ ७ (हिन्दी आदिवासी कविताओं में  
न्यावरण चेतना) का शेष....

समाज ने जंगलों को काटकर रास्ते, इमारतें, संसद  
मवन, लाताव, गेस्ट हाउस, फार्म हाउस बनाए जब  
आदिवासी को वहाँ से बेदखल होना ही था। वह  
अपने जीवन की गठरी के साथ उसी रास्ते के  
हृत्पाथ पर अपना डेरा लगा दिया था और  
प्राधुनिकता अथवा सभ्य समाज की भाषा में  
श्रतिक्रमण हुआ है? यहाँ पर साफ-साफ दिखाई  
ता है कि अतिक्रमण क्यों हुआ है।  
आदिवासी सिर्फ जल-जंगल और जमीन की बात  
ही करते बल्कि वैश्विकरण के इस दौर में वह

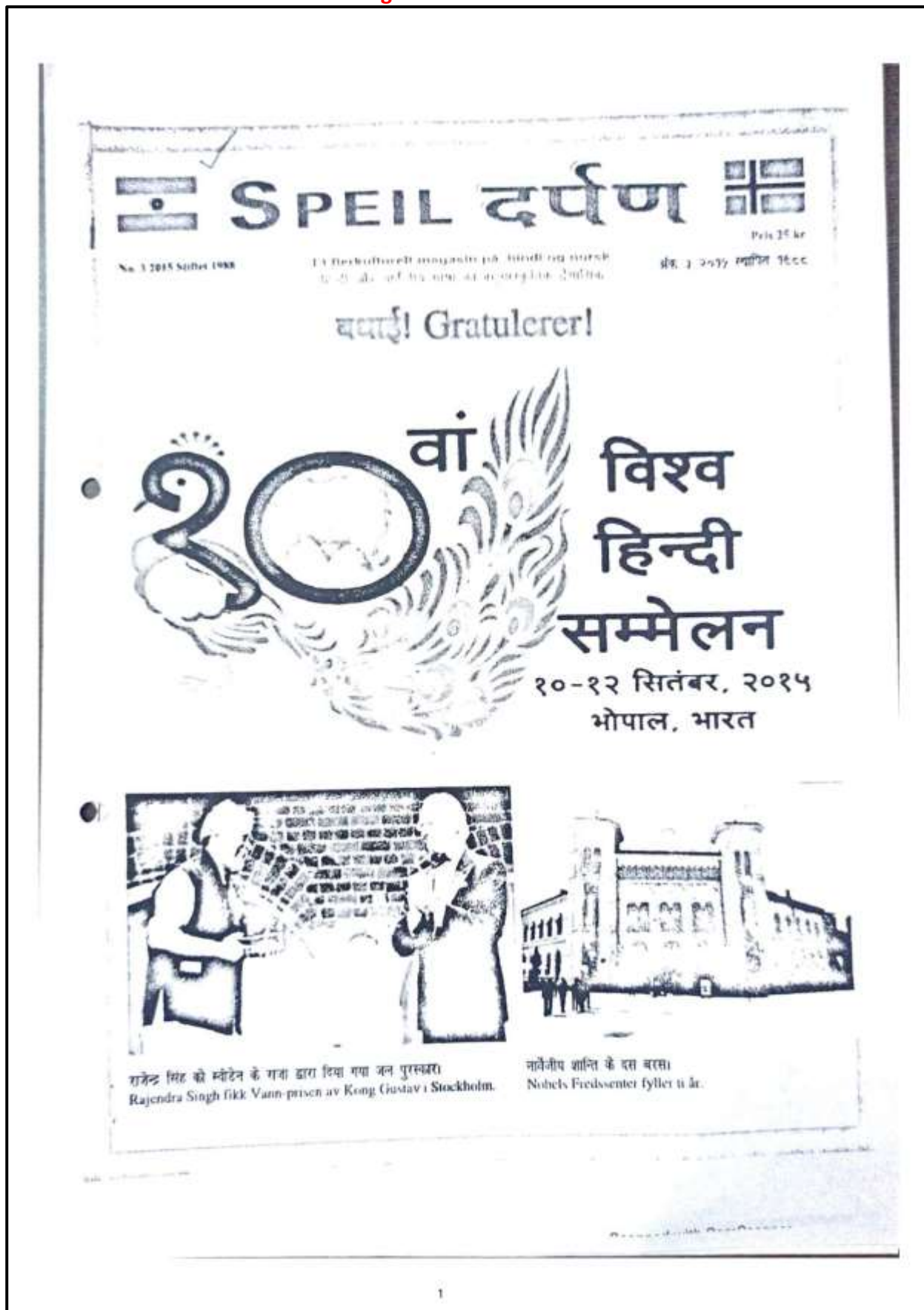
अपनी छवि अपना अस्तित्व की भी विश्व के सामने  
लाना चाहता है। आदिवासियों के पास वे प्राकृतिक  
जीवन मूल्य हैं, उनके पास उन बड़ी बूटियों का ज्ञान  
है जो अन्य किसी के पास नहीं। भूतकाल से अपना  
अस्तित्व बचाते हुए आज तक वह इस जीवन मूल्यों  
और अपने ज्ञान की लोककथाओं, लोकगीतों के साथ  
संभालकर रखा है। अगर आज हम इन्हें नहीं  
बचावेंगे तो इसे अतीत/इतिहास बनने में समय नहीं  
लगेगा।

संदर्भ ग्रंथ:  
१. <http://www.deshbandhu.co.in/newsdetail/7674970>

२. अघोषित उनमुमान (कविता)-अनुज सुगुन वसुधा  
अप्रैल-जून-२०१०
३. आदिवासी अस्मिता की पड़ताल करते  
साक्षात्कार-संपा, रमणिका गुप्ता, पृष्ठ सं.-६६
४. आदिवासी कौन?-संपा, रमणिका गुप्ता,  
राधाकृष्ण प्रकाशन, नई दिल्ली-११०००२
५. आदिवासी विश्वसशील अडोपे-पी.सी. झाकडे  
संस्कारी प्रकाशन, कल्याण (पूर्व) ठाणे (मस.) २०११
६. अपने घर की ललाट में-निर्मला पुस्तक, रमणिका  
फाउंडेशन, नई दिल्ली-२००७
७. आदिवासी साहित्य यात्रा, रमणिका गुप्ता,  
राधाकृष्ण प्रकाशन नई दिल्ली-२००८



5. Gandivad Ki Prasangikata



## Speil दर्पण

Speil er et flerkulturelt magasin på norsk og hindi. Vi representerer viktige nyheter både fra India og Norge for våre lesere. Formålet vårt er å øke forståelse og kontakt mellom mennesker og kulturen. Speil er et talerør for kulturarbeidere i Norge, uansett etnisk bakgrunn. Vi ønsker alle velkommen til å skrive i Speil-darpen. Har du noe å bidra med, spørsmål, ideer eller lignende? Ta kontakt med oss på [speil.net@gmail.com](mailto:speil.net@gmail.com) eller [suresh@shukla.no](mailto:suresh@shukla.no)

स्वदन-दर्पण हिन्दी और नार्वेजिय भाषा को एक बहुसांस्कृतिक पत्रिका है। हम भारत और नार्वे के महत्वपूर्ण समाचार देते हैं। इसका उद्देश्य लोगों और संस्कृतियों में अंतरों समझ बनाना है चाहे उनकी कोई भी ऐतिहासिक दृष्टिकोण हो। स्वदन नार्वे में सांस्कृतिकता को आवाज दे और हम सभी का स्वदन में लिखने के लिए स्वागत करते हैं। आप स्वदन में कोई योगदान देना चाहते हैं, कोई प्रश्न, विचार या सम्पादन विषय में कुछ भी? आप संपर्क करें ई-मेल पर:

[speil.net@gmail.com](mailto:speil.net@gmail.com) या [suresh@shukla.no](mailto:suresh@shukla.no)

Phone: (47) 22 25 51 57

Adresse: Postboks 31, Veitvet  
0518, Oslo, NORWAY

Løssalg 25 kr

Bankkonto : 6072 05 14969

## I dette nr. इस अंक में हिन्दी Hindi

- रसम  
सम्पादन ५  
संपर्क के नाम पर ५
- लेख और समाचार  
स्वदन सम्पादन पुरस्कृत ५  
दरजा विश्व हिन्दी सम्मेलन : मुम्बई ७  
विश्व हिन्दी सम्मेलन और हम  
- डा. विनोद खन्ना ८  
अमेरिका में हिन्दी शिक्षा का मानकीकरण  
- प्रो. सुषम बेदी १०  
नार्वे में हिन्दी जगत : विस्तार एवं संभावनाएँ  
- सुरेशचन्द्र शुक्ल ११  
सुर की वास्तव्य भावना - डा. सुरेश खन्ना १४  
गणेशवादी की प्रार्थना  
- डा. विजय कुमार खन्ना १५  
अखण्ड भारत का विभागीय है दलित महिला  
- प्रो० बल्लभदेव स्नेही १७  
डी.बी.सी. सन्दर्भ और हिन्दी  
- डा. नीलम शर्मा १८  
एक नम्बर बदमाश की रामकहानी  
- मार्क टॉली २१  
नार्वे में भारतीय मूल के चुनाव में  
- प्रबलिन खौर २२  
जल पुरुष को जलसम्मान  
- डा. राजेश श्रीवास्तव २४  
डा. शशि की अंतर्राष्ट्रीय सम्मान  
- विश्वेश्वर अवस्थी तथा जमीर अहमद २५
- कहानी  
सारीब - तेजेंद्र शर्मा २५  
इंसान - अलका भटनागर २६  
प्रेम चुपन - इन्द्र खोसला ३०

## ● कविताएँ

- विचार - जय अशोक ६  
हिन्दी में बदन नहीं दूँ मैं १०  
प्रकृति संगीत - जय अशोक ११  
क्याओं की बग्गी - पूर्णिमा बाबत १८  
मेरा भारत - मिनेज कुमार, एक वंशवी गजल,  
सा पकड़ता - राव भद्रती, शिव की गदगदारी  
- जय दीवान, गजल - मोहम्मद इदरीस,  
मार्ग में ऐसी गुँठियाँ होती - शीतल शर्मा अग्रवाल,  
हमने जीना सीखा लिया - अलका भटनागर ३३  
बेटी केवल बेटी होती है - संगीता सुक्ता दिदीकमल  
हिन्दी का सुवसुत है - पुनम शर्मा, अन्न की बने  
- इन्द्रजीत कान, क्या हुआ - अरविश वेणु  
अओ संग हमारा - राज कपूर  
क्या छोपा क्या चाचा - देवचन्द्र धरमजीव कुमार ३३  
सुदूरतट का द्वीप - अनुपमसुन, एक नाम मेरा जीवन  
सिगरीब जनसेन ३४  
मुझे न करना याद - गोपालदास नीरज, एक नकाश  
- सुपाकर अर्पित, जीवन एक रंग है  
- शानकली दीक्षित, मेरे बाद - सुषम ३५  
हृदय को यकबूत - अम्बरीश कुमार शर्मा,  
स्टी का बहन सुष्म है  
- डा. शिवप्रकाश सिंह शर्मा, सुपु को कहानी  
- विनोद पारती 'हंसकमल', एक रत्न में कवि -  
अमित बनविजय, मायुषिकिन - सुब्र कुमर पाण्डेय,  
आपनी लोकगीत - अनुवादक विरिज बन्तो ३६

## Norsk (Norwegian) नार्वेजीय

### ● Faste spalter

Leder 4  
Leserbrev 5

### ● Artikler og informasjon

Internasjonal dag for yoga 37  
Ny politikk for bærekraftige byer  
og sterke distrikter 38  
Kulturministerens innlegg i filmdebatten  
i Hugesund 39  
Gratis kjernetid i barnehage 41  
Bruker Utvalgte Kulturlandskap i  
studentoppdage Utvalgte Kulturlandskap 42  
Bruker området til studentoppdage 43  
Kommunestyre- og fylkestingsvalget 2015  
Hadde på stemmesedlene 44

Norsk institutt for bioøkonomi (NIBIO)  
er opprettet 47

Vil inspirere kommunene til å tenke nytt  
om lokaldemokratiet 50  
Sammen mot antisemittisme  
Av Kommunal- og moderniseringsminister  
Jan Tore Sanner 51  
Innlegg på seminar om Asean og Norge  
Av Statssekretær Morten Høglund 52  
Endringer i valgloven og valgfredskriften 54

### ● Dikt

Kan speilet tale? - Sigbjørn Obstfelder 46  
Ord - Suresh Chandra Shukla 46

**'गांधीवाद की प्रासंगिकता'**

डॉ. वि. ए. कृष्ण राज



मानव मन में विचारों का प्रवेश तब संभव है, जो कि तब वे विचार बुद्धि होती होने की क्षमता रखते हैं। स्वतंत्र रूप से उन विचारों को स्वीकार लेता है। 'विचारमार्ग' के रूप में उनका महत्त्व महत्त्व होने लगता है और एक 'सद' समाने जाता है। वे विचार एक प्रकार के दर्शन का स्वरूप लेते हैं। 'गांधीवादी' दर्शन का ऐसी ही मूलभूत में निर्माण हुआ है। ब्रिटिश सत्ता की गुलामी तथा स्वतंत्रता आंदोलन के समय भारतीय जीवन में मौजूद अज्ञान, अंधश्रद्धा तथा लाचारी ने कागु के विचारों को प्रदीपित किया था। जिसमें कारण आन्दोलन पर महत्त्वपूर्ण उन जीवन में स्थिरता तथा संतोष मानने में प्रयत्नरत थे।

स्वाधीन भारत के प्रवर्तक नेता महात्मा गांधी एक पुण्य पुरुष की पदचान रखते हैं। उनके गांधीवादी विचार जीवन जीने की कला को गाढ़ करते हैं, 'गांधीदर्शन' 'दर्शन' इस परम्परागत अर्थ में भिन्न है। यह एक जीवन पद्धति है। महात्मा गांधी ने जीवन के सभी पहलुओं पर विचार किया है। उनका जीवन बहुमुखी रूप 'विराट' था। उन्होंने अपने जीवन को 'सत्य के लिए' समर्पित किया है। उन्होंने अपने जीवन प्रयोगों में प्रत्येक क्षण का प्रयोग किया और अपनी अनुभूति पर रखा। इसी संघर्ष में निरन्तर हुई उपलब्धि उनके प्रखर है। उन्होंने प्राचीन सभ्यता को नए अर्थ में पुनः किया है, विन्दुन आधुनिक रूप देने का काम किया है।

उदात्त भारत को देखने का जो गांधी जी का सपना है, उसकी बुनियाद उनके मानवतावादी विचारों में ही है। समाजवादी जीवन को स्वतंत्रता देने का विचार कि वह अपना विकास कर सके। सत्य और ईसा उनके ध्यान के मूल तत्व रहे हैं। वे दोनों ही मनुष्य को दुर्दान्तता का घाट पढ़ाते हैं। परंपरा

को मानने तथा उनका वैधानिक इंगी कान का प्रमाण है। अन्धकार को त्याग कर विचार को मानने का ही गांधी जी का प्रिय था।

सत्य और अहिंसा गांधीवाद की मान्यता ही आधारभूत है। एक नदरदायी है तो वह उनके मानववाद की एक संकेत है। सत्य की आपसी उनका सत्तागत और जनसाधारण के कल्याणकारी मानना से युक्त उनका 'सौंदर्य' मानना भी उनके दार्शनिक विचारों की मौलिकता को सिद्ध करता है। उनसे सत्य, अहिंसा जैसे गुणों की उपयुक्तता तथा प्रासंगिकता सामाजिक गुलामी में किनारी नीति को उतरी ही स्थावर धारण में भी है। कनिष्ठ के मन में वे पुण्य मानने प्रयुक्त का ही काम करते हैं। नैतिक, आधुनिक मनुष्य यात्रिक एवं शैक्षिकता के आचरण में सत्य की आर्थिक प्रवृत्ति को भी देना है। जिसके अंतर्गत सत्य के शुद्ध, दीनकर्म एवं शक्तिपूर्ण जैसी गुणों में विभूतियों भी। इस संश्लेष में 'गांधीवाद' की प्रासंगिकता पर प्रवृत्त, मानव तथा जीवन का ही दृष्टि में सभी आवश्यक हो सकती है।

गांधी जी के अनुसार 'सत्य' और 'अहिंसा' एक दूसरे में भिन्न तत्व रहे हैं। जिस प्रकार प्रेम पर प्रेम के द्वारा वस्तु प्राप्त जा सकता है, वैसे ही 'असत्य' को मन में जीता जा सकता है। अतः सत्य को सम्प्रेषण करने में आत्मसंयम, प्रयास, जागरण, नृसिद्धा का स्वयं, शिव के कर्मों का आचरण और कर्मों सदायक सिद्ध होनी है। उनके मतानुसार "आज के युवा वर्ग को ऐसा आचरण आदर्श नृसिद्धा प्रदान कर सकता है। उनकी राजनीति मान्यता की उपलब्धि थी, "मे सत्य का विनाश रोषक हूँ। मैं आत्मज्ञान प्राप्त करने को अधीर हूँ। मेरी राष्ट्रसेवा मेरी अध्यात्मिक साधना है, जिसके द्वारा मैं अपनी आत्मा को प्रदीप के चरण से मुक्त करना चाहता हूँ। मेरे लिए तो मोक्ष का मार्ग स्वदेश एवं निश्चित मानवता की सेवा ही मान है। मेरी यात्रा मोक्ष और सनातन शक्ति की ओर है। देशभक्ति ही इस यात्रा का पथ है। इसलिए मेरी दृष्टि में राजनीति धर्म से हीन नहीं हो सकती।" कागु का यह धर्म मानवता से सम्बन्धित था। राजनीतिक धर्म मनुष्य को केन्द्र में मानता था। उनके अनुसार किसी भी सत्ता का धर्म मनुष्य जीवन के प्रत्येक क्षेत्र को विकसित करने का साधन होना चाहिए। ब्रिटिशों की राजनीति तत्कालीन भारतीय जनता की नृसिद्धा स्वतंत्रता के लिए, उसकी उन्नति के लिए बाधक थी इसलिए वे 'भारत

कोटो' के निरन्तर पर दृढ़ रहे। इसी भारतीय जनता नृसिद्धा दर्शन प्रवृत्त के मुख को महत्त्व का था। "गांधी जी ने सत्य को ही अपना ईश्वर माना और आत्मसंयम उसकी ही आराधना की। वे कहते हैं, "सत्य में अन्धकार नहीं है। ईश्वर की अनुभूति या साक्षात्कार नहीं हुआ है। सम्भव होने का एकमात्र मार्ग अहिंसा है।"

गांधी जी के 'अहिंसा' तत्व में उनका दर्शन जीवन बुद्ध तथा अहिंसा के विचारों में फेर रखता है। उनके अनुसार अहिंसा दर्शन की महत्त्व ही हीनकर्म जीवन का साधन बन सकती है। वह एक प्रवृत्तिक बन है। तत्कालीन मनुष्य मानव वर्ग इस बन को पदचान लेना तो जायद इतिहास के पन्नों पर मनुष्य की बजाय 'अपना' की स्वाधीनता जो कर्मचान और भविष्यकालीन पीढ़ी को शक्ति और मनोपजनक जीवन का पथ प्रदर्शन जरूर करनी।

गांधीवाद का मूल सत्तागत में संबन्धित है। जिसमें सत्य के साथ-साथ अहिंसा का भी आग्रह है, 'गांधीवाद का मूल तत्व सत्तागत है। जिसके चारों ओर उसकी अन्य सम्पन्न धारणाएँ केन्द्रित है। इसका प्रयोग गांधीजी ने अहिंसात्मक संघर्ष को संचालित करने के लिए किया। इसका अर्थ है कि सत्य पर डटे रहो।" उनकी स्वतंत्रता की कल्पना भी ऐसी ही अहिंसा थी। इसमें परंपरा की बजाय स्वतंत्रता में अर्थिक विश्वास किया गया है। 'नीतिशास्त्र' पर आधारित ऐसे सत्तागत में उनका 'आजीवन अनशन' का अर्थ भी सम्बन्धित है। ब्रिटिशों की कठोर नीति को भी इस शास्त्र को जरूरत है। लेकिन उसे सफल बनाने के लिए गांधी जी के सत्तावादी आत्मबल की भी जरूरत है। केवल एक गांधी नहीं बल्कि गांधीवाद है। "गांधी की सत्तागत की अहिंसा कल्पना पश्चिम के सामाजिक एवं राजनीतिक विचारों में अद्वितीय है। अतः यह 'सत्तागत संकल्पना' वैश्विक विचारधारा के लिए एक देन है ऐसा कहना अतिशयोक्ति नहीं होगी। ब्रिटिश सत्ता से मुक्ति प्राप्त करने हेतु भले ही उन्होंने इसका निर्माण किया हो। विश्व के अनेक राष्ट्रों में, विभिन्न समस्याओं का निराकरण करने के लिए उसकी उपयुक्तता सिद्ध हुई है।" इस प्रकार गांधीवाद एक वैश्विक दर्शन बन जाता है।

गांधी जी ने विश्व शांति की कामना की थी। आजीवन सत्य और अहिंसा का आचरण करने वाले इस पुण्य प्रवृत्त का अंत हिंसा से कायरता से, हुआ वह बड़े श्रेष्ठ की बात है। लेकिन इससे उनके विचारों की शेष 20 पर....

**लेख**

कि, उन्हें पारसी के मन्दिरों का रही है और एक देवी हिन्दी संस्कृतियों को रही है।

**सुन्दरदार भाषा**

एक बात है कि अपने हिन्दी जगहों को विकसित करने के इस प्रयास में इसी यह कभी नहीं भूलें कि उनकी सबसे बड़ी ताकत उनकी सुन्दरदार भाषा है। सुन्दरदार भाषा बीबीसी की हिन्दी की एक और पहचान है जिसे कुछ लोगों ने जीवित रखा। बीबीसी की हिन्दी के इतिहास और परम्परा की बात करने के साथ-साथ उसके प्रोताओं की बात करना जरूरी है क्योंकि बीबीसी की हिन्दी की एक अलग पहचान बनाए रखने में उसके प्रोताओं का बहुत बड़ा रोल रहा है।

अन्त में दशक के अंतिम वर्षों तक भारत में मीडिया क्षेत्र की 'मीडिया इंडस्ट्री' वैसा नहीं था, प्रोताओं के पास विकल्प सीमित थे, बीबीसी हिन्दी प्रामाण्य क्षेत्रों के साथ-साथ नगरी-महानगरी में भी सुनी जाती थी। सुनने वाली में नेता-अभिनेता, शोध, पत्रकार, लेखक, भाषाविद् सभी शामिल थे, आपातकाल के दौरान तो घरे में ही नहीं जेलों की कोठरियों में भी बीबीसी हिन्दी की आवाज सुनी जाती थी। नब्बे के दशक के आरम्भ में परिवर्तन तैयारी से बदलना शुरू हुआ। टेक्नोलॉजी ने बहुत कुछ सम्भव कर दिया, सिटीसाइट और वेबक टेक्नोलॉजी चैनलों ने टेली-विकल्प पैदा किए, देखने-देखने कई समाचार चैनल शुरू हुए और अब एकदम रोज़ेबे।

लेकिन टेक्नोलॉजी और एक एम. चैनलों की इस भीड़ में भी आज, भारत के लगभग पैंने दो करोड़ लोग बीबीसी के श्रोता हैं, वे बीबीसी हिन्दी इसलिए सुनते हैं ताकि खुद को दुनिया से जुड़ा हुआ महसूस कर सकें, अपने मन के असन्तुष्ट को विस्तृत कर सकें।

हिन्दी माध्यम भर है। इन श्रोताओं की सबसे बड़ी संख्या बिहार, झारखंड और उत्तर प्रदेश में है। बाकी मध्यप्रदेश, गुजरात, छत्तीसगढ़ उत्तरांचल, महाराष्ट्र और गुजरात में बिड़रे हैं। हर प्रान्त में हिन्दी के

अलग अलग रूप हैं, अलग अलग रंग हैं।

**बीबीसी हिन्दी डॉट कॉम**

समय बदला और अन्य संसार सामग्रियों की तरह बीबीसी ने वेबसाइट की अवधिगत को भी पाठयाना और वर्ष २००२ में बीबीसी हिन्दी डॉट कॉम की शुरुआत हुई। इसका उद्देश्य भारत और दुनिया भर के हिन्दीभाषी पाठकों तक समाचार और विश्लेषण पहुंचाना था। यह एक २४x७ वेबसाइट है और पत्रकारों की एक टीम साप्ताहिक के सातों दिन, २४ घंटे दुनिया भर के पाठकों के लिए सामग्री उपलब्ध कराती है।

बीबीसी हिन्दी डॉट कॉम के पहले पन्ने पर सभी प्रमुख समाचारों को जगह दी जाती है। और इसके अलावा विश्लेषण, जनसंचय की खबरों और फीचरों का प्रकाशन किया जाता है। वेबसाइट के अन्य इंटरेक्स हैं- भारत, पाकिस्तान, चीन, खेल, मनोरंजन, विज्ञान, वारोचर, मल्टीमीडिया, ब्लॉग/जोरम, बीबीसी विशेष और लॉनिंग इंगलिशा दो पूर्व प्रधानमंत्री, इंद कुम्हार गुजराल और विश्वनाथ प्रताप सिंह बीबीसी हिन्दी डॉट कॉम के स्तंभकार रह चुके हैं। इसके अलावा फिल्मकार देवानंद और मनोज चान्पेदी, कवि और लेखक निधा फाल्गुनी, साहित्यकार अतगर वजाहत, फिल्म स्तंभकार कोमल माहटा और भावना सोमिया और खेल पत्रकार प्रदीप मैगजीन समय-समय पर वेबसाइट से जुड़े रहे हैं।

इस लंबी-पौड़ी दुनिया की दूरियों को कम करने में रेडियो और दूरसंचार के साधनों ने जो महत्वपूर्ण भूमिका निभाई है, वह स्वयं बीबीसी हिन्दी सर्विस के विगत सात दशकों के अपने इतिहास द्वारा भी प्रमाणित होती है। दक्षिण की दृष्टि से बीबीसी ने रेडियो पत्रकारिता को ही संपन्न किया है, लेकिन समतामयिकता से पत्रकारिता सरोकार रखते हुए भी, उसने समतामयिक घटनाचक्र के संवाद और विश्लेषण द्वारा केवल यही सामग्री नहीं दी है, जो

सांस्कृतिक पहलु की होती है। यह टीक है कि सांस्कृतिक दृष्टि से आज समाचारों में जो प्रमुख और शीर्षक स्थान का अधिकारी है, वह कल किरी दुगरे समाचार मात्र-आपदम्य होता रहेगा, लेकिन जैसे कुछ घटनाएं और उनके परिणाम कालजयी सिद्ध हुए हैं, ऐसे ही बी बी सी और उसकी हिन्दी सर्विस द्वारा किए गए अनेक प्रसारण भी कालजयी बने हैं। इस अर्थ में विगत सात दशकों के इतिहास के लिए बी बी सी कोई कम महत्वपूर्ण श्रोत नहीं है। बी बी सी की हिन्दी सर्विस विगत सात दशकों के कल्पवृक्ष की माली है, इसलिए उसकी प्रामाणिकता का विशिष्ट स्थान है।

काल की इस धिरंतन रंगशात में विश्व के मंच पर हर समय घटनाएं होती रहती हैं और उनके कर्त्ता या भोक्ता पात्र हमारे सामने आते-जाते रहते हैं। बी बी सी इस माना घटनाचक्र जगत के संवाद देते समय और उनकी कारण-कार्य शृंखला का विश्लेषण करने समय जिस दर्पण का काम करता है, उसे मैं मुखर दर्पण कहना चाहती हूँ। इस बोलने वाले दर्पण में दुनिया अपना जो दायिक प्रतिबिम्ब देखनी है, वह उसे पसंद है या नापसंद, इसकी परवाह दर्पण को नहीं होनी चाहिए। यह मुखर दर्पण वैश्विक जागरणक द्रष्टा का काम भी करता है और सक्रिय बौद्धिक का काम भी, इसलिए जगत के यदायक की चर्चा करके विचारोत्तेजन करता है। कहां क्या हो रहा है, प्रोताओं की इस जिज्ञासा का शमन तो उसका पहला कर्त्तव्य है, लेकिन अवगति को विचारोत्तेजन में बदलकर वह जो संवाद करता है, वह वाद-विवाद को भूमिका भी बनता है और मैं समझता हूँ कि स्वस्थ वाद-विवाद अन्वेषणाश्रित होते हैं।

बी.बी.सी. हिन्दी सर्विस ने विगत सात दशकों में अपने सामने बहुत-कुछ होते और गुजरते देखा है। बी बी सी संवाददाता की भूमिका रचनाकार की नहीं, निष्पक्ष समीक्षक की रही है; सनसनी फैलाने या सनसनी खोजने की नहीं, स्थितियों-परिस्थितियों को प्रासंगिकता और मानवीय सरोकार को रही है।

**पृष्ठ ५६ ('शोकेश का प्रसंगिकता') का शेष**

प्रासंगिकता अमूर्त बन गई। इतिहास में उसने अपना बहुमूल्य योगदान दिया, वर्तमान में उसकी प्रासंगिकता शीघ्र ही है।

वर्तमान बुद्धिजीवी भारतीय समाज यांत्रिकता एवं मौलिकता का गुलाम है। राष्ट्रपिता के विचारों का स्मरण केवल उनके जन्मदिन और स्मृतिदिन के लिए सीमित हो गया है। आज का बालक उनका महत्व परिचय भारत-पाकिस्तान विभाजन के नेता के रूप में जानता है, वह उन्हें गांधीवाद से पतायन की सीख का

उदाहरण है। ऐसे बालक देश की कमजोर रीढ़ ही बनने को केवल मरने और मारने की हिंसा को जानेंगे। ऐसी परिस्थिति में गांधीवाद की प्रासंगिकता अधिक जरूरी हो जाती है,.... "भविष्य में भारत के सामने गांधीवाद के अनुकरण के सिवा कोई विकल्प नहीं होगा। हिंसा, खूनखराबा, सुटमार, टगबाजी एवं दहशत से मनुष्य संग आ चुका है, उज्र चुका है। विश्व को मुक्त होने का मार्ग केवल भारत ही दर्शाएगा, वह भी एवमात्र गांधीवाद के बल पर।"

निष्कर्षतः गांधीवाद दर्शन इतिहास, वर्तमान और

भविष्य की मानवजाति को अपना अस्तित्व सुरक्षित रखने का उपाय बन जाता है। ग्रंथ, अखबार तथा फिल्म जैसे प्रसार माध्यमों से अगर उन विचारों को प्रस्तुत किया जाता है तो वह केवल मनोरंजन का साधन नहीं बल्कि मनोबल का स्रोत बने। ऐसा मनोबल जो देश को पुनश्च विभाजित होने से बचा सके। इन विचारों की इससे बड़कर और मौलिक प्रासंगिकता भला क्या होगी?

6. Trends of Indian Agricultural Productivity



- 
- 95 **IMPACT OF GST ON INDIAN ECONOMY**  
*Dr. Smt. B. D. Patil(443-448)*
- 96 **GLOBALIZATION'S IMPACT ON ORGANIZATION'S CULTURE**  
*Dr. Manisha A. Navare (449-451)*
- 97 **EMERGING TRENDS IN MARKETING**  
*Prof. Sushil D. Pawar (452-454)*
- 98 **AGRICULTURAL MARKETING IN INDIA: PROBLEMS AND PRESENT STATUS**  
*MS. Nayan Deepak Kale (455-457)*
- 99 **E-BANKING, ADVANTAGES & DISADVANTAGES**  
*Dr. Wakale G. E.(458-460)*
- 100 **INNOVATIVE BUSINESS STRATEGIES ADOPTED BY ENTREPRENEURS IN NASHIK DISTRICT**  
*Dr. Chintamani Avinash Ramesh (461-464)*
- 101 **TEHSIL DEVELOPMENT INDEX: A STUDY OF NASHIK DISTRICT**  
*Dr. Sudhakar K. Pagar & Sambhaji R. Pagar (465-572)*
- 102 **TRENDS OF INDIAN AGRICULTURAL PRODUCTIVITY: PERFORMANCE AND CHALLENGES**  
*Deepak.P.Sontakke (573-577)*
- 103 **RECENT TRENDS IN BANKING SECTORS**  
*Dr. Ashok Vishwnath Ghorpade (578-580)*
- 104 **New Option For Gross National Product (GNP) : Human Development Index**  
*Dr. V.J. Joshi (581-584)*
- 105 **INTERNET BANKING: AN EMERGENT AVENUE**  
*Prof. More Y.S. & Prof. Shinde S.V. (585-587)*
- 106 **STRESS MANAGEMENT: DIFFRENT METHODS TO MINISIZE STRESS**  
*Dr. Kamal R. Dhakane (588-591)*
- 107 **TRIBAL POPULATION CONCENTRATION IN NASHIK DISTRICT, MAHARASHTRA**  
*Sunita Kalnar & Dr. Wavale Vijaykumar G. (592-596)*
- 108 **HIGHER EDUCATION IN INDIA: RECENT TRENDS, ISSUE & PUBLIC EXPENDITURE**  
*Dr. Sandeep Vitthal Irole & Manisha Pandit Gunjal (597-601)*
-

Deepak.P.Sontakke (573-577)

### TRENDS OF INDIAN AGRICULTURAL PRODUCTIVITY: PERFORMANCE AND CHALLENGES

Asst. Prof. Deepak.P.Sontakke

Head, Department of Economics, New Arts Commerce and Science College, PARNER  
Tal. Parner, Dist. Ahmednagar

**Introduction:** Agriculture is the core sector of Indian economy; it accounts for about 34.8 percent of the national income and provides livelihood to 66.7 percent of the working population of the country. Agriculture is commonly grouped with farming, mining, forestry and fisheries under the head of primary industries. The importance of agricultural sector of the economy, rich/poor, is borne out by the fact that it is primary sector of the economy which provides the basic ingredients necessary for the existence of mankind. History of economic development of various advanced nations shows that development of their secondary and tertiary sector to some extent was preceded by the development of agriculture. Agriculture is the backbone of our country. Major part of country's income/population earns its livelihood from agriculture. It has also been the source of raw materials to our leading industries such as sugar, cotton, jute, textiles, hydrogenated oils, soap and other agro-based industries which together accounts for 50 percent of the income generated in the manufacturing sector in India. A sustained and wide spread agricultural growth is pre condition of development of a country like India which is an agrarian economy. The slow growth in agriculture whether allied or non allied can be of great strain for the economy. While agriculture's share in India's economy has progressively declined to less than 15% due to the high growth rates of industrial and services sectors, the sector's importance in India's economic and social fabric goes well beyond this indicator. First, nearly three-quarters of India's families depend on rural incomes. Second, the majority of India's poor (some 770 million people or about 70 percent) are found in rural areas. And third, India's food security depends on producing cereal crops, as well as increasing its production of fruits, vegetables and milk to meet the demands of a growing population with rising incomes. To do so, a productive, competitive, diversified and sustainable agricultural sector will need to emerge at an accelerated pace. India is a global agricultural powerhouse. It is the world's largest producer of milk, pulses and spices, and has the world's largest cattle herd (buffaloes), as well as the largest under wheat, rice and cotton. It is the second largest producer of rice, wheat, cotton, sugarcane, farmed firs, sheep & goat meat, fruit, vegetables and tea. The country has some 195 m ha under cultivation of which some 63 percent are rain fed (roughly 125m ha) while 37 percent are irrigated (70m ha). In addition, forests cover some 65m ha of India's land (world bank report)At present in terms agricultural productivity, India hold second position. The agricultural production in India comprises of field crop, fruit plantation crop, livestock, forestry, fishery etc, but the pace of productivity is low in recent years, even may initiatives has been led by the government. Many schemes like RKVY, NADP, were launched by government to cope with the problem of slow pace of agricultural growth. India has wide capability to produce wide range of agricultural and allied products. Major crops of the area are paddy, wheat and maize. Manpower is also available in sufficient quantity which can be utilized properly for overall development of agricultural sector. Production of agriculture and allied sector has not been increasing over the past years which are major concerns for the authorities. Swot (strength's, weakness, opportunities and threats) analysis reveals the need and

### 3. Technical Causes

**Technological Backwardness:** Most of farmers use traditional agriculture methods mainly due to paucity of finance. The use of high-yield variety seeds and fertilizers is very limited. Government has withdrawn from provisioning of HYV seeds developed in laboratory to the farms. Farmers have to pay exorbitant prices to the private suppliers for the low quality seed variety which has adverse consequences on the agricultural productivity.

**Increasing Input Cost:** The increase in the input cost due to reduction in subsidies for fertilizers and better seeds and increase in cost of power are responsible for the deceleration in the agriculture growth in the recent years.

**Inadequate Irrigation Facilities:** The vast proportion of cultivable land in India is rain-fed. Further, the infrastructure for irrigation is highly underdeveloped due to defective management as revealed by the fact that only 52.4 percent of the land was irrigated in the year 2003. As rainfall is often insufficient, uncertain and irregular, it leads to low productivity. Further, the Government's expenditure on irrigation coverage and flood control has witnessed a declining trend during the reform period.

**Conclusion:** From the above evidence we can conclude that overall performance of the Indian agriculture growth and production has shown the significant change in the last three decades. It reveals that the agriculture major crop has increase over the period of time. An average of 94.49 million tones of rice is produced annually which is higher than production of wheat, coarse cereals and pulses taken individually. However, it is less than annually average production of all food grain (2227.48 Million tones). Nonetheless, the variation in annual production of all food grains is significant standard Deviation value obtained of rice, cereals, wheat and pulses have increased comparatively over the last few years. This paper is mainly depends on the secondary sources of the different agriculture departments and planning commission.

#### References

- Ramesh Chand and others(2007): *Growth Crisis in Agriculture, Economics and political weekly,GOI, Planning commission (2012): 12<sup>th</sup> Five Year Plan (2012-17) Delhi*
- Balkrishnan Pulapre (2000): *Agriculture and economic reforms, Growth and Welfare, Economics and Political Weekly.*
- Bhalla G.S. and Gurumal Singh (2001): *Indian Agriculture four decades of Development, Sage Publication New Delhi.*
- Joshi P.C. (1975): *Land reforms in India, New Delhi*
- Economic Survey 2012,2013*
- Shauraja and Others (2004): *Development issues of Indian Economy, Seth Publication, Mumbai*
- Fahim Munde "Agricultural Productivity in India : Trends during Five Years Plans" 2005, *Business and Management Review, Volum 5.*
- Suzy MM (2013) : *Five Years Plans of India, New Century Publications, New Delhi.*



7. Recent Trends in Banking Sectors



SJIF 2016 = 6.177

Online ISSN 2278-8808

Printed ISSN 2349-4766

An International, Peer Reviewed, & Referred Quarterly

**Scholarly Research Journal for Interdisciplinary Studies**

**OCT-DEC, 2017, VOL-6, ISSUE-34**

- 
- 71 **SUPPORTING EDUCATION THROUGH CSR: AN OVERVIEW OF INDIAN BANKS**  
*Mr. Shingade B.N. & Dr. Wakchaure R.N. (346-350)*
- 72 **ELECTRONIC BANKING TECHNOLOGY WITH REFERENCE TO INDIAN BANKING SECTOR**  
*Dr. H. R. Tiwari, Dr. Nilam M. Chhangani (351-354)*
- 73 **SPIRITUAL MANAGEMENT**  
*Dr. Vilas S. Kolhe(355-356)*
- 74 **SIX SIGMA METHODOLOGIES: APPLICATION, BENEFITS AND SCOPE**  
*Paikhan Salman Salim (357-359)*
- 75 **MEASURING HUMAN PROGRESS: THE CONTRIBUTION OF THE HUMAN DEVELOPMENT INDEX AND RELATED INDICES**  
*Dr. Dnyandeo E.Zine (360-362)*
- 76 **IMPORTANCE & STATUS OF GOAT FARMING IN INDIA**  
*Dr. G. D. Kharat (363-367)*
- 77 **RECENT TRENDS AND IMPACT OF E-COMMERCE IN INDIA**  
*Prof (Dr.) Vishwas B. Chavan (368-372)*
- 78 **STRUCTURE AND FEATURES OF GOODS AND SERVICE TAX IN INDIA**  
*Dr. Palwe Ajaykumar Madhukar(373-376)*
- 79 **APPROACHES TO STUDY THE OPPORTUNITIES AND CHALLENGES TOWARDS E-BANKING IN INDIAN BANKING CONTEXT**  
*Dr. M. A. Raffey & Mr. Adamane Santosh L.(377-379)*
- 80 **DIGITAL MARKETING IN THE TOURISM INDUSTRY**  
*Dr. Manohar Kacharu Sanap(380-383)*
-

- 
- 95 **IMPACT OF GST ON INDIAN ECONOMY**  
*Dr. Smt. B. D. Patil(443-448)*
- 96 **GLOBALIZATION'S IMPACT ON ORGANIZATION'S CULTURE**  
*Dr.Manisha A.Navare (449-451)*
- 97 **EMERGING TRENDS IN MARKETING**  
*Prof. Sushil D. Pawar (452-454)*
- 98 **AGRICULTURAL MARKETING IN INDIA: PROBLEMS AND PRESENT STATUS**  
*MS. Nayan Deepak Kale (455-457)*
- 99 **E-BANKING, ADVANTAGES & DISADVANTAGES**  
*Dr. Wakale G. E.(458-460)*
- 100 **INNOVATIVE BUSINESS STRATEGIES ADOPTED BY ENTREPRENEURS IN NASHIK DISTRICT**  
*Dr. Chintamani Avinash Ramesh (461-464)*
- 101 **TEHSIL DEVELOPMENT INDEX: A STUDY OF NASHIK DISTRICT**  
*Dr.Sudhakar K. Pagar & Sambhaji R.Pagar (465-572)*
- 102 **TRENDS OF INDIAN AGRICULTURAL PRODUCTIVITY: PERFORMANCE AND CHALLENGES**  
*Deepak.P.Sontakke (573-577)*
- 103 **RECENT TRENDS IN BANKING SECTORS**  
*Dr. Ashok Vishwnath Ghorpade (578-580)*
- 104 **New Option For Gross National Product (GNP) : Human Development Index**  
*Dr. V.J. Joshi (581-584)*
- 105 **INTERNET BANKING: AN EMERGENT AVENUE**  
*Prof. More Y.S. & Prof. Shinde S.V. (585-587)*
- 106 **STRESS MANAGEMENT: DIFFRENT METHODS TO MINISIZE STRESS**  
*Dr. Kamal R. Dhakane (588-591)*
- 107 **TRIBAL POPULATION CONCENTRATION IN NASHIK DISTRICT, MAHARASHTRA**  
*Sunita Kalnar & Dr. Wavale Vijaykumar G. (592-596)*
- 108 **HIGHER EDUCATION IN INDIA: RECENT TRENDS, ISSUE & PUBLIC EXPENDITURE**  
*Dr.Sandeep Vitthal Irole & Manisha Pandit Gunjal (597-601)*
-

**Abstract**

India's banking sectors has made rapid strides in reforming and make even itself to the new competitive business environment. Indian Banking Industry is in the midst of the information Technology evolution and its changes has put for competition among the Banks worldwide. Indian economic environment is witnessing pathbreaking reform measures. The financial sector, of which the banking industry is the largest player, has also been undergoing a orphic change. Today, we are having a fairly well developed banking system with different classes of banks – public sector banks, foreign banks, private sector banks – both old and new generation, regional rural banks and cooperative banks with the Reserve Bank of India as the fountain head of the system.

**INTRODUCTION:** In 1969, a landmark was registered in the Indian Financial Sector, when 14 Banks were nationalized by the Centre. It is a matter of great pride to mention that during the economic meltdown in 2008-09, our Indian Bank stood firm and remained unaffected. This shocked the whole world as few Banks of the developed nations crumbled down but Indian Bank stood strong and also witnessed many positive developments in this industry. To improve the regulation in this sector, several notable efforts were made by the Policy Makers i.e. The Reserve Bank of India, Ministry of Finance and other Government and financial sector agencies. It must be appreciated that the Banks are in a position to meet the demands of the customers and are also adding to the economic development of the nation at large. India's Banking sector has made rapid strides in reforming and aligning itself to the new competitive business environment. Technology has swiftly turned as a boon to the customers.

**Objectives Of The Study**

1. The main objective of the study is to understand Banking Sector
2. To understand the emerging technological trends in Banking Sector in India.
3. To trace the utility of technology in Banking with special reference to India.

**RESEARCH METHODOLOGY:** This Research Is Based On The Analysis Of these secondary data and the research proposes to throw light on the emerging technology trends in banking sector.

**Recent Trends in Banking**

**1) Electronic Payment Services – E Cheques** Now-a-days we are hearing about e-governance, e-mail, e-commerce, e-tail etc. In the same manner, a new technology is being developed in US for introduction of e-cheque, which will eventually replace the conventional paper cheque. India, as harbinger to the introduction of e-cheque, the Negotiable Instruments Act has already been amended to include; Truncated cheque and E-cheque instruments.

**2) Real Time Gross Settlement (RTGS)** Real Time Gross Settlement system, introduced in India since March 2004, is a system through which electronics instructions can be given by banks to transfer funds from their account to the account of another bank. The RTGS system is maintained and operated by the RBI and provides a means of efficient and faster funds transfer among banks facilitating their financial operations. As the name suggests, funds transfer between banks takes place on a 'Real Time' basis. Therefore, money can reach the beneficiary instantaneously and the beneficiary's bank has the responsibility to credit the beneficiary's account within two hours.

**3) Electronic Funds Transfer (EFT)** Electronic Funds Transfer (EFT) is a system whereby anyone who wants to make payment to another person/company etc. can approach his bank and

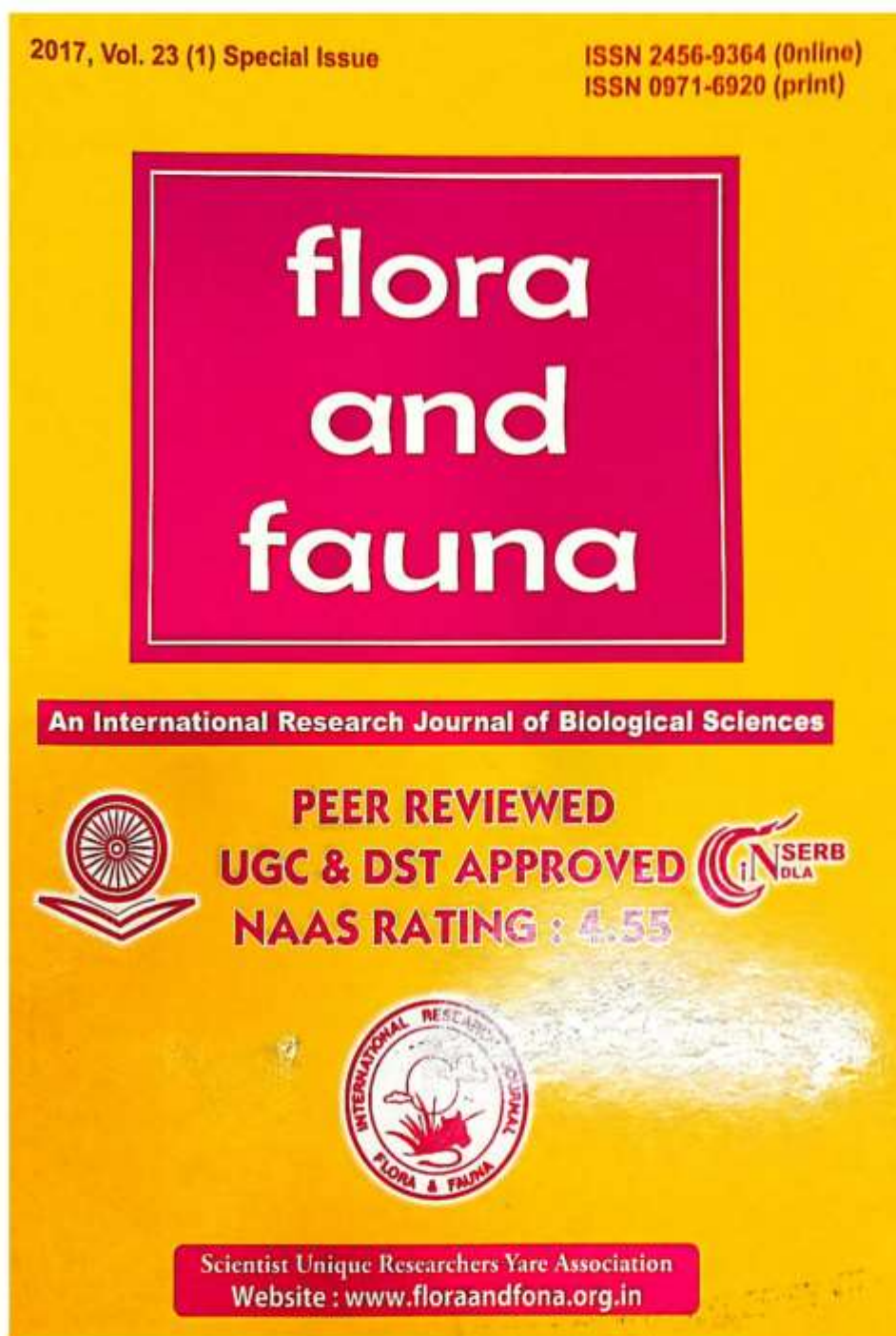
Gemini's 2014 World Retail Banking Report. In the previous year's study, this metric wasn't even included, website All Analytics reports. This finding may help drive interest in more social banking products. "The new generation of customers does not want to take your phone call," researcher Dorsey advises bankers. But they may read a bank's texts, he says. With a growing focus on big data and analysis of consumer behavior, many banks are expanding their social-media presence and targeting potential customers with more personalized messages. Mobile apps such as Venmo and Snap cash are also seizing on opportunities to make payments more personal and shareable.

**12) D-Mat Accounts:** Transacting shares business through electronic media is called D-Mat. Investor opens an account called Demat Accounts with DPS. They get shares in electronic form. Then they send the actual shares to the investor. Investor pays for the opening, maintenance and collection of shares. This has reduced the paper work, bad deliveries; loss of shares and less transaction cost. However delays in demat, higher cost charged by the investors has not given a good start for the growth and scope of Demat in India. Depository.

**Conclusion:** Indian banking system will further grow in size and complexity while acting as an important agent of economic growth and intermingling different segments of the financial sector. AS banking in India will become more and more knowledge supported, capital will emerge as the finest assets of the banking system. Ultimately banking is people and not just figures. To conclude it all, the banking sector in India is progressing with the increased growth in customer base, due to the newly improved and innovative facilities offered by banks. The economic growth of the country is an indicator for the growth of the banking sector. The Indian economy is projected to grow at a rate of 5-6 percent the country's banking industry is expected to reflect this growth.

#### References

1. [www.google.com](http://www.google.com)
  2. [www.wikipedia.com](http://www.wikipedia.com)
  3. [www.ijsr.net](http://www.ijsr.net)
  4. [www.abhinavjournal.com](http://www.abhinavjournal.com)
  5. [www.moneycontrol.com](http://www.moneycontrol.com)
  6. [http://www.vikalpa.com/pdf/articles/2003/2003\\_july\\_sep\\_83\\_99.pdf](http://www.vikalpa.com/pdf/articles/2003/2003_july_sep_83_99.pdf)
  7. [http://www.vikalpa.com/pdf/articles/2003/2003\\_july\\_sep\\_83\\_99.pdf](http://www.vikalpa.com/pdf/articles/2003/2003_july_sep_83_99.pdf)
- Report on Trend and Progress of Banking in India for the year ended June 30, 2011 submitted to the Central Government in terms of Section 36(2) of the Banking Regulation Act, 1949*

**8. Role of Library Science in Environment**

Dr. S. S. Shelke  
Librarian

# FLORA AND FAUNA

An International Research Journal  
Devoted to the applied and fundamental  
Aspects of Plant and Animal Sciences  
(2017, Vol. 23(1), *Special Issue*)



## Special Issue

Of the

BCUD, SPPU, Pune, and Microbiologist Society, India,

Sponsored

6<sup>th</sup> International Conference on,

“Recent Trends in Life Sciences” (ICRTLS-2017)

29-30, December, 2017

Organized by,

Department of Botany and Research Center,  
New Arts, Commerce and Science College, Parner,  
Tal- Parner, Dist- Ahmednagar, M S, India, 414 402.

### INDEXED IN

Copernicus International, Indian Citation Index, Indian Science Abstracts, Thomson Reuters, C.A.B. International, Journal seeker, Cambridge Scientific Abstract, International Agronomy Abstract.

AJMVPS	2017 Vol. 23 (1)	ISSN 0971-6920
CONTENTS		
01. The study of rain water harvesting system in new arts commerce and science college Parner, Dist. Ahmednagar, (M. S). India. <b>Chhangarde Dattatray Sheshrao.</b>	402-404	
02. Tourism development impacts of occupational structure: a case study of Shirdi and Shani-Shingnapur Tourist Place In Ahmednagar District. <b>Mhaske Pandurang H. and Dr. Tupe Babasaheb Karbhari.</b>	405-410	
03. A clean timeless renewable energy sources in environmental protection <b>Deore V. P. and Khale A. S.</b>	411-415	
04. Benefits of probiotics to human health <b>Dr. Chetana. V. Donglikar</b>	416-420	
05. To study preparation of sugar catalyst and its use for production of biodiesel <b>Kale Sambhaji Mahipati</b>	421-423	
06. Drugs, doping and sports performance <b>Sanjay M. Gaikwad</b>	424-427	
07. Effects of short-term magnetic field exposure on germination, growth on seeds of pea ( <i>Pisum sativum</i> ), chick-pea ( <i>Cicer arietinum</i> ). <b>Ashutosh Khade and Avinash Mancharkar</b>	428-433	
08. Isolation and synthesis of Sesquiterpene ar- Himachalene from <i>Cedrus deodara</i> by heck reaction <b>T. S. Thopate* and R. S. Diggikar</b>	434-438	
09. Peanut aerobiology At Newasa Dist. Ahmednagar (M.S.) <b>C. S. Arsule</b>	439-447	
10. Role of library science in environment <b>Dr. Bhausaheb B. Shelke</b>	448-450	
11. Effect on various polluted water on vegetative growth of pomegranate crop. <b>Navale Mahesh, R.J.Sawant and M.S.Wadikar</b>	451-454	
12. Enzymatic antioxidant defence mechanism of sorghum under water stress <b>Ravindra Deshmukh</b>	455-463	
13. Synthesis and characterization of aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ) nanoparticles and its application in malachite green AZO dye Decolorization <b>V.P. Dhawale*, V. B. Khobragade, K.C. Mohite and S. D. Kulkarni</b>	464-471	
14. Study of acute toxicity of inorganic fertilizers urea, potassium sulphate and npk on fresh water fish <i>Clarias batrachus</i> <b>Bhalsing D. G. and Deokar P. V.</b>	472-481	



FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

448

### ROLE OF LIBRARY SCIENCE IN ENVIRONMENT

DR. BHAUSAHEB B. SHELKE

**Librarian**

New Arts Commerce and Science College,  
Parner, Dist – Ahmednagar (M.S)  
bhausahelshelke@gmail.com

#### ABSTRACT

Environment is the source of life on earth. It determines and directs the existence, growth and development of mankind and all its activities. But at present world is facing multifarious problems of environmental degradation. It is due to technological and industrial development as well as an explosive growth of population which has caused enormous strain on environmental resources. There is thus an urgent need for maintaining a balance between the capacity of environment and the quantum of sustainable utilization. It is really possible, but when? By understanding environment in its totality and the principle of its scientific management.

Figure: 00

References: 07

Table:00

KEY WORDS: Remote sensing, GIS, NMIS, ENVIS.

#### Environment- (Definition):

Environment means the sum of total condition which surrounds man at a given point in space and time.

The term of "Environment" was introduced in ecology by biologist Jacob Van Uerkul (1864-1944). "Environ" means "Surroundings" and "meant" means "the auctioning".

Environmental studies are concentrated on temporal change in the occurrence, a balance and activities of organisms. (seasonal, annual, seasonal and geological studies).

Environmental science is the relatively interdisciplinary study. It examines the interaction between mankind and the environment, with specific reference to the problem resulting from the emergence of the human activity.

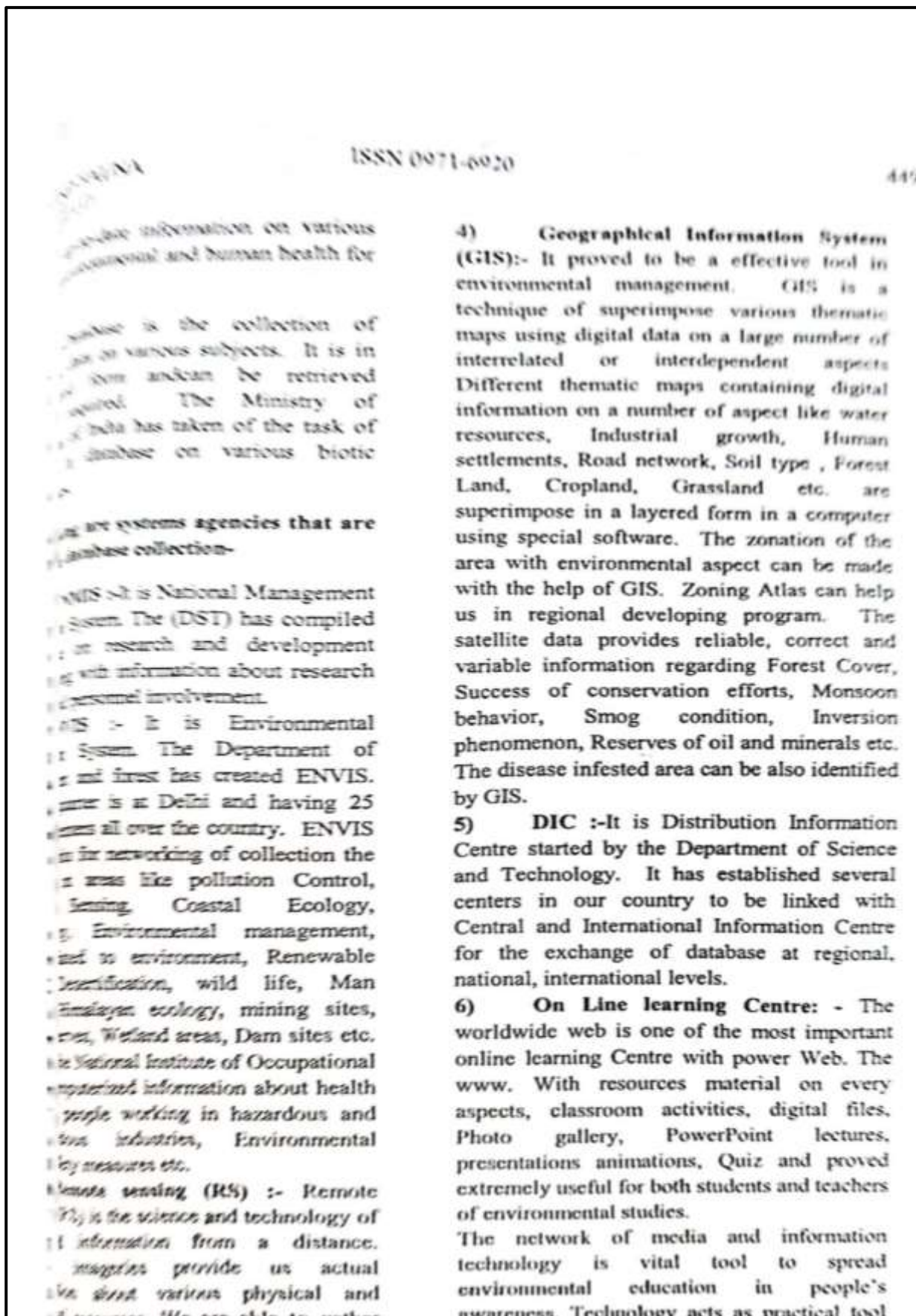
Environmental studies include the integrated application of life science (Genetics, Physiology, Ecology) Chemical sciences (Chemistry, Biotechnology) Physical sciences, sociology, psychology, Library and Information Science). Any multidisciplinary science describes a quantitative extension of

approaches to the problems which commonly occur within a given area.

Environmental studies deal with application of knowledge from different science for managing the environment. Such studies have direct influence on survival, growth, development and reproduction of organism.

Information Technology (IT) is the most fascinating subject today. It is one of the most important resources in day-to-day life. IT provides vast information at tremendously fast speed.

Information is an important resource in all areas of life such as education, industry, commerce, health, defense. One gets information through various media i. e. newspaper, Books, Magazine, Telephone, Radio, Television, Computer, Mobile, phone etc. Internet has revolutionised the area of information technology by providing vast information instantly from all over the world. Information technology has tremendous-potential in the field of environmental education and environmental health. The internet facility, www and GIS has generated a



provide information on various environmental and human health for

is the collection of data on various subjects. It is in form and can be retrieved. The Ministry of Health has taken of the task of studies on various biotic

are systems agencies that are

NMS is National Management System. The (DST) has compiled research and development with information about research involvement.

ENVIS :- It is Environmental System. The Department of Environment has created ENVIS. It is in Delhi and having 25 offices all over the country. ENVIS is in networking of collection the areas like pollution Control, Planning, Coastal Ecology, Environmental management, and to environment, Renewable Identification, wild life, Man Environment ecology, mining sites, Wetland areas, Dam sites etc. The National Institute of Occupational Information about health people working in hazardous and industries, Environmental measures etc.

Remote sensing (RS) :- Remote is the science and technology of information from a distance. Images provide us actual view about various physical and resources. We are able to gather

4) **Geographical Information System (GIS):-** It proved to be a effective tool in environmental management. GIS is a technique of superimpose various thematic maps using digital data on a large number of interrelated or interdependent aspects. Different thematic maps containing digital information on a number of aspect like water resources, Industrial growth, Human settlements, Road network, Soil type, Forest Land, Cropland, Grassland etc. are superimpose in a layered form in a computer using special software. The zonation of the area with environmental aspect can be made with the help of GIS. Zoning Atlas can help us in regional developing program. The satellite data provides reliable, correct and variable information regarding Forest Cover, Success of conservation efforts, Monsoon behavior, Smog condition, Inversion phenomenon, Reserves of oil and minerals etc. The disease infested area can be also identified by GIS.

5) **DIC :-**It is Distribution Information Centre started by the Department of Science and Technology. It has established several centers in our country to be linked with Central and International Information Centre for the exchange of database at regional, national, international levels.

6) **On Line learning Centre:** - The worldwide web is one of the most important online learning Centre with power Web. The www. With resources material on every aspects, classroom activities, digital files, Photo gallery, PowerPoint lectures, presentations animations, Quiz and proved extremely useful for both students and teachers of environmental studies.

The network of media and information technology is vital tool to spread environmental education in people's awareness. Technology acts as practical tool

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

450

brochures exhibitions, posters, photo, shows, slide shows, films shows are effective in

distribution of information about environment.

#### Conclusion

Technology play a critical role in this process. Humans were able to rapidly create this diverse set of tools because cultural evolution allows human populations to solve problems. The world war itself stimulated development

of new technologies, Culminating in the electronic and computer revolutions. These have brought the closer together, creating a "Global Village" with new forms of social, political economic organizations, including the rise of Multinational Corporation.

#### References

1. SANTRA, S.C., Environmental Science.
2. KUMAR, S. ., Basic of Remote Sensing and GIS.
3. WIKIPEDIA.
4. AASTHANA D. K., ASTHANA MEERA, " Environment Problem and Solutions"
5. MURTHY D.B.N., " Environmental Awareness and Protections" New Delhi.,
6. PATIL, B.A., " Environmental Awareness" Sunny publication,Pune Page- 329. (2005)

9. Drugs, Doping & Sports Performance

2017, Vol. 23 (1) Special Issue

ISSN 2456-9364 (Online)  
ISSN 0971-6920 (print)

# flora and fauna

An International Research Journal of Biological Sciences



PEER REVIEWED  
UGC & DST APPROVED  
NAAS RATING : 4.55



Scientist Unique Researchers Yare Association  
Website : [www.floraandfona.org.in](http://www.floraandfona.org.in)

# FLORA AND FAUNA

An International Research Journal  
Devoted to the applied and fundamental  
Aspects of Plant and Animal Sciences  
(2017, Vol. 23(1), *Special Issue*)



## Special Issue

Of the

BCUD, SPPU, Pune, and Microbiologist Society, India,

Sponsored

6<sup>th</sup> International Conference on,

**“Recent Trends in Life Sciences” (ICRTLS-2017)**

29-30, December, 2017

Organized by,

Department of Botany and Research Center,  
New Arts, Commerce and Science College, Parner,  
Tal- Parner, Dist- Ahmednagar, M S, India, 414 402.

### INDEXED IN

Copernicus International, Indian Citation Index, Indian Science Abstracts, Thomson Reuters, C.A.B. International, Journal seeker, Cambridge Scientific Abstract, International Agronomy Abstract.

## FLORA AND FAUNA

2017 Vol. 23 (1)

ISSN 0971-6920

## CONTENTS

- |      |  |         |
|------|--|---------|
| 90.  | The study of rain water harvesting system in new arts commerce and science college<br>Parner, Dist. Ahmednagar, (M. S). India.<br><b>Ghungarde Dattatray Sheshrao.</b>   | 402-404 |
| 91.  | Tourism development impacts of occupational structure: a case study of Shirdi and<br>Shani-Shinganapur Tourist Place In Ahmednagar District.<br><b>Mhaske Pandurang H. and Dr. Tupe Babasaheb Karbhari.</b>                                  | 405-410 |
| 92.  | A clean timeless renewable energy sources in environmental protection<br><b>Deore V. P. and Khade A. S.</b>  | 411-415 |
| 93.  | Benefits of probiotics to human health<br><b>Dr. Chetana. V. Donglikar</b>   | 416-420 |
| 94.  | To study preparation of sugar catalyst and its use for production of biodiesel<br><b>Kale Sambhaji Mahipati</b>  | 421-423 |
| 95.  | Drugs, doping and sports performance<br><b>Sanjay M. Gaikwad</b>   | 424-427 |
| 96.  | Effects of short-term magnetic field exposure on germination, growth on seeds of pea<br>( <i>Pisum sativum</i> ), chick-pea ( <i>Cicer arietinum</i> ).<br><b>Ashutosh Khade and Avinash Mancharkar</b>                                      | 428-433 |
| 97.  | Isolation and synthesis of Sesquiterpene ar- Himachalene from <i>Cedrus deodara</i> by<br>heck reaction<br><b>T. S. Thopate* and R. S. Diggikar</b>  | 434-438 |
| 98.  | Peanut aerobiology At Newasa Dist. Ahmednagar (M.S.)<br><b>C. S. Arsule</b>  | 439-447 |
| 99.  | Role of library science in environment<br><b>Dr. Bhausahab B. Shelke</b>   | 448-450 |
| 100. | Effect on various polluted water on vegetative growth of pomegranate crop.<br><b>Navale Mahesh, R.J.Sawant and M.S.Wadikar</b>   | 451-454 |
| 101. | Enzymatic antioxidant defence mechanism of sorghum under water stress<br><b>Ravindra Deshmukh</b>  | 455-463 |
| 102. | Synthesis and characterization of aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ) nanoparticles and its<br>application in malachite green AZO dye Decolorization<br><b>V.P. Dhawale*, V. B. Khobragade, K.C. Mohite and S. D. Kulkarni</b> | 464-471 |
| 103. | Study of acute toxicity of inorganic fertilizers urea, potassium sulphate and npk on<br>fresh water fish <i>Clarias batrachus</i><br><b>Bhalsing D. G. and Deokar P. V.</b>  | 472-480 |

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

424

**DRUGS, DOPING AND SPORTS PERFORMANCE**  
SANJAY M. GAIKWAD

Director of Sports and Physical Education,  
New Arts, Commerce & Science College, Parner, Dist-Ahmednagar,  
Pin – 414302 ( M.S.)

**ABSTRACT**

Today doping refers a global problem in the field of sports. All federations and IOC (International Olympic Committee) tries from last five decades to have genuine solution over this problem with the help of educational programmes, and medical camps. Due to advanced development of technical gadgets new more powerful and undetectable doping methods and techniques are introduced as well as to run this drug business sophisticated network of distribution have developed. In ancient period i.e in 776 BC Greek Olympians and Roman gladiators uses mushrooms, plants, mixture of wine and herbs to enhance the performance and get recovery from pain and injuries. But observing the side effects on human body these substances and drugs are banned by IOC.

Figures:00

References: 03

Tables:00

**KEY WORDS-** Doping, WADA, NADA, IOC, Ergogenic aids,

**Introduction**

In recent years, players those who are participating at various sports and games at different levels are using many substances to increase their performance. (banned by NADA & WADA i.e. National Anti-Doping Agency & World Anti-Doping Agency). These substances have been referred to as ergogenic aids. Drugs may improve sports performance but their effects are temporary. These drugs are very harmful in the long run of life. These substances are powerful stimulant of the brain, as well as they are given in the form of intravenous injections, they can produce more sensation of both physical and mental with decreased sensibility to pain, fatigue and hunger.

**Natural remedies-** home cures with natural remedies, herbs; herbal teas and soon have always been used in the treatment of illness. Some of these products have demonstrated effects and have recognition as medicine.

Eg- Ginseng- is the best known of the traditional Chinese medicines. In China it is said to give the consumer a long and mental tonic for elderly.

The Ginseng root comes from the plant *Panax Ginsen*, which cultivated chiefly in China and Korea. The root grows slowly

and can be harvested after near about 5 to 6 years. It is approximately 2-3 cm thick and 10 -20 cm long. The lower part of the root sometimes gives the appearance of a living being. In China the root is called tu- China which means 'earth spirit'. Depending on the drying method used for the fresh drug, the final product will be either white or red.

**Russian root-** Ginseng root, having its high cost and difficulty in cultivating it, Russians thought about an indigenous plant that might prove to be a suitable alternative for ginseng. A wide range of plants were investigated like ginseng, belonged to the ivy family and in the late 1950s, the root of *Eleutherococcus Sentiosusas*, was found in animal studies to have effect similar to Ginseng.

*Eleutherococcus Sentiosusas* is a thorny bush about 2-3 m tall which grows widely large areas of eastern Siberia, China & Korea. In 1964 the root extract was launched on the market as a remedy for practically all illness and as a dietary supplement.

**Drugs** – chemical substance that excite a person mentally or physically are called drugs.

**Ergogenic Aids** - is defined as something that improves (*Ergo means More & Genic means to produce more*) physical work performance.

**Doping** – use of substance to augment artificially the performance of an athlete during, either participation or preparation.

#### Drugs used by Individuals –

1. Unemployment- there is hardly any scope of employment for youth, they see nothing but blankness and despair before them.
2. Failure & Frustration- drive them into dark wells of despair
3. Lack of Vocational Courses- vacuum so far as their failure is concerned
4. Peer Group pressure- youth succumb to peer group pressure in schools, colleges & Universities. They feel secure and reassured in the company of their peer group and have temporary solace from the ills of life.
5. Illegal sale of drugs- there is mushroom growth of chemist shops which have become easy outlets of illegal sales of the drugs.
6. Loss of physical labour- most of the people lost their work traditional love for physical labour. Manual work has been taken by the advanced machines in almost all the spheres of life.
7. Mismatch of routine expenditure- many families have become rich by the sale of their ancestral immovable assets and enjoy all the luxuries of life. Members of the other party become asset less and participate in antisocial activities and take the support of drugs.
8. NRIs Money- NRIs money has also led to the change in the life style of rural youth because they think that this easy money is for drugs only.
9. Responsibility of parents- parents do not have enough time for their children due to certain reason. Lack of confidence, guidance regarding future, as a result they take the drugs and society does not accept them as a good citizen.
10. Illiteracy- uneducated youth do not know how to lead a good life. They think that drugs are the only status symbol.
11. Poverty- for a poor man drugs are drugs are the only recreation, generally they

take alcohol and tobacco to get over the fatigue.

#### Drugs used by sports persons-

1. To attain honor- for excellence and improved performance they use drugs.
  2. Psychologically to get them 'up' for the competition or event.
  3. Physiologically they want to reduce fatigue.
- Following classes and methods are described by the IOC are..

#### I) Doping classes-

1. Stimulants
2. Narcotic
3. Analgesic
4. Anabolic
5. Steroids
6. Beta-blockers
7. Diuretics
8. Peptide
9. Hormones & Analogues

#### II) Doping Methods- 1. Blood Doping

2. Pharmacological, Chemical and physical manipulation

#### III) Classes of drugs subject to certain restriction

1. Alcohol
2. Marijuana
3. Local Anesthetics
4. Corticosteroids

**1. Stimulants-** CNS ( Central Nervous System)stimulants were originally introduced for medicinal purpose because of their stimulant, appetite and weight reducing properties.( American Foot Ball, Cyclists, Long Distance Runners)

#### Risks-

1. Increases aggressiveness
2. It is habit forming.
3. Increases body temperature
4. It could contribute to heart illness
5. It gives temporary disappearance to fatigue and hunger
6. Muscle tone increase, lead to loss of skills in more complex tasks.

**2. Narcotic Analgesics-** Morphine like analgesics are the most effective of all



analgesics, which is powerful anxiolytics and sedative.

Risks-

1. It is habit forming
2. Risk of respiratory arrest and death
3. **Anabolic Steroids-** Anabolic Steroids act upon the CNS. It is generally believed that 70% or more athletes are using these drugs. Majority of the championship level athletes taking part in weight and strength oriented events. Anabolic Steroids increases muscle mass and body weight. These drugs mostly used by sprinters, throwers, weight & power lifters, Tennis players, Marathon runners and other Long distance runners to gain strength and power.

Risks-

1. It affects the growth hormones of sportsman
2. Risk of Liver disorder and causes cancer.
3. It develops secondary male characteristics in female. ( increase in body musculature , voice change, menstrual irregularities)
4. Impotency
5. Decreases height and leads to stoppage long bones growth in young boys.
6. Risk of high blood pressure and kidney damage or kidney failure.
4. **Beta Blockers-**It is used to reduce tremor and palpitation. This drug is mainly used by shooters, Archers and jumpers and also used for patients suffers from hypertension, spasm of the coronary arteries, arrhythmias, prevention of recurrent heart attacks, toxic goiter and migraine.

Risks-

1. Most common side effect encountered with the use of beta blockers are.
2. Mild gastrointestinal upsets in the form of nausea, diarrhea and stomachache.
3. Mild depressive symptoms.
4. Decreases heart rate
5. Asthmatic condition certain irregularities of cardiac rhythm(severe heart attack)

5.**Diuretics-** diuretics ( water tablets) increases the excretion of sodium and potassium in the urine, which promotes an increase in passive loss of water. The term 'Sal uretic' is

occasionally used to indicate a drug that increases the excretion of salt in the urine. In sports medicine, they have three principal areas of application.

- a) To reduce localized swelling this may arise as a result of inflammation or trauma.
  - b) In compartmental syndrome
  - c) To counteract premenstrual symptoms
- Diuretics mainly used in sports to reduce weight. ( Judo, Boxing, Weight & Power Lifting, Wrestling, etc)

Risks-

1. Reduce aerobic capacity
2. Risk of cramps
3. Decreases cardiac output
4. Risk of heart attack
5. Concentration of uric acid in the blood may increases
6. Gout disease affecting small joints
6. **Peptide hormones and analogues-** since 1989, the IOC (International Olympic Committee) has classed Human Chorion Gonadotropin (HCG), adrenocorticotropin (ACTH), and human growth hormone (HGH), as doing agents, HCG can increase the production of testosterone in male subject, ACTH has been misused either intravenously or intramuscularly. HGH brings similar effects like anabolic steroids. Unethical and unsafe having several dangerous side effects so it banned by IOC.

II. 1. **Blood Doping-**blood doping ( Blood boosting or Blood transfusion) is the injection of either whole or packed red blood cells(RBCs) into the participant the day prior to competition in the hope increasing the blood volume and its oxygen carrying capacity, & thus improving endurance performance, Blood doping may be the injection of an individual's own blood which was drawn several weeks prior to reinjection. Training continuous and this apparently allows time for the body to regenerate new RBCs in which to restore the normal hemoglobin.

- Risks-
1. Hypertension
  2. More Viscosity

3. Intravascular blood clotting

4. Infection

5. Untrained physician – leads to mismatch blood transfusion.

**II. 2. Pharmacological, Chemical and physical manipulation-** in this class probenecid are related compounds are banned. Transport of organic acids across some tissue (epithelial) barriers. This is the most important in the kidney, where many drugs and drug metabolites are excreted. The effect of probenecid is twofold. It increases the blood level of many drug, which give more probenecid effect with the usual dosages (or the usual effect with a lower dosage).

Secondly, probenecid reduces the amount of trace substance (for eg. Anabolic steroids) released in the urine, thus making such substance much more difficult to detect in a urine sample.

**III. 1. Alcohol-** stimulate CNS, Small moderate doses of alcohol increases strength, muscular endurance. Alcohol brings extra load on heart, affects the liver and digestive system. It also increases urine production. It is mainly used by shooters and modern pentathlon players. IOC banned it. About performance some found decrease in performance and some found increase in performance.

**2. Marijuana-** studies have suggested that there is no difference between smoking marijuana and placebo in measurements of vital capacity expiratory flow rate and handgrip strength.

**3. Local anesthetics-** used to block the sensation of pain from any injured part of the body. (Widely used in surgical practice) also used to hide the severity injury or disease, so to avoid more seriousness. IOC has imposed certain restriction.

**4. Corticosteroids-** mainly used as anti-inflammatory drug. High doses can produce euphoria. In sports carry the risk of impaired healing of wounds and fracture. IOC banned it. During the Olympic Games, the IOC required written notification from the doctor, whenever Corticosteroids are injected locally intra articularly.

**Conclusion-** 'Behind Every Great Fortune There is Crime' in sports rising players are in search of short cut to get success, accidentally getting involved doping, which is harmful to their health as well as their carrier too. Now as a third eye NADA & WADA taking strict actions against those players who are involved in doping. If there is adequate number of testing labs, there will be check on players. Drugs and Doping reduces mentally stress, fatigue and gives relief from pain and inflammation, as well as increases artificially stamina, muscular power and endurance which is unethical in sports. Sports persons, Trainers, Coaches, Sports Association and Federation authorities should be aware and alert from the banned drugs which will be beneficial for sports culture.

#### References

1. DR. AJMER SINGH, DR. JAGDISH BAINS, DR. JAGTAR GILL, DR. R.S. BRAR, DR. NIRMALGIT RATHEE,- Essentials of Physical Education, Kalyani Publishers, B-1/292, Rajinder Nagar, Ludhiana-141 008
2. BENGT O. ERIKSSON, TORE MILLSTRAND, LASS PETERSON, PER RENSTORM, NILS SVEDMYR- Sports Medicine Health & Medication- Guinness Pub. Ltd, 33 London Road.
3. DR. P. K. PANDE – Know How Sports Medicine- AP Publications- 19 Blocks Market, Chow Tanda, Jalandhar- 144008.

## 10. Effect of short term magnetic field on germination at growth on seeds of pea

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

428

**EFFECTS OF SHORT-TERM MAGNETIC FIELD EXPOSURE ON GERMINATION, GROWTH ON SEEDS OF PEA (*PISUM SATIVUM*), CHICK-PEA (*CICER ARIETINUM*).**

ASHUTOSH KHADE AND AVINASH MANCHARKAR

Department of Physics,  
New Arts, Commerce & Science College, Parner,  
Ahmednagar- 414302, India

**ABSTRACT**

The Numerous studies have been carried out to investigate the effect of short-term magnetic field exposure on plants, where seedlings (4–5 days old) were continuously exposed and grown under short exposure condition. Here, we have used a novel 'short-term magnetic field exposure experimental method' where imbibed seedlings were exposed to higher gauss values ranging from 300 gauss to 0.2 Tesla for a short interval time of 10 minutes. Changing patterns in peas and chick-peas germination and growth, along with various photosynthetic and biochemical parameters were studied. Results revealed the significant inhibition of germination and growth in short-term magnetic field exposure treated seeds over control. Photosynthesis parameters such as chlorophyll content were found to be affected significantly in 5 days old seedlings exposed to short-term magnetic field exposure treatment. In order to investigate the cause of observed inhibition, we examined the  $\alpha$ -amylase activity and antioxidative enzyme activities.

$\alpha$ -amylase activity was found to be inhibited, along with the reduction of sugars necessary for germination and earlier growth in short-term magnetic field exposure. In addition, the health status was measured by leaf color, spots and the stem curvature and the death rate. The result showed the magnetism had a significant positive effect on plant growth. Plant seeds under the influence of magnetic field had higher germination rate and these plants grew taller, larger and healthier.

**Figure:** 03

**References:** 18

**Table:**00

**KEYWORDS:** Hall-probe instrument·Pisum sativum·Cicer arietinum·Chlorophyll content · Photosynthesis · Short-term magnetic field

**Introduction**

Plants have adapted themselves to the ever existing force of gravity (1 g) on earth for eons of years. Any change in the magnitude of gravity as result in magnetism therefore affects the plant growth and development. In recent years, gravity as well as magnetism driven changes in plant productivity has remained an exciting research area in the mainstream of plant physiology research. To understand the role of changing magnetism on plant behavior various systems have been developed. In most of the earlier reports, three to five days old seedlings were exposed to higher *gauss* values up to 3000 *gauss* for longer durations and effects were studied. For instance, suppression in elongation

of both epicotyls and roots as well as inhibition in lateral root growth was observed in peas centrifuged at 140 *gauss*, 370 *gauss* and 1050 *gauss* for five days continuously (Waldron and Brett 1990). The decrease in percentage germination and growth was observed in wheat exposed to basipetal magnetic field for three days at 25 °C in the dark (Wakabayashi et al. 2005b). Stem elongation in 5 mm *Arabidopsis thaliana* inflorescence stems was suppressed, while dry weight of the inflorescence stems increased, when exposed to 300 *gauss* for 24 hrs in dark at 25 °C (Tamaoki et al. 2006; Nakabayashi et al. 2006). Such approach does not provide any information about the magnetic field effect on germination. Moreover, the

duration of field exposure were considerably high ranging from 12 hrs to 21 days.

Many studies have reported a reduction in percentage germination under field exposure environment, which has been maintained for a longer duration, but none have explained the possible cause for such reduction. Also, the influence of higher *gauss* values on important aspects of photosynthesis process such as chlorophyll pigment content, net photosynthetic rate, efficiency of photosystem PSII etc. have not been reported.

This showed that the growth and yield of lettuce could be improved by treatment of its seeds before they were grown, using rectified sinusoidal non-uniform electromagnetic fields. It was observed that magnetism has effects on lettuce at the nursery, vegetative, and maturity stages, including a significant increase in root length and shoot height, a greater growth rate, and a significant increase in plant height, leaf area, and fresh mass. Positive biological effects of magnetism on sunflower and wheat seedlings weights were reported. Further data show that the magnetic field induced by the voltage of a specific waveform enhanced or inhibited mung bean growth, depending on the frequencies, which suggests that the magnetic field on plant growth may be sensitive to the waveform and frequency of the source electrical voltage. The effect of static magnetic field on plant growth has also been studied. We have found that static magnetic field accelerated germination and early growth of wheat and bean seeds, obtained similar results with chickpeas; furthermore, they found that the responses of the plant to static magnetic field varied with field strength and duration of exposure with no particular trend. However, as indicated by a literature review, weak magnetic field exhibited negative effects on plant growth, such as inhibition of primary root growth, in some cases. For instance, exposure to magnetic field inhibited early growth of radish seedlings with decrease in the weight and leaf area. An interesting result is that the biological effect of a magnetic field is different between the south and north poles, as illustrated by a study, which showed that radish

seedlings had a significant tropic response to the south pole of the magnet, but insignificant response to the North Pole. It is theorized that the south pole of the magnet enhances plant and bacterial growth by conferring energy, whereas the north pole retards their growth. Thus, it is possible to utilize the magnetic north pole against infections or tumor growths. Morphological anomalies in pollen tubes of a particular plant exposed to magnetism were observed, which raises an important question of whether magnetism can cause gene mutation and cancer. This issue is still controversial and demands more research evidence before any conclusion can be drawn.

Therefore, the aim of the present study was to analyse the effect on the germination and various physiological parameters, when seeds were exposed to short-term magnetic field. Various physiological and biochemical parameters such as germination, growth, chlorophyll content, photosynthesis, chlorophyll fluorescence as well as antioxidative response were studied. As per our knowledge such kind of work has not been carried so far.

#### Materials and Methods

**Seeds Selection and Short-term magnetic field exposure Treatment** Pea seeds (*Pisum sativum*) and chick peas (*Cicer arietinum*) were procured from the local market of Parner city (MH). They were treated with 0.5 % systemic fungicide (Uthane M-45, United Phosphorus Limited), washed thoroughly and imbibed in distilled water (D.W) for 24 hours. After imbibition these seeds were subjected to short-term magnetic field treatment viz. 1000 gauss 1500 gauss, 2000 gauss for 10 min each at 25 °C, using a Hall probe Method. Light intensity was maintained as 15  $\mu\text{E m}^{-2}\text{s}^{-1}$ . All the measurements were carried out on 5<sup>th</sup> day post sowing with emerged out shoots.

#### Estimation of Embryo Viability

Immediately after 10 min of short-term field treatment, control and treated seeds were stained with 1 % tetrazolium solution to check the embryo viability.

#### Seed Germination, Growth and Vigor Index

**Measurement:** Percentage germination, root

length, shoot length, fresh weight of shoot and root were measured for both control and short-term magnetic field treated samples on fifth day from sowing. Vigor index of the seedlings was calculated by using the relation,  
Vigour Index = Average total height of seedlings

x % seed germination

#### Enzyme Extraction and Assays

Five days post short-term magnetic field exposure, control and short-term field treated seeds without leaf blades were homogenized in ice cold 0.05 M phosphate buffer (pH 6.8) containing EDTA (0.5 mM). Each homogenate was centrifuged at 10,000 x g for 10 min at 4 °C. The supernatant was used for enzyme assays.

$\alpha$ -Amylase activity, catalase activity (CAT) and guaiacol peroxidase (GPX) activity were determined as described by Sadasivam and Manickam (2008) with some minor modifications. One unit of Amylase activity was defined as the amount of enzyme required for liberating 1 mg of maltose per min at 37 °C. Catalase activity was measured by the decrease in H<sub>2</sub>O<sub>2</sub> concentration in a reaction mixture containing 0.05 M phosphate buffer (pH 7.0), enzyme extract & H<sub>2</sub>O<sub>2</sub> at 430 nm. Guaiacol Peroxidase activity was determined as the rate of oxidation of guaiacol to tetraguaiacol that is being monitored by recording the absorbance change at 436 nm for one min. Protein concentration was determined according to using bovine serum albumin standard.

#### Biochemical Quantification of Non

##### Structural Carbohydrate Reserve:

Starch content and total reducing sugars were estimated from caryopses of five-days old seedlings raised from short-term magnetic field and control as described by Sadasivam and Manickam (2008).

#### Estimation of Chlorophyll Content

Chlorophyll was extracted from shoots of five days old seedlings raised from control and short-term magnetic field exposed seeds according to the method of (Porra et al. 1989). Absorption spectra of total chlorophyll were recorded by using UV-Visible spectrometer (Perkin Elmer lambda- 950, Singapore). Chlorophyll a, b and

total chlorophyll contents were calculated using Arnon's formula (Arnon 1949).

#### Photosynthesis and Chlorophyll Fluorescence Parameter

Photosynthesis parameters were recorded with the help of TPS-2, a portable photosynthesis system (PP systems, USA). Shoots of five days old peas seedlings were placed in the leaf cuvette (PLC4-B type, area 2.5 cm<sup>2</sup>) and photosynthesis rate (P<sub>N</sub>), transpiration rate (Evap), stomatal conductance (G<sub>s</sub>) and intracellular CO<sub>2</sub> concentration (C<sub>int</sub>) were measured at PAR intensity of 600  $\mu\text{mol m}^{-2}\text{s}^{-1}$ .

Before recording chlorophyll fluorescence, shoots were dark adapted for 15 minutes. The chlorophyll fluorescence transient was induced by applying a pulse of saturating red light (peak at 650 nm, maximum intensity > 3000  $\mu\text{mol m}^{-2}\text{s}^{-1}$ ) at the sample surface. The LEDs are focused via lenses onto the leaf surface to provide even illumination over the area of leaf exposed by the leaf clip (4 mm diameter). Fluorescence parameters defining the photochemistry of PSII such as maximum quantum efficiency of PSII photochemistry (Fv/Fm), performance index on the basis of absorption (PI) and maximal photochemical efficiency of PSII (Fv/Fo) were measured using Handy PEA (Hansatech Instruments Ltd, England).

#### Statistical Analysis

Each experiment was done in triplicates. For each measurement, the mean values and the standard error of the means (SE) were calculated. The significance of differences between control and treatment was analyzed by the Student's t-test.

#### Results and Discussion

In the present study we have analyzed the post effects of short-term magnetic field exposure on peas and chick peas germination and growth parameters. The results provide physiological and biochemical evidences suggesting that seeds are able to perceive magnetic field stress within short duration interval of 10 min, can memorize and respond to it upto five days.

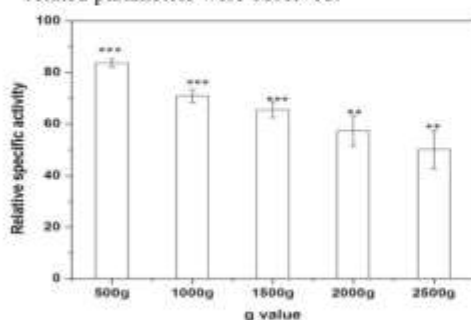


**Fig 1:** The unhealthy changes in control and experimental groups at the end of the fourth week.

*Embryo Viability, Caryopses*

*Germination, Growth and Vigour Index*

Embryo viability test was performed to rule out the possibility of physical damage to the seeds exposed to field values. Result showed that seeds were 100 % viable even after exposure to field value and have ability to grow. Figure 1 shows the growth of five days seedlings raised from control and short-term magnetic field exposed seeds. No germination was observed in 2500 gauss. Any change in the magnitude of field is thus expected to affect seed physiology. In the preliminary experiments it was found that germination and growth was resistant to the inhibitory effect of short-term magnetic field up to 400 gauss. This could be due to the relatively harder seed coat which might be shielding the effective magnetic force experienced by the embryo. It is only after 500 gauss, that the inhibitory effects on germination and growth related parameters were observed.

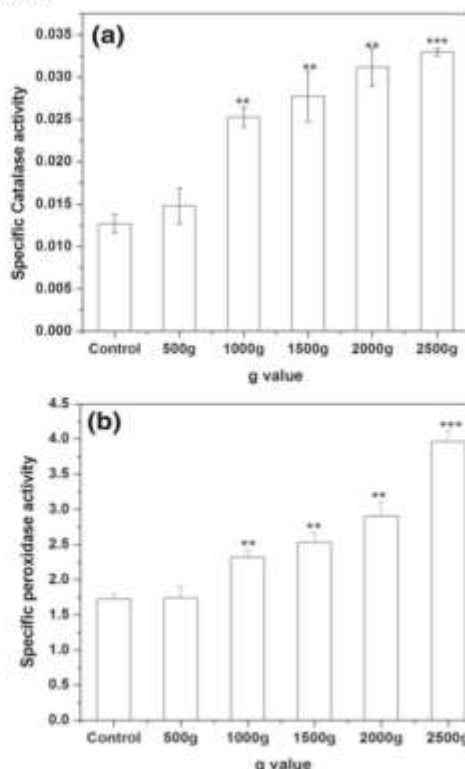


**Fig 2:** Effect of short-term magnetic field on relative  $\alpha$ -amylase activity in seeds ( $U\ g^{-1}$  of seed). Percent relative activity was calculated with respect to control

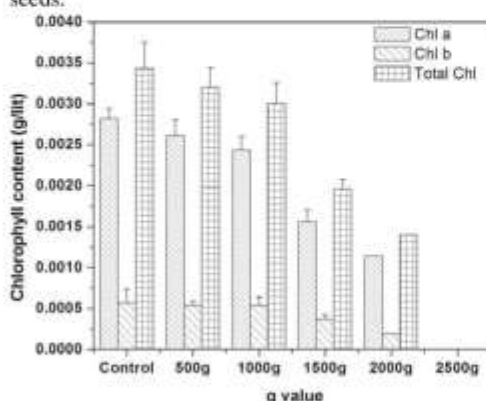
*Chlorophyll Content*

After germination, degreening, a major event occurs in seedlings, where etioplasts get converted to chloroplast. At this stage, chlorophyll is synthesized with a greater rate. Therefore, inhibition at the stage of germination can have adverse effect on the greening process of plants. Moreover, oxidative stress is responsible for the inhibition of chlorophyll biosynthesis (Aarti et al. 2007).

We therefore investigated the chlorophyll concentration in short-term magnetic field treated seedlings with control. Major photosynthetic pigments, chl a and chl b, were significantly decreased in seedlings raised from short-term magnetic field exposed. Decrease in chlorophyll content was 7 %, 14 %, 45 % and 60 % in 500 gauss, 1000 gauss, 1500 gauss and 2000 gauss, respectively as compared to the control.



**Fig. 3 a** Effect of short-term magnetic field exposure on Catalase specific activity ( $U g^{-1}$  of seed) in pea seeds. **b** Effect of short-term magnetic exposure on Guaiacol peroxidase specific activity ( $U g^{-1}$  of seed) in chick pea seeds.



**Fig. 4** Chlorophyll contents (Chl a, Chl b and total Chl, g/ltr) in shoots of 5 days old seedlings raised from control and short-term magnetic field exposed seeds.

#### Conclusion

Present study has shown for the first time that imbibed seeds could sense and respond to

magnetic field exposure given for a very short period of 10 min, without any physical damage. Further, they can retain this memory even while growing less than 1 *gauss* conditions post short-term hyper-gravity treatment. In conclusion, short-term magnetic exposure of 10 min might disrupt the  $\alpha$ -amylase activity of germinating peas, which probably restricts the supply of sugars necessary for the embryo growth and development. Further, short-term magnetic field exposure reduced chlorophyll content and thus, the photosynthetic activity of growing peas seedlings. This can be related to the enhanced antioxidative enzyme activity in short-term magnetic field exposed seeds. Though such high *gauss* values used in the experiments do not exist in nature, situations may occur where hydrostatic forces of this order may exist. Moreover, without any special modification in the instrument design of centrifuge, it is possible to study the effect of short-term magnetic field on plants. This method in itself provides a simple and novel approach to study magnetic field effects on plants. As per our knowledge, this kind of study has not been reported previously.

#### References

1. BELYAVSKAYA, N. A. (2004) Biological effects due to weak magnetic field on plants. *Adv Space Res.* **34**: 1566-74.
2. DATTILO, A.M., BRACCHINI, L., LOISELLE, S.A., OVIDI, E. and TIEZZI, A. (2005) Morphological anomalies in pollen tubes of *Actinidia deliciosa* (kiwi) exposed to 50 Hz magnetic field. *Bioelectromagnetics.* **26**: 153-6.
3. DE SOUZA, A., SUEIRO, L., GONZÁLEZ, L.M., LICEA, L., PORRAS, EP. And GILART, F. (2008) Improvement of the growth and yield of lettuce plants by non-uniform magnetic fields. *Electromagn Biol Med* **27**:173-84.
4. FISCHER, G., TAUSZ, M., KOCK, M. and GRILL, D. (2004) Effects of weak 16 3/2 Hz magnetic fields on growth parameters of young sunflower and wheat seedlings. *Bioelectromagnetics;* **25**:638-41.
5. HUANG, H.H. and WANG, S. R. (2008) The effects of inverter magnetic fields on early seed germination of mung beans. *Bioelectromagnetics* **29**:649-57.
6. VASHISTH, A. and NAGARAJAN, S. (2008) Exposure of seeds to static magnetic field enhances germination and early growth characteristics in chickpea (*Cicer arietinum* L.). *Bioelectromagnetics* **29**: 571-8.
7. AARTI, D., TANAKA, R., ITO, H. and TANAKA, A.: High light inhibits chloro-phyll biosynthesis at the level of 5-aminolevulinate synthesis during de-etiolation in cucumber (*Cucumis sativus*) cotyledons. *Photochem. Photobiol.* **83**, 171–176 (2007)

FLORA AND FAUNA  
2017 Vol. 23 (1)

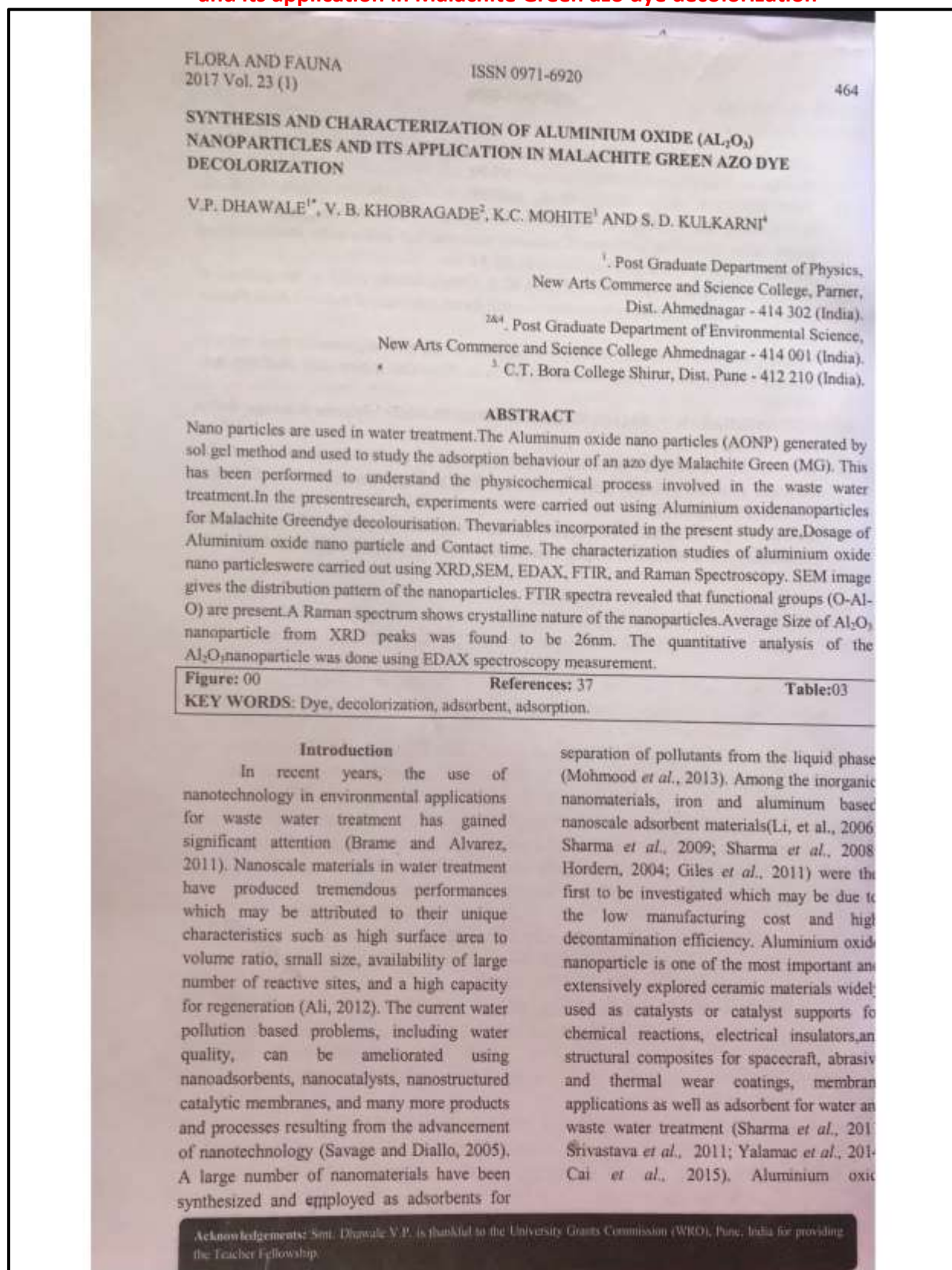
ISSN 0971-6920

433

8. ARNON, D.I.: Copper enzymes in isolated chloroplasts Polyphenoloxidase in *Beta vulgaris*. *Plant Physiol.* **24**(1), 1–15 (1949)
9. BARJAKTAROVIC, Z., NORDHEIM, A., LAMKEMEYER, T., FLADERER, C., MADLUNG, J., HAMPP, R.: Time-course of changes in protein amounts of specific proteins upon exposure to hyper-g, 2-D clinorotation and random positioning of *Arabidopsis* cell cultures. *J. Exp. Bot.* **58**(15–16), 4357–4363 (2007)
10. BECK, E., ZIEGLER, P.: Biosynthesis and degradation of starch in higher plants. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* **40**, 95–117 (1989)
11. JAGTAP, S.S., VIDYASAGAR, P.B.: Effects of high gravity (g) values on growth and chlorophyll content in wheat. *Int. J. Int. Biol. BBB10 special issue* **9**(3), 127–129 (2010)
12. KOIZUMI, T., SAKAKI, T., USUI, S., SOGA, K., WAKABAYASHI, K., HOSON, T.: Changes in membrane lipid composition in azuki bean epicotyls under hypergravity conditions: Possible role of membrane sterols in gravity resistance. *Adv. Space Res.* **39**(7), 1198–1203 (2007)
13. RAJJOU, L., DUVAL, M., GALLARDO, K., CATUSSE, J., BALLY, J., JOB, C., JOB, D.: Seed germination and vigor. *Annu. Rev. of Plant Biol.* **63**, 507–33 (2012)
14. SADASIVAM, S., MANICKAM, A.: *Biochemical Methods*, 3rd Edition. New Age International Publishers, New Delhi, India (2008)
15. SANTOS, M.A.D., RUSSAMANO, T., FACHEL, F.N.S., CASSEL, E., ASTARITA, L.V.: The effect of hypergravity on the germination and growth of *Eruca sativa* Mill. *TOJST* **2**(3), 57–60 (2012)
16. TAMAOKI, D., KARAHARA, I., SCHREIBER, L., WAKASUGI, T., YAMADA, K., KAMISAKA, S.: Effects of hypergravity conditions on elongation growth and lignin formation in the inflorescence stem of *Arabidopsis thaliana*. *J Plant Res.* **119**(2), 79–84 (2006)
17. WAKABAYASHI, K., SOGA, K., KAMISAKA, S., HOSON, T.: Increase in the level of arabinoxylan-hydroxycinnamate network in cell walls of wheat coleoptiles grown under continuous hypergravity conditions. *Physiol. Plant.* **125**(1), 127–134 (2005b)
18. P. B. VIDYASAGAR, S. S. JAGTAP, A. A. NIRHALI, B. SANTOSH and V. HASE, in *Photo-synthesis. Energy from the Sun: Proc. 14th Int. Congr. on Photosynthesis*, eds. J. F. Allen, E. Gantt, J. H. Golbeck and B. Osmond (Springer, 2008), pp. 1597–1600.



## 11. Synthesis and characterization of aluminium oxide (Al<sub>2</sub>O<sub>3</sub>) nanoparticles and its application in Malachite Green azo dye decolorization



nanoparticle is reported to exist in several phases (Shek, 2017).

It is well recognized that the presence of dyes in aquatic environment can be most undesirable. Dyes are water soluble in nature and most suited in their action in aqueous medium. Industrial waste water is one of the major environmental problem now days due to increasing environmental awareness. Many industries like plastics, pharmaceuticals, textiles, leather, cosmetics, paints and varnishes etc. use dyes to colour their final products. Consequently, the waste water effluents are highly coloured and the disposal of this waste in water bodies causes damage to aquatic flora and fauna. These dyes affect photosynthetic activities of aquatic flora due to reduced penetration of sun light. Most of the dyes are xenobiotic and non-biodegradable in nature (Khosala, 2015). The conventional waste water treatment technologies depend upon removal of biological oxygen demand but reduction of BOD is ineffective against colour removal. The combination of technologies like adsorption and dye degradation can provide the solution to the problem (Chatterjee *et al.*, 2001). Adsorption is a conventional technology for dye removal with very high efficiency and simple process. Activated carbon is very efficient adsorbent and very efficient for cationic and anionic dyes. The adsorbent use of carbon in wastewater treatment is impractical due to competitive adsorption of other organic molecules along with dye molecules, the carbon as adsorbent can be thus used in end of treatment steps exclusively for colour removal. The non-conventional adsorbents are in application due to their easy availability. Adsorption technology is non-destructive technology involving phase change from aqueous phase to solid surface immobilization. Some techniques involving adsorption with catalytic degradation of dye seems to be more lucrative removed aromatic compounds on single walled carbon nanotubes (Chen *et al.*, 2008). The application of nanoparticles as adsorbents has come up as an interesting area

of research because of their small particle size and high surface area. The active sites are also more and capable of interacting with pollutant species (Khaled *et al.*, 1999). The application of AONP has been evaluated for the removal of hexavalent chromium from aqueous medium (Sharma *et al.*, 2010). A previous study indicates that adsorption capacity remains unchanged after regeneration of nano sized adsorbent (Khosla, 2013).

Malachite Green (MG) is one of the most commonly used dyes in various industries such as textiles, printing and rubber (Bautista, 2008; Xu *et al.*, 2011; Wei *et al.*, 2013). The effluents from these industries are a major source of environmental pollution. Not only water bodies become coloured, but also environmental damage occurs to living organisms by decreasing the dissolved oxygen capacity of water and blocking the sunlight, thereby disturbing the natural growth activity of aquatic life. Therefore, the treatment of effluents containing dyes is one of the challenging problems in the field of environmental chemistry (Chitha *et al.*, 2013; Chatterjee *et al.*, 2013; Etaiw, and Saleh, 2014; Le *et al.*, 2012; Impart *et al.*, 2013).

In the present study Aluminium oxide nano particles (AONP) prepared by sol-gel method are used for adsorptive removal of azo dye Malachite Green (MG) from aqueous medium using batch adsorption technique.

#### Experimental

##### Synthesis of aluminium oxide nanoparticles

The nanoparticles were prepared by the sol-gel technology. All chemicals used were analytical reagents. Aluminium chloride,  $AlCl_3$  (Molychem, Mumbai), 25%  $NH_3$  solution (Qualigen fine chemicals, Mumbai) and polyvinyl alcohol (Modern industries, Nashik.) were used as raw materials for the synthesis of aluminium oxide nanoparticles.

Alcoholic  $AlCl_3$  solution was prepared, followed by addition of 25% ammonia solution. The resulting solution turned to a white sol. This was followed by the addition of PVA. The sol was stirred

Scanned with CamScanner



Scanned with CamScanner

As given as shown in above Figures 1 and figures 2. It has been observed that as the amount of adsorbent  $Al_2O_3$  was increased, the rate of photo degradation of dye increases. This may be due to the fact that as the amount of adsorbent was increases the number of active sites on the adsorbent surface and the exposed surface area also increases, concentration of the adsorbent increases above the optimum value, the degradation rate decreases due to the interception of the light by the suspension (Byrappa *et al.*, 2006; Chakrabarti and Dutta, 2004). And also excess adsorbent prevent the illumination,  $\cdot OH$  radical, a primary oxidant in the adsorbent catalytic system decreased and the efficiency of the degradation reduced accordingly (Sun *et al.*, 2008). Furthermore, the increase of adsorbent concentration beyond the optimum may result in the agglomeration of adsorbent particles, hence more adsorbent surface become unavailable for photo adsorption, and degradation rate of adsorbent decreases (Huang *et al.*, 2008). Beyond a certain limit of adsorbent amount, the solution comes turbid and thus blocks

UV radiation for the reaction to proceed and therefore percentage degradation starts decreasing (Wang *et al.*, 2008; Macedo *et al.*, 2007).

**Effect of Contact Time**

The effect of contact time was investigated in the batch experiment at dye concentration 100mg/L. The results suggest that the adsorption capacity of dye sometimes increases, decreases or remains nearly constant with increasing contact time.

**Characterization**

The characterization studies of aluminium oxide nanoparticles were carried out using XRD, FTIR, and Raman Spectroscopy. Image 1 shows FTIR spectra which revealed that, there are 410.84, 420.48, 445.56, 491.85, 501.49, 588.29, 636.51, 709.80 (O-Al-O) functional groups. Image 2 of Raman spectra shows crystalline nature of the nanoparticles (Adar, 2014). XRD shows peaks at an angles  $25.67^\circ$ ,  $35.34^\circ$ ,  $37.98^\circ$ ,  $43.61^\circ$ ,  $52.85^\circ$ ,  $57.81^\circ$ ,  $61.60^\circ$ ,  $66.80^\circ$  and  $68.47^\circ$  and average size calculated from XRD peaks was 26 nm (Image3).



Image 1: FTIR of  $Al_2O_3$  nanoparticles

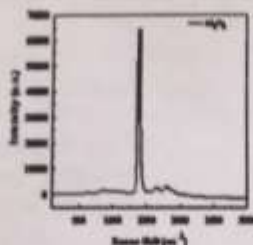


Image 2: Raman Spectra of  $Al_2O_3$  Nanoparticles

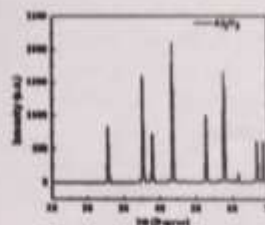


Image3: XRD of  $Al_2O_3$  Nanoparticles

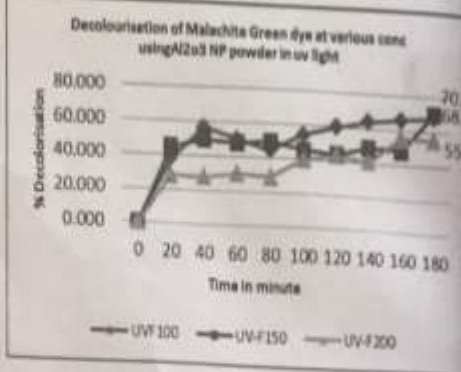
TABLE 5. Amount of dye absorbed (%qe) using  $Al_2O_3$  NP over batch Experiment

Malachite Green(MG) Dye Conc.=100mg		
Dose of adsorbent	In UV light	In Visible light
100 mg	39.707	50.070
150 mg	23.871	30.371
200 mg	16.111	23.011

%age after 3 hr	79.689	103.452
-----------------	--------	---------

**TABLE 1. %Decolourisation of Malachite**

Malachite Green(MG) Dye Conc.=100mg			
Time	UV-F100	UV-F150	UV-F200
0	0.000	0.000	0.000
20	37.947	44.973	28.227
40	56.626	49.642	27.987
60	50.147	47.875	30.154
80	44.426	49.432	28.805
100	54.270	45.225	39.692
120	59.823	43.837	43.208
140	63.778	48.969	40.800
160	66.050	48.338	55.347
180	68.069	70.130	55.010

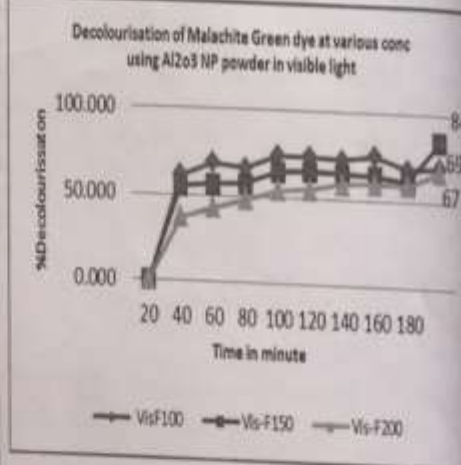


**Fig.1. %Decolourisation of Malachite Green dye in UV light**

**Green dye in UV light**

**TABLE 2. %Decolourisation of Malachite Green dye in Visible light**

Malachite Green(MG) Dye Conc.=100mg			
Time	VisF100	Vis-F150	Vis-F200
0	0.000	0.000	0.000
20	61.555	55.210	36.918
40	68.739	56.555	42.970
60	66.050	57.311	48.138
80	74.160	64.832	53.864
100	73.908	65.630	55.307
120	72.899	64.790	58.939
140	75.630	63.950	59.544
160	68.571	61.303	59.171
180	69.622	84.496	67.225



**Fig.2. %Decolourisation of Malachite Green dye in visible light**

**Conclusion**

The following logical conclusions can be drawn:

- Aluminium oxide nanoparticles ( $Al_2O_3$ ) were successfully synthesized via sol gel technique.
- FTIR spectra of Aluminium oxide nanoparticles indicated the formation of aluminium oxide nanoparticles ( $Al_2O_3$ ).

- The Crystalline nature of aluminium oxide ( $Al_2O_3$ ) nanoparticles was validated from Raman spectra analysis.
- The average amount of dye adsorbed in the batch experiment was 79.69 mg/g in presence of UV light whereas in presence of visible light 103.45mg/g.

- Maximum decolourisation was found to be 70% and 84% for 100 mg Malachite Green dye concentration using 150 mg dose of Aluminium oxide (AONP) nanoparticles.
- Maximum Decolourisation is found to be more in Visible light as compared to UV light radiation for malachite Green dye.

Thus, the above results support the recommendation that aluminium oxide nanoparticles offer new dimensions toward reliable and economically affordable water treatment of coloured effluents. The material is very promising and can be effectively used for the removal of azo dyes from the aqueous solutions.

#### References

1. BRAME, J., LI, Q. AND ALVAREZ, P.J.J. (2011). Nanotechnology enabled water treatment and reuse: emerging opportunities and challenges for developing countries. *Trends Food Sci. Technol.*, **22**: 618.
2. ALI, I. (2012). New generation adsorbents for water treatment. *Chem. Rev.*, **112**:5073.
3. SAVAGE, N. DIALLO, M.S. (2005). Nanomaterials and water purification: opportunities and challenges. *J. Nanoparticle Res.*, **7**: 331.
4. MOHMOOD, I., LOPES, C.B., LOPES, I., AHMAD, I., DUARTE, A.C., PEREIRA, E. (2013). Nanoscale materials and their use in water contaminants removal—a review, *Environ. Sci. Pollut. Res.*, **20**:1239.
5. LI, L., FAN, M., BROWN, R.C., LEEUWEN, J.V., WANG, J., WANG, W., SONG, Y., ZHANG, P. (2006). Synthesis, properties, and environmental applications of nanoscale iron-based materials: a review *Crit. Rev. Environ. Sci. Technol.*, **36**: 405.
6. SHARMA, Y.C., SRIVASTAVA, V., SINGH, V.K., KAUL, S.N., WENG, C.H. (2009). Nano-adsorbents for the removal of metallic pollutants from water and wastewater. *Environ. Tech.*, **30**: 583.
7. SHARMA, Y.C., SRIVASTAVA, V., UPADHYAY, S.N., WENG, C.H. (2008). Alumina nanoparticles for the removal of Ni(II) from aqueous solutions. *Ind. Eng. Chem. Res.*, **47**: 8095.
8. HORDERN, B.K. (2004). Chemistry of alumina, reactions in aqueous solution and its application in water treatment. *Adv. Colloid Interf. Sci.*, **110**: 19.
9. D.E. Giles, M. Mohapatra, T.B. Issa, S. Anand, P. Singh, (2011). Iron and aluminium based adsorption strategies for removing arsenic from water. *J. Environ. Manage.*, **92**: 3011.
10. SHARMA, Y.C., SRIVASTAVA, V., MUKHERJEE, A.K. (2010). Synthesis and application of nano- $\text{Al}_2\text{O}_3$  powder for the reclamation of hexavalent chromium from aqueous solutions. *J. Chem. Eng. Data*, **55**: 2390.
11. SRIVASTAVA, V., WENG, C.H., SINGH, V.K., SHARMA, Y.C. (2011). Adsorption of nickel ions from aqueous solutions by nanoalumina: kinetic, mass transfer, and equilibrium studies. *J. Chem. Eng. Data*, **56**: 1414.
12. YALAMAC, E., TRAPANI, A., AKKURT, S. (2014). Sintering and microstructural investigation of gamma-alpha alumina powders. *Eng. Sci. Technol. Int. J.*, **17**: 2.
13. CAI, W., HU, Y., YU, J., WANG, W., ZHOU, J., JARONIEC, M. (2015). Template-free synthesis of hierarchical  $\gamma\text{-Al}_2\text{O}_3$  nanostructures and their adsorption affinity toward phenol and  $\text{CO}_2$ . *RSC Adv.*, **5**: 7066.
14. SHEK, C.H., LAI, J.K.L., GU, T.S., LIN, G.M. (1997). Transformation evolution and infrared absorption spectra of amorphous and crystalline nano- $\text{Al}_2\text{O}_3$  powders. *Nano Struct. Mater.*, **8**: 605.

Scanned with CamScanner

15. KHOSALA, E. (2015). Adsorption of azo dye methyl orange over aluminum oxide nano particles. *International Journal of Basic and Applied Chemical Sciences*, **5** (4): 37-46.
16. CHATTERJEE, D., RAJ, B. AND MAHATA, A. (2001). Adsorption and photocatalytic color removal using flyash and sunlight, *Catalysis. Communications*, **2**: 113-117.
17. CHEN, J., CHEN, W. AND ZHU, D. (2008). Adsorption of non ionic aromatic compounds to single walled carbon nanotubes: Effect of aqueous solution chemistry. *Environmental Science and Technology*, **42**(19): 7225-7230.
18. KHALED, A., KAPOOR P.N. AND KLABUNDE, K.J. (1999). Nanocrystalline metal oxides as new adsorbents for air purification. *Nanostructured Materials*, **11**(4): 459-468
19. SHARMA, Y.C., SRIVASTAVA V. AND MUKHERJEE, A.K. (2010). Synthesis and application of nano  $Al_2O_3$  powder for the recalcination of hexavalent chromium from aqueous solutions. *Journal of Chemical and Engineering Data*, **55**(7): 2390-2398.
20. KHOSLA, E., KAUR, S. AND DAVE, P.N. (2013). Mechanistic study of Adsorption of Acid Orange-7 over Aluminum oxide nano particles. *Journal of Engineering*. Article ID593534, doi.org/10.1155/2013/593534.
21. BAUTISTA, P., MOHEDANO A.F., CASAS, J.A., ZAZO, J.A., RODRIGUEZ, J.J. (2008). An overview of the application of Fenton oxidation to industrial waste water treatment. *J Chem Technol Biotechnol*, **83**: 1323-1338.
22. XU, A., LI, X., YE, S., YIN, G., ZENG, Q. (2011). Catalyzed oxidative degradation of Malachite Green by in situ generated cobalt (II)-bicarbonate complexes with hydrogen peroxide. *Appl Catal B* **102**: 37-43.
23. WEI, W., GAO, P., XIE, J., ZONG, S., CUI, H., AND YUE, X. (2013). Uniform  $Cu_2Cl(OH)_2$  hierarchical microspheres: a novel adsorbent for Malachite Green adsorptive removal from aqueous solution. *J Sol State Chem*, **204**: 305-313.
24. CHITHA, A., GARARAJ, M., SANJINI, N.S., BOSE, A.C. AND VELMATHI, S. (2013). Flower-like hierarchical h- $MoO_3$ : new findings of efficient visible light driven nanophotocatalyst for Malachite Green degradation. *Catal Sci Technol*, **3**:1405-1414.
25. CHATTERJEE, D., ROTHBART, S., AND ELDIK, R. (2013). Substrate versus oxidant activation in Ru(II) (EDTA) catalyzed dye degradation. *RSC Adv*, **3**: 3606-3610.
26. ETAIW, S.E.H. AND SALEH, D.I. (2014). The organotin coordination polymer [(n-Bu<sub>3</sub>Sn)<sub>4</sub>Fe(CN)<sub>6</sub>H<sub>2</sub>O] as effective catalyst towards the oxidative degradation of Malachite Green. *Spectrochim Acta A Mol Biomol Spectrosc*, **117**: 54-60.
27. LE, H.A., LINH, L.T., CHIN, S. AND JURNG, J. (2012). Photocatalytic degradation of Malachite Green by a coMgination of  $TiO_2$ -anatase and coconut shell activated carbon. *Powder Technol*, **225**: 167-175.
28. IMPART, O., KATAFIAS, A., KITA, P., MILLS, A., PIETKIEWICZ-GRACZYK, A., AND WRZESZCZ, G. (2003). Kinetics and mechanism of a fast leuco-Malachite Green oxidation by copper (II)-halide species in acidic aqueous media. *Dalton Trans*, **2003**: 348-353.
29. VARGHESE, N., HARIHARAN, M., A. CHERIAN, B., SREENIVASAN, P.V., PAUL, J., AND ASMY ANTONY, K.A. (2014). PVA -Assisted Synthesis and Characterization of Nano  $\alpha$ -Alumina. *International Journal of Scientific and Research Publications*, **4**(10): 1-5.
30. HASSENA, H. (2016). Photocatalytic Degradation of Malachite Green by Using  $Al_2O_3/Fe_2O_3$  Nano Composite under Visible Light. *Mod Chem Appl*, **4**:176, doi:10.4172/2329-6798.1000176
31. BYRAPPA, K., SUBRAMANI, A. K., ANANDA, S., LOKANATHA, R.K.M. AND DINESH, R. (2006). Photocatalytic degradation of Rhodamine B dye using hydrothermally synthesized ZnO. *Bull Mater Sci*, **29**: 433-438.

Scanned with CamScanner

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

471

32. CHAKRABARTI, S. AND DUTTA, B.K. (2004). Photocatalytic degradation of model textile dyes in waste water using ZnO as semiconductor catalyst. *J Hazard Mater.* 112:269-278.
33. SUN, J., QIAO, L., SUN, S. AND WANG, G. (2008). Photocatalytic degradation of Orange G on nitrogen-doped TiO<sub>2</sub> catalysts under visible light and sunlight irradiation, *J Hazard Mater.* 155: 312-319.
34. HUANG, M., XU, C., WU, Z., HUANG, Y. AND LIN, J. (2008). Photocatalytic discolorization of methyl orange solution by Pt modified TiO<sub>2</sub> loaded on natural zeolite. *Dyes Pigm.* 77: 327-334.
35. WANG, C.C., LEE, C.K., LYU, M.D., AND JUANG, L.C. (2008). Photocatalytic degradation of C.I. Basic Violet 10 using TiO<sub>2</sub> catalysts supported by Y zeolite: an investigation of the effects of operational parameters. *Dyes and Pigments*, 76: 817-824.
36. MACEDO, L.C., ZAIA, D.A.M., MOORE, G.J., SANTANA, H. DE. (2007). Degradation of leather dye on TiO<sub>2</sub>: a study of applied experimental parameters on photoelectrocatalysis. *Jr. of Photochemistry and Photobiology A: Chemistry*, 185: 86-93.
37. FRAN A. (2014). Molecular spectroscopy workbench Raman spectra of metal oxide. *Spectroscopy Solution for Material Analysis*. <http://www.horiba.com>.



## 12. A Clean timeless renewable energy sources in Envi. Protection

2017-2018 V.P. DEORE

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

411

A CLEAN TIMELESS RENEWABLE ENERGY SOURCES IN ENVIRONMENTAL  
PROTECTION

DEORE V. P., KHADE A. S.

P.G.Department of Physics,  
New Arts, Commerce & Science College,  
Parner, 414302, India

## ABSTRACT

Renewable technologies are considered as clean sources of energy and optimal use of these resources minimize environmental impacts, produce minimum secondary wastes and are sustainable based on current and future economic and social societal needs. Sun is the source of all energies. The primary forms of solar energy are heat and light. Sunlight and heat are transformed and absorbed by the environment in a multitude of ways. Some of these transformations result in renewable energy flows such as biomass and wind energy. Renewable energy technologies provide an excellent opportunity for mitigation of greenhouse gas emission and reducing global warming through substituting conventional energy sources. Human beings used different mode and means to generate power from different source like coal, solar cooker, wind mill, biofuels, biomass and water etc.

Figure: 03.

References: 07

Tables: 00

**KEYWORDS:** greenhouse gases, sustainable development, renewable energy sources.

## Introduction

Renewable energy sources (RES) supply 14% of the total world energy demand. RES includes biomass, hydropower, geothermal, solar, wind and marine energies. The renewable are the primary, domestic and clean or inexhaustible energy resources. Large-scale hydropower supplies 20 percent of global electricity. Wind power in coastal and other windy regions is promising source of energy. RESs are also called alternative energy sources. The share of RESs is expected to increase very significantly (30–80% in 2100).

Sustainable development requires methods and tools to measure and compares the environmental impacts of human activities for various products. At present, consumption of fossil fuels are dramatically increasing along with improvements in the quality of life, industrialization of developing nations, an increase of the world population. It has long been recognized that this excessive fossil fuel consumption not only leads to an increase in the diminishing fossil fuel reserves, but it also has significant adverse impact on the environment, resulting in increased health risks and global climate change. Changes and environmental improvements are

becoming more politically acceptable globally, especially in developed countries. Society is slowly moving towards seeking more sustainable production methods, waste minimization, reduced air pollution from vehicles, distributed energy generation, conservation of native forests, and reduction of greenhouse gas emissions.

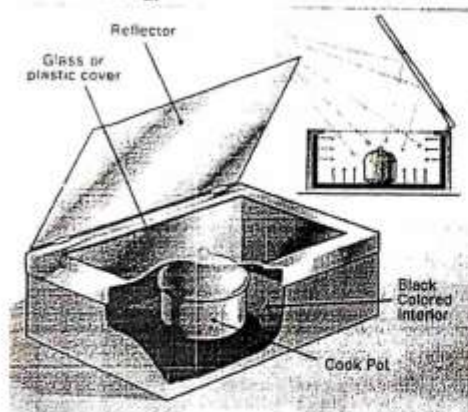
Increasing consumption of fossil fuel to meet our current energy demands alarm over the energy crisis has generated a Resurgence of interest in promoting renewable alternatives to meet the developing world's growing energy.

## Renewable energy resources

Renewable energy resources will play an important role in the world's future. The energy resources have been split into three categories: fossil fuels, renewable resources and nuclear resources. Renewable energy sources are those resources which can be used to produce energy again and again, e.g. solar energy, wind energy, biomass energy, geothermal energy, etc. and are also often called alternative sources of energy. Renewable energy sources that meet domestic energy requirements have the potential to provide energy services with zero or almost zero emissions of both air pollutants and greenhouse gases. Renewable energy system development

will make it possible to resolve the presently most crucial tasks like improving energy supply reliability and organic fuel economy; solving problems of local energy and water supply; increasing the standard of living and level of employment of the local population; ensuring sustainable development of the remote regions in the desert and mountain zones; implementation of the obligations of the countries with regard to fulfilling the international agreements relating to environmental protection. Development and implementations of renewable energy project in rural areas can create job opportunities and thus minimizing migration towards urban areas. Harvesting the renewable energy in decentralized manner is one of the options to meet the rural and small scale energy needs in a reliable, affordable and environmentally sustainable way. The main renewable energy sources like hydropower (power generation), geothermal (urban heating power generation hydrothermal, solar (solar home system, solar cooker and solar dryers), wind (power generation wind mills, water pumps), tidal system etc.

**Solar energy**

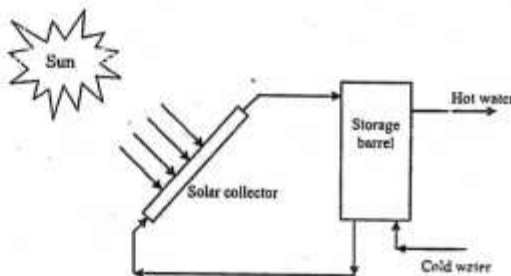


**Fig. 1. Box type solar cooker**  
**Solar thermal application**

As far as renewable energy sources are concerned solar thermal energy is the most abundant one and is available in both direct as well as indirect forms. The Sun emits energy at a rate of  $3.8 \times 10^{23}$  kW, of which, approximately  $1.8 \times 10^{14}$  kW is intercepted by

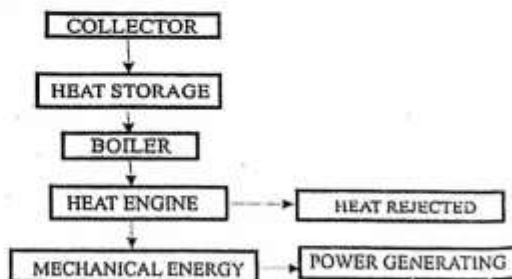
the earth. There is vast scope to utilize available solar energy for thermal applications such as cooking, water heating, crop drying, etc.

Solar cooking is the most direct and convenient application of solar energy. Solar energy is a promising option capable of being one of the leading energy sources for cooking. Various types of solar cookers are available, out of them box type solar cooker is widely used all over the world. A study was conducted in the world as a whole, and then compared the advantages and limitations of solar ovens with conventional fire-wood and electric stoves. The payback period of a common hot box type solar oven, even if used 6–8 months a year, is around 12–14 months, roughly 16.8 million tons of firewood can be saved and the emission of



**Fig. 2. A typical domestic-scale solar water heater.**

38.4 million tons of carbon dioxide per year can also be prevented. Solar water heater of domestic size, suitable to satisfy most of the hot water needs of a family of four persons, offers significant protection to the environment and should be employed whenever possible in order to achieve a



**Fig. 3. Schematic diagram of a solar thermal conversion system**

maximum flexibility, it should be used in conjunction with other methods of power generation to ensure continuity. Wind energy potential studies show that the world-wide wind resources are abundant. The world-wide potential for wind energy is estimated to be 26,000 TWh/yr, while a capacity of 9000 TWh/yr may be utilized due to economical and other reasons.

Wind energy for electricity production today is a mature, competitive, and virtually pollution-free technology widely used in many areas of the world. Wind technology converts the energy available in wind to electricity or mechanical power through the use of wind turbines. The function of a wind turbine is to convert the motion of the wind into rotational energy that can be used to drive a generator. Wind turbines capture the power from the wind by means of aerodynamically designed blades and convert it into rotating mechanical power. Wind turbine blades use airfoils to develop mechanical power.

In the power-starved developing countries, wind power is the viable source of electricity, which can be installed and transmitted very rapidly, even in remote, inaccessible and hilly areas. Electricity generation from wind never depletes and never increases in price. The electricity produced by these systems could save several billion barrels of oil and avoid many million tons of carbon and other emissions.

#### Hydrogen as fuel

Hydrogen has fascinated generations of people for centuries, including visionaries like Jules Verne. Hydrogen is expected to play a key role in the world's energy future by replacing fossil fuels. Hydrogen is gaining increasing attention as an encouraging future energy. Its conversion to heat or power is simple and clean. When burnt with oxygen, hydrogen generates no pollutants, only water, which can return to nature. However, hydrogen, the most common chemical element on the planet, does not exist in nature in its elemental form. It has to be separated from chemical compounds, by electrolysis from water or by chemical processes from hydrocarbons or other hydrogen carriers. The electricity for the electrolysis may come

eventually from clean renewable sources such as solar radiation, kinetic energy of wind and water, or geothermal heat. Therefore, hydrogen may become an important link between renewable physical energy and chemical energy carriers.

Most  $H_2$  is currently produced from nonrenewable sources such as oil, natural gas, and coal. Thermo chemical conversion processes such as pyrolysis and gasification of biomass have considerable potential for producing renewable hydrogen, which is beneficial to exploit biomass resources, to develop a highly efficient clean way for large-scale hydrogen production, and to lessen dependence on insecure fossil energy sources.

#### Conclusion

A comprehensive literature survey of major renewable energy gadgets for domestic and industrial applications such as solar water heaters, solar cookers, dryers, wind energy, biogas technology, biomass gasifiers, improved cook stoves and biodiesel was made. The scope of  $CO_2$  mitigation for clean and sustainable development. The use of solar drying of agricultural produce has good potential for energy conservation in developing nations. Biodiesel from non-edible vegetable oil reduces carbon dioxide emissions and petroleum consumption when used in place of conventional diesel. Biodiesel is technically competitive with or offer technical advantages compared to conventional petroleum diesel fuel. The presence of oxygen in biodiesel improves combustion and, therefore, reduces hydrocarbon, carbon monoxide, and particulate emissions; oxygenated fuels also tend to increase nitrogen oxide emissions. Wind energy also present good potential in minimization of greenhouse gases where wind potential is available.

The application of biomass gasifier at small scale industries is found suitable and it save considerable amount of conventional fuel. The improved cook stoves provide better kitchen environment to rural women and improve their health standards. At the same time it also reduces fuel collection burden for them.

Sustainable future. It is estimated that a domestic solar water heating system of 100 l per day capacity can mitigate around 1237 kg of CO<sub>2</sub> emissions in a year at 50% capacity utilization and in hot and sunny region it is about 1410.5 kg. A schematic of solar water heater is illustrated in Fig. 3

Solar-drying technology offers an alternative which can process the vegetables and fruits in clean, hygienic and sanitary conditions to national and international standards with zero energy costs. It saves energy, time, occupies less area, improves product quality,

#### Solar thermal power

Solar energy is a very important energy source because of its advantages. There are many remote areas in the world where electricity is not available, but solar irradiation is plentiful, thus the utilization of solar energy to produce electricity in these areas is quite possible. Solar thermal electricity power system is a device which utilizes the solar radiation for the generation of electricity through the solar thermal conversion; basically collected solar energy is converted to electricity through the use of some sort of heat to electricity conversion device as shown.

The major component of any solar thermal system is the solar collector. Solar energy collectors are special kind of heat exchangers that transform solar radiation energy to internal energy of the transport medium. A historical introduction into the use of solar energy was attempted followed by a description of the various types of collectors including flat-plate, compound parabolic, evacuated tube, parabolic trough, Fresnel lens, parabolic dish, and Heliostat field collectors. Electricity production cost through solar energy is quite higher than that of conventional power station.

#### Solar photovoltaic system

Electrical energy is the pivot of all developmental efforts in both the developed and the developing nations because conventional energy sources are finite and fast depleting. In the last decades, energy related problems are becoming more and more important and involve the ideal use of resources, the environmental impact due to the emission of pollutants and the consumption of conventional energy resources,

Direct solar energy conversion to electricity is conventionally done using photovoltaic cells, which makes use of the photovoltaic (PV) effect. PV effect depends on interaction of photons, with energy equal to, or more than the band-gap of PV materials. Some of the losses due to the band-gap limitations are avoided by cascading semiconductors of different band-gaps. PV modules generate electricity directly from light without emissions, noise, or vibration. Sunlight is free but power generation cost is exceptionally high, although prices are starting to come down. Solar energy has low energy density: PV modules require a large surface area for small amounts of energy generation. The primary component in grid connected PV systems is the inverter, it convert DC power produced by PV array into AC power consistent with the voltage and power quality requirement of the utility grid as illustrated.

Silicon solar cells are perhaps the simplest and most widely used for space and terrestrial applications. The PV system is promising source of electricity generation for energy resource saving and CO<sub>2</sub> emission reduction, even if current technologies are applied. Further the development in efficiency of solar cells, amount of material used in the solar cell and the system design for maximum use of recycled material will reduce the energy requirement and greenhouse gas emissions.

#### Wind energy

Of the renewable energy technologies applied to electricity generation, wind energy ranks second only to hydroelectric in terms of installed capacity and is experiencing rapid growth. India is one of the most promising countries for wind power development in the world. Expansion of wind energy installed capacity is poised to play a key role in climate change mitigation. However, wind energy is also susceptible to global climate change. Some changes associated with climate evolution will most likely benefit the wind energy industry while other changes may negatively impact wind energy developments, with such 'gains and losses' depending on the region under consideration. Wind power may prove practical for small power needs in isolated sites, but it

## References

1. WENTZEL, M. AND POURIS, A. (2007). The development impact of solar cookers: a review of solar cooking impact research in South Africa. *Energy Policy*. 35(3):1909-19.
2. NANDWANI, S. S. (1996). Solar cookers cheap technology with high ecological benefits. *Ecological Economics*;17:73-81
3. KUMAR, A. AND KANDPAL, T. C. (2007). CO<sub>2</sub> emissions mitigation potential of some renewable energy technologies in India. *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*. 29(13):1203-14.
4. JYOTIRMAY, M., KUMAR, N.K. AND WAGNER, H.J. (2002). Energy and environmental correlation for renewable energy systems in India. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects* 24 (1): 19-26.
5. SHARMA, A. AND CHEN CR, LAN NV. (2008). Solar-energy drying systems: a review. *Renew-able and Sustainable Energy Reviews*. 13(6-7):1185-210.
6. PIACENTINI, R. D. AND MUJUMDAR A. S. "Climate change and drying of agricultural products." *Drying Technology* 2009; 27(5):629-35.
7. Kumar A, Kandpal TC. Solar drying and CO<sub>2</sub> emissions mitigation: potential for selected cash crops in India. *Solar Energy* 2005; 78:321-9.

### 13. Correlation Coefficient of Bore Well Water Samples from Drought Prone area of Maharashtra India

<i>ejbps</i> , 2017, Volume 4, Issue 11, 596-599.	Research Article	SJIF Impact Factor 4.382
	<b>EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES</b> <a href="http://www.ejbps.com">http://www.ejbps.com</a>	ISSN 2349-8870 Volume: 4 Issue: 11 596-599 Year: 2017
<b>CORRELATION COEFFICIENT OF BORE WELL WATER SAMPLES FROM DROUGHT PRONE AREA OF MAHARASHTRA INDIA</b>		
<b>Dhawale Vijaya Pandurang<sup>*1</sup>, Sahadeo Kondaji Aber<sup>2</sup> and Satish Dhondiba Kulkarni<sup>3</sup></b>		
<sup>1</sup> Post Graduate Department of Physics, New Arts, Commerce and Science College Parner, Dist. Ahmednagar – 414 302 (MS) India.		
<sup>2</sup> Post Graduate Department of Botany, New Arts, Commerce and Science College Parner, Dist. Ahmednagar – 414 302 (MS) India.		
<sup>3</sup> Post Graduate Department of Environmental Science, New Arts, Commerce and Science College Ahmednagar – 414 001 (MS) India.		
*Corresponding Author: Dhawale Vijaya Pandurang Post Graduate Department of Physics, New Arts, Commerce and Science College Parner, Dist. Ahmednagar – 414 302 (MS) India.		
Article Received on 15/09/2017	Article Revised on 06/10/2017	Article Accepted on 27/10/2017
<b>ABSTRACT</b> A detailed study was conducted to evaluate the bore well water quality from a drought prone area of Maharashtra (Parner Tahsil, Dist. Ahmednagar) to evaluate the ground water quality. Groundwater samples from bore wells of thirteen sampling stations were analyzed for different physico-chemical parameters. The analytical results shows higher concentration of electrical conductivity, alkalinity and hardness at some sampling stations indicate signs of deterioration but values of pH, total dissolved solids, chloride, calcium, magnesium, sulphate and sodium are within permissible limit as per WHO standards. The correlation co-efficient has been reckoned for the water quality parameters have been obtained which can be used for rapid monitoring of water quality parameters. SAR and % Sodium indicated that ground water is safe and excellent to good for irrigation.		
<b>KEYWORDS:</b> Bore well water quality, Physico-chemical parameters, Correlation co- efficient, Drought prone area.		
<b>INTRODUCTION</b> Ground water is one of the earth's most important resources. It is also adversely affected both qualitatively and quantitatively by all kinds of human activities. The fresh water is contaminated by inorganic and organic substances such as dissolved solids, metals, detergents, pesticides etc. The quantity of utilizable water decreases due to over exploitation and also by pollution. This is a major environmental problem.  During the last few decades, disposal without proper treatment of sewage wastes from urban areas and of effluents from industries, excess use of chemical fertilizers and pesticides in agriculture has been the cause of deterioration in the quality of ground water.  Industrialisation brings with it the attendant problem of waste disposal. The effluents discharged from industries variously introduce into ground water undesirable. Colour, odour and taste, organic matter and dissolved salts, which may include arsenic, cadmium and cyanine, in toxic concentrations.  Ramanaiyah <i>et al.</i> (2006) monitored fluoride concentration in ground water in eight villages of	Prakasham district and their correlation with physico-chemical parameters. Ghandour <i>et al.</i> (1985) studied the distribution of carbonates, bicarbonates, and pH values of ground water of the Nile Delta region, Egypt. Prajapati and Mathur (2005) analysed statistically the ground water from Sheopurkalan (Madhya Pradesh). Durgude (1999) worked on analysis of soil, water and plants. Raghunath (1968) interpreted on the composition of ground water and chemical reactions with the soil. Nikumbh (1997), Pawar and Nikumbh (1999) studied geochemistry of ground water trace elements from Nashik district.  Correlation coefficient of various parameters give an idea of the bearing that a single parameter analyzed has other parameters. These correlation coefficient values can be used in estimating the values of other parameters at the particular place without actually measuring them (Mishra <i>et al.</i> , 2003). The specific objective of this study are (1) find out the suitability of groundwater for irrigation and drinking purposes and (2) establish significant correlation amongst various water quality parameters.	
<a href="http://www.ejbps.com">www.ejbps.com</a>		596

**MATERIALS AND METHODS**

The Ahmednagar district is located between 18° 49' 40" N, and 19° 21' 13" N. Latitude and 74° 10' 22" E. and 74° 38' 34" E. Longitude in the western part of Maharashtra State. The samples were analyzed for physical parameters pH, electrical conductivity (EC), temperature, total dissolved solids (TDS) (using water quality analyzer) and chemical parameters such as alkalinity, hardness, chlorides, calcium, magnesium (using titrimetric method), phosphate, sulphate (using spectrophotometer) and sodium and potassium (using flame photometer). Analytical techniques as described in Trivedi and Goel (1986) are adopted for physico-chemical analysis. As there is some inter-dependence between the physico-chemical parameters, they may be related by the method of least square principle. All the results are compared with standard limits recommended by APHA-AWWA (1995) and World Health Organization (WHO, 1983).

**Correlation**

The relationship between the two variables is such that a change in one variable results in a change in the other variable is known as correlation. There are three kinds of correlations: Positive, zero and negative correlations. The equation for the correlation coefficient is,

$$r_{xy} = \frac{Cov(X, Y)}{\sigma_x \cdot \sigma_y}$$

Where,  $-1 \leq r_{xy} \leq 1$

$$Cov(x, y) = \frac{1}{N} \sum_{i=1}^N (X_i - \mu_x)(Y_i - \mu_y)$$

**T -Test**

Verification of significance of correlation coefficient is given by t- test. Correlation coefficient (r) gives a measure of the degree of relationship between the two variables of a sample.

The formula of t- test is,

$$t = \frac{r\sqrt{N-2}}{\sqrt{1-(r)^2}}$$

**Regression analysis**

As there is some interdependence between the physico-chemical parameters, they may be related by method of least square principle. While keeping one parameter as independent variables (X), remaining parameters are treated as dependence variables (Y). And they can be related as given below,

$$Y = AX + B$$

Where, A and B are constants.

Values of A and B can be calculated with the help of following equations,

$$A = \frac{\sum xy}{\sum x^2}$$

Where,  $x = X - \bar{X}$

Where,  $y = Y - \bar{Y}$

$$A = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

$$B = \bar{Y} - A \bar{X}$$

The degree of fitness of the equation is determined by the factor, correlation coefficient (r). From the correlation coefficient of the parameters, certain important linear relationship can be proposed between the various parameters. From the linear relationship, standard error Y of estimate is calculated (Prasad, 2004).

**RESULTS AND DISCUSSION**

The mean values of physico-chemical parameters with standard deviation (σ), %CV, variance are given in Table 1. 92.3% water samples from the study area indicates high alkaline nature of water. Electrical conductivity values of the study area shows that all the water samples except in one (1420μs/cm) are below permissible limit. Hardness concentration in 15% water samples were found to exceed the limit of potability of water (WHO, 1983). This might be due to leaching of effluents driven out by sugar factory nearby area of the sampling station.

**Table 1: Statistical parameters.**

Sr. No.	Parameter	Mean	Std. Devn.	% CV	Variance
1	Temp.	25.7	2.3	8.9	5.2
2	pH	8.6	0.6	7.1	0.4
3	EC	868.8	304.9	35.1	92966.3
4	TDS	433.4	163.4	37.7	26687.6
5	Alkalinity	360.8	231.1	64.1	53425.7
6	Hardness	355.2	145.9	41.1	21274.2
7	Chlorides	99.2	69.8	70.4	4878.6
8	Ca <sup>++</sup>	83.0	43.2	52.1	1867.0
9	Mg <sup>++</sup>	37.6	22.0	58.7	485.3
10	PO <sub>4</sub> <sup>-</sup>	0.2	0.3	140.4	0.1
11	SO <sub>4</sub> <sup>-</sup>	20.3	19.4	95.6	376.2
12	Na <sup>+</sup>	13.2	7.4	56.1	54.7
13	K <sup>+</sup>	6.0	16.6	275.7	275.8

Total dissolved solids, chlorides, calcium, magnesium, sulphate and sodium, potassium values are less than prescribed standards and is fit for drinking purposes (WHO, 2006). 30% water samples were found to exceed the limit which might be due to improper or faulty applications of irrigation water and over use of chemical fertilizers. The obtained results are in support of the

results obtained by Auti (2007). SAR and % sodium of the study area shows that ground water is excellent too good for irrigation purposes.

A strong correlation was observed between EC and TDS, EC and sulphate, TDS and sulphate, hardness and chlorides, hardness and calcium, hardness and

magnesium, chlorides and sodium and TDS and sodium. A good correlation of water samples was observed between EC and chlorides, EC and calcium, EC and sodium, TDS and chlorides, hardness and sodium, chlorides and calcium, chlorides and sulphate, chlorides and sodium, magnesium and potassium, sulphate and sodium (Table 2).

**Table 2: Correlation coefficient matrix among water quality parameters.**

Parameter	Temp.	pH	EC	TDS	Alkalinity	Hardness	Chlorides	Ca++	Mg++	PO4-	SO4-	Na+	K+
Temp.	1.00												
PH	0.42	1.00											
EC	-0.11	-0.04	1.00										
TDS	-0.10	0.06	<b>0.99</b>	1.00									
Alkalinity	-0.12	-0.33	0.37	0.34	1.00								
Hardness	0.14	-0.06	0.45	0.44	0.38	1.00							
Chlorides	0.05	0.10	<b>0.57</b>	<b>0.61</b>	0.40	<b>0.71</b>	1.00						
Ca++	-0.35	-0.19	<b>0.57</b>	<b>0.56</b>	0.17	<b>0.72</b>	<b>0.57</b>	1.00					
Mg++	0.53	0.19	0.13	0.13	0.38	<b>0.74</b>	0.53	0.09	1.00				
Po4-	0.21	0.36	0.25	0.18	-0.23	0.02	-0.05	0.03	0.05	1.00			
So4-	0.08	-0.12	<b>0.89</b>	<b>0.87</b>	0.44	0.35	<b>0.57</b>	0.40	0.11	0.10	1.00		
Na+	0.07	0.11	<b>0.60</b>	<b>0.66</b>	0.33	0.48	<b>0.93</b>	0.37	0.38	0.16	<b>0.64</b>	1.00	
K+	0.20	0.16	0.23	0.19	0.03	<b>0.63</b>	<b>0.60</b>	0.29	<b>0.64</b>	0.20	0.21	0.41	1.00

From the correlation coefficient of the water quality parameters, important linear relationship can be proposed between various parameters. As there is some interdependence between the physico-chemical

parameters, they may be related by the method of least square principle. Least square fitting of the relation  $Y = AX + B$  are presented in Table 3.

**Table 3: Least square fitting of the relation  $Y = AX + B$ .**

Sr. No.	Y	X	A*X	B	Std. Error of Y Estimate
1	TDS	EC	0.5283*EC	-25.55	27.18
2	Chlorides	EC	0.1316*EC	-15.15	57.17
3	Calcium	EC	0.0811*EC	12.59	37.31
4	Sulphate	EC	0.0565*EC	-28.79	5.92
5	Sodium	EC	0.0145*EC	0.56	8.91
6	Chlorides	TDS	0.2622*TDS	-14.46	55.17
7	Calcium	TDS	0.1469*TDS	19.33	58.3
8	Sulphate	TDS	0.1035*TDS	-24.58	9.5
9	Sodium	TDS	0.0299*TDS	0.22	2.71
10	Chlorides	Hardness	0.3405*hardness	-21.77	35.57
11	Calcium	Hardness	0.2138*hardness	7.05	15.88
12	Magnesium	Hardness	0.1121*hardness	-2.27	13.26
13	Potassium	Hardness	0.0715*hardness	-19.37	5.55
14	Calcium	Chlorides	0.3512*Chlorides	48.18	12.92
15	Sulphate	Chlorides	0.1594*Chlorides	4.48	49.11
16	Sodium	Chlorides	0.0985*Chlorides	3.41	29.9
17	Potassium	Chlorides	0.1432*Chlorides	0.14	14.75
18	Potassium	Magnesium	0.4846*Magnesium	0.48	12.72
19	Sodium	Sulphate	0.2458*Sulphate	8.2	5.65

Keeping one parameter as independent variable (X) and remaining parameters are treated as dependent variables (Y) from the pairs of significant variables. They can be related as  $Y = AX + B$  where A and B constants such that

A is slope of fitted line and C is the intercept of fitted line. Standard error of Y intercept was also calculated. Table 4 illustrates significance of the correlation coefficient.



Table 4: T-Test for the significance of the correlation coefficient.

Parameter	Temp.	pH	EC	TDS	Alkalinity	Hardness	Chlorides	Ca <sup>++</sup>	Mg <sup>++</sup>	PO <sub>4</sub> <sup>-</sup>	SO <sub>4</sub> <sup>-</sup>	Na <sup>+</sup>	K <sup>+</sup>
Temp.	1.00												
PH	1.52	1.00											
EC	0.36	0.12	1.00										
TDS	0.33	0.20	<b>19.66</b>	1.00									
Alkalinity	0.40	1.16	1.34	1.20	1.00								
Hardness	0.47	0.20	1.67	1.61	1.38	1.00							
Chlorides	0.18	0.35	<b>2.33</b>	<b>2.58</b>	1.43	<b>3.35</b>	1.00						
Ca <sup>++</sup>	1.26	0.64	<b>2.31</b>	<b>2.22</b>	0.59	<b>3.46</b>	<b>2.29</b>	1.00					
Mg <sup>++</sup>	2.05	0.64	0.43	0.45	1.37	<b>3.68</b>	2.05	0.29	1.00				
PO <sub>4</sub> <sup>-</sup>	0.71	1.28	0.84	0.59	0.79	0.07	0.16	0.09	0.17	1.00			
SO <sub>4</sub> <sup>-</sup>	0.27	0.39	<b>6.41</b>	<b>5.91</b>	1.64	1.23	<b>2.32</b>	1.44	0.35	0.33	1.00		
Na <sup>+</sup>	0.25	0.35	<b>2.48</b>	<b>2.92</b>	1.17	1.79	<b>8.43</b>	1.32	1.34	0.54	<b>2.80</b>	1.00	
K <sup>+</sup>	0.67	0.52	0.78	0.63	0.10	<b>2.68</b>	<b>2.50</b>	1.00	<b>2.78</b>	0.67	0.71	1.49	1.00

The correlation co-efficient has been reckoned for the water quality parameters have been obtained which can be used for rapid monitoring of water quality parameters.

**CONCLUSION**

This study was carried out to check the suitability of groundwater for irrigation and drinking purposes and establish significant correlation amongst various water quality parameters. The correlation co-efficient has been reckoned for the water quality parameters have been obtained which can be used for rapid monitoring of water quality parameters. Verification of significance of correlation coefficient is given by t- test. From the correlation coefficient of the water quality parameters, important linear relationship between 19 parameters has been proposed between various physico-chemical parameters. These parameters are related by the method of least square principle by the relation Y= AX+B.

**ACKNOWLEDGEMENT**

One of the authors (Dhawale V.P.) is thankful to University Grants Commission (WRO), Pune for providing financial support.

**REFERENCES**

1. APHA-AWWA-WPCF. Standard methods for the estimation of water and waste water (19<sup>th</sup>). New York, USA, 1995.
2. Auti BK. Impact of canal irrigation on microflora crops and water quality from Pravara canal command area, Dist. Ahmednagar. Ph.D. Thesis, Pune University, Pune, 2007.
3. Durgude AG. Morphological characterization, classification and mapping of salt affected soils of central research farm M. P. K. V. Rahuri, Ahmednagar. Ph. D. thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M. S.), 1999.
4. Ghandour MFM, Khali JB and Atta SA. Distribution of carbonates, bicarbonates and pH values in ground

water of the Nile Delta region, Egypt. Ground Water, 1985; 23(1): 35-41.

5. Mishra PC, Pradhan KC and Patel RK. Quality of water for drinking and agriculture in and around a mine in Keonjhar district, Orissa. Indian Journal of Environmental Health, 2003; 45(3): 213-220.
6. Nikumbh JD. Geochemistry of ground waters from Behdi basin, district Nashik, Maharashtra. Ph. D. Thesis, Pune University, Pune, 1997.
7. Pawar NJ and Nikumbh JD. Trace element geochemistry of groundwater from Behdi basin, Nashik district. Journal of the Geological Society of India, 1999; 54: 501-514.
8. Prajapati R and Mathur R. Statistical studies on the groundwater at the rural areas of Sheopurkalan, Madhya Pradesh. Journal of Ecotoxicology and Environmental Monitoring, 2005; 15(1): 47-54.
9. Prasad S. Elements of Biostatistics. Rastogi Publications, Meerut, India, 2004; 45-192.
10. World Health Organization. Guidelines for drinking water, Vol. I Geneva, 1983; 52-82.
11. World Health Organization. Guidelines for drinking water quality, First Addendum, 1986.
12. Raghunath R. Ground water Hydrology, McGrew Hill Publications, New Delhi, 1968.
13. Ramanaish SV, Venkata MS, Rajkumar B and Sharma PN. Monitoring of fluoride concentration in ground water of Prakasham district in India: Correlation with physico-chemical parameters. Journal of Environmental Science and Engineering, 2006; 48(2): 129-134.
14. Trivedi RK and Goel PK. Chemical and biochemical methods for water pollution studies. Environmental Publications, Karad, India, 1986; 35-96.

14. **Mycorrhizal fungal association in certain medicinal plants from Ahmednagar District, M S.**  
**Int. Res. Jr. of Biological Sciences ( Flora and Fauna) 23(1) : 229-232**

FLORA AND FAUNA  
 2017 Vol. 23 (1)

ISSN 0971-6920

229

**MYCORRHIZAL FUNGAL ASSOCIATION IN CERTAIN MEDICINAL PLANTS FROM AHMEDNAGAR DISTRICT, M.S.**

R K AHER\*

Department of Botany,  
 New Arts, Commerce and Science College, Parner,  
 Ahmednagar, M.S. India

**ABSTRACT**

Numbers of medicinal plants are on the way of extinction. Hence conservation of medicinal plants is essential. The present research work investigation was carried out to study the association of AM fungi in certain important medicinal plants growing around Ahmednagar district by determining the extent of root colonization, spore density in the rhizospheric soil. In all 23 medicinal plants which were screened for the presence of AM fungi. All the 23 medicinal plants from different families were found to be mycorrhizal. The colonization was seen in the form of mycelium, arbuscules, vesicles and chlamydo spores. The Arbuscular mycorrhizal fungi, propagules isolated from different sites were represented by three genera, namely 1 species of *Acaulospora*, 3 species of *Glomus* and 3 species of *Scutellospora*. In the present investigation maximum plant showed root colonization and the formation of vesicles. Out of 23 plants 12 plants shows mycelial colonization (70 %) and 3 plant shows formation of vesicles (66 %) and remaining plants showed colonization ranging between 30-40%. The co-relation was studied between root colonization and number of spores present in the rhizosphere soil. It has been observed that *Phyllanthusemblica* showed maximum number of spores (78/25gm of soil) followed by *Ocimum sanctum* (72/25 gm of soil). Minimum number of spores were recorded in *Rosa centifolia* (35/25gm of soil).

Figure: 00

References:13

Tables:01

**KEY WORDS:** Arbuscular mycorrhizal fungi, medicinal plants

**Introduction**

The term mycorrhiza was for the first time applied to "fungus tree associations" by German Forest Pathologist A. B. Frank in 1885. Since then we have learned that the vast majority of land plants form symbiotic associations with fungi. Arbuscularmycorrhizal fungi are one of the important components of rhizosphere ecosystem, because they play an important role in establishment of plant community and enhancing the growing plant's water and nutrient gathering ability and protecting the plant from diseases. Arbuscularmycorrhizal association is one which is exceptionally common among flowering plants. AM fungi derive reduced carbon required for their growth and metabolism. In turn they supply water and minerals especially phosphorus to the plant. Mycorrhizal colonization provides

plant additional support for nutrient uptake in stress. Mycorrhizal fungi enhance the growth of most of the plant species in various ways. Inoculated plants showed greater biomass and highest levels of phosphorus, calcium in the roots.

They also helpful to the plants in uptake of minerals such as phosphorus from the rhizosphere soil and in return they take reduced carbon which is required for their growth and development. They are also playing a critical role in influencing the nutrient cycle ( Landis FC, Fraser LH (2008), soil structure stabilization (Tisdall J M *et al*, 2008) and transfer and accumulation of organic matter (Thite R. K and Frey S. D 2006). Mycorrhizal fungi have developed a symbiotic relationship with the fibrous root system of living plants. Extramatrical network of mycorrhizal mycelium enhances nutrient

10/22, 3:57 PM

flora and fauna

# Flora and Fauna


An International Research Journal of Biological Sciences  
Journal recognised by DST New Delhi (NAAS RATING 4.53)

Login | Free Registration

Home Current Issue Archives Instructions to Authors Search About Us Online Submission

About Journal

Picture Gallery



## Instructions to Authors

### Aims & Objectives

- The international Research To provide a platform to the Scientists, Professors, Teachers, Experts and Students related with Biological Sciences for exchanging their views on NATURE and biological STRUCTURES and FUNCTIONS.
- To organize seminars, conferences, workshops etc. for encouraging close interaction among Scientists, Research Scholars, Professors and Experts.
- To disseminate the knowledge of Flora and Fauna for their improvements, conservation and management

### Focus & Scope


- The international Research Journal FLORA AND FAUNA publishes original research and review articles, short communications and letter to the Editor. The Journal covers all aspects of Biological Sciences Viz. Animal Sciences, Plant Sciences, Microbiology, Cell Biology, Biochemistry, Biophysics, Biotechnology, Applied Biology, Toxicology, Parasitology, Environmental Sciences, Medical Sciences, Veterinary Sciences, Medicine etc. The journal also publishes reports and announcements of National and International conferences, seminars, Workshops etc. Excursion reports, Discoveries, Book reviews and Advertisements are also accepted for publication.

### Publication Frequency

- FLORA AND FAUNA is published twice a year in the months of June and December.

### Peer Review Policy

- Flora and Fauna international journal of biological sciences use double blind peer review policy. It means that both the

 Feedback-Dr. A.K.Srivastav, Executive Editor,  
Flora and Fauna, "Sukh Sadan" F-3, Surya Puram,  
Sipri Bazar, Jhansi - 284003 (U.P.) India  
Phone - 0510 - 2480424, 09415030098  
E-mail : akscks@rediffmail.com  
Copyright © 2008-2022. All rights reserved.

Sitemap  
Visitor No : 477245  
Designed & Maintained by  
www.apvtechnologies.com

15. Marine ascomycetes fungi from *Avicennia marina* of Goa.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

171

MARINE ASCOMYCETES FUNGI FROM *AVICENNIA MARINA* OF GOA (INDIA)

J. B. CHOLAKE AND R. K. AHER<sup>1</sup>

New Arts, Commerce and Science College Ahmednagar,  
Dist. -Ahmednagar, M.S., India.

<sup>1</sup>New Arts, Commerce and Science College Parner,  
Dist. -Ahmednagar, Maharashtra, India.

Corresponding author e-mail: [jayacholake2@gmail.com](mailto:jayacholake2@gmail.com)

ABSTRACT

The present study deals with marine Ascomycetes fungi from *Avicennia marina* of Goa. The dead, decaying, intertidal and submerged mangrove wood samples were collected from Goa. These samples examined for colonization of marine fungi. Total 12 species of marine Ascomycetes fungi from *Avicennia marina* were encountered. These include *Aigialus grandis* Kohlm. and Schatz, *Aigialus mangrovei* Borse, *Ascocrater manglicola* Kohlm., *Corollospora intermedia* Schmidt, *Dactylosporaheliotrepha* (Kohlm. and E. Kohlm.) Hafellner, *Halomassarina thalassiae* (Kohlm. and Volkman - Kohlm.) Suetrong, et al, *Halorosellinia oceanica* (Schatz) Whalley, Jones, Hyde and Laessle, *Koralionastess* sp., *Neptunella longirostris*, (Cribb and J. W. Cribb) K. L. Pang and E. B. G. Jones, *Saccardoella rhizophorae* Hyde, *Savorella lignicola* Jones and Eaton, *Verruculinaenalia* (Kohlm.) Kohlm and Volkman-Kohlm. Out of these fungi *Verruculinaenalia* is very common fungus reported from most of the wood samples of *Avicennia marina* in Goa.

Figure: 12

References: 14

Table: 00

Keywords: Marine, Fungi, Ascomycetes, Mangrove, *Avicennia marina* and Goa.

Introduction

Goa coast is about 105 km. long and 30 to 60 km. broad, between 14° 53'57" to 15° 47'59" North latitudes and 73° 40'54" to 74° 20'11" East longitudes with a geographical area of 3702 sq. km. In Goa the summer period from March to May, the south-west monsoon season from June to September, the post monsoon, October to November and the winter December to February. The average rainfall for the Goa region as a whole which is almost continuous from June to middle of October is 2500 mm. In the hot season, temperature rises slowly from March and latter part of April and May forms the hottest period with 35°-37° C., temperatures are the lowest in January, ranging 15° - 16° C. The region on the whole is very humid being very close to the sea with the percentage of humidity varying from 70-90 along the coast and from 80-95 along the ghat zone. Mangrove forests are the 'hot spots' of biodiversity and also for marine fungi.

Mangroves are the dominant features of Indian coastline and provide niches and habitats for many marine organisms. Nandan, *et al.*, (1993), Borse, *et al.*, (1999), Borse and Tuwar (2006), Tuwar (2009), Tuwar *et al.*, (2012), Nayak, *et al.*, (2012) and Sarma and Raghukumar (2013 a, b) were studied on the marine fungi from mangroves of Goa.

Material and Methods

The 105 samples of dead and decaying mangrove (*Avicennia marina*) substrates were collected from Clova beach of Goa. All the collected samples were observed directly for the fungal fructification under microscope and incubated in plastic boxes. Incubated material was periodically examined for the occurrence of fungi. The permanent slides were prepared as per suggested by (Volkman- Kohlmeier and Kohlmeier, 1996; Kohlmeier and Kohlmeier 1972). The measurements of various parts of fungi were taken with the help of ocular micrometer and stage micrometer.

9/26/22, 3:57 PM

flora and fauna


**Flora and Fauna**

An International Research Journal of Biological Sciences  
Journal recognised by DST New Delhi (NAAS RATING 4.53)

Login | Free Registration

Home Current Issue Archives Instructions to Authors Search About Us Online Submission

About Journal  
Picture Gallery



### Instructions to Authors

#### Aims & Objectives

- The International Research To provide a platform to the Scientists, Professors, Teachers, Experts and Students related with Biological Sciences for exchanging their views on NATURE and biological STRUCTURES and FUNCTIONS.
- To organize seminars, conferences, workshops etc. for encouraging close interaction among Scientists, Research Scholars, Professors and Experts.
- To disseminate the knowledge of Flora and Fauna for their improvements, conservation and management

#### Focus & Scope


- The International Research Journal FLORA AND FAUNA publishes original research and review articles, short communications and letter to the Editor. The Journal covers all aspects of Biological Sciences Viz. Animal Sciences, Plant Sciences, Microbiology, Cell Biology, Biochemistry, Biophysics, Biotechnology, Applied Biology, Toxicology, Parasitology, Environmental Sciences, Medical Sciences, Veterinary Sciences, Medicine etc. The journal also publishes reports and announcements of National and International conferences, seminars, Workshops etc. Excursion reports, Discoveries, Book reviews and Advertisements are also accepted for publication.

#### Publication Frequency

- FLORA AND FAUNA is published twice a year in the months of June and December.

#### Peer Review Policy

- Flora and Fauna International journal of biological sciences uses double blind peer review policy. It means that both the

 **Feedback**-Dr. A.K.Srivastav, Executive Editor,  
Flora and Fauna, "Sukh Sadan" F-3, Surya Puram,  
Sipri Bazar, Jhansi - 284003 (U.P.) India  
Phone - 0510 - 2480424, 09415030098  
E-mail : [akscks@rediffmail.com](mailto:akscks@rediffmail.com)  
Copyright © 2008-2022. All rights reserved.

Sitemap  
Visitor No : 477245  
Designed & Maintained by  
[www.apvtechnologies.com](http://www.apvtechnologies.com)

## 16. Soil analysis for the cultivation of tomato from the selected localities of Parner Tehsil.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

174

**SOIL ANALYSIS FOR THE CULTIVATION OF TOMATO FROM THE SELECTED LOCALITIES OF PARNER TEHSIL**

DHUMAL.L.K.<sup>1</sup>, DR.AHER.R.K.<sup>2</sup>

1. New Arts, Commerce and Science College Ahmednagar, 414001

2. New Arts, Commerce and Science College Parner, 414302

Email: lata\_dhumal@rediffmail.com.

**ABSTRACT**

Tomato (*Lycopersicon esculantum* Mill. 'Heinz1350 VF 402') belongs to family Solanaceae. It is one of the major crops grown worldwide. For the cultivation of tomato the selection of soil is the major aspect. In present work the soil samples were collected from five different localities of Parner Tehsil. The soil samples were analyzed with respect to some physical as well as some chemical aspects like P<sup>H</sup>, Salinity, organic carbon, phosphorus, copper, potassium, iron, zinc, manganese etc. These samples were analyzed by Agriculture Department of Ahmednagar.

Figures:00

References:16

Tables:05

**KEYWORDS:** Tomato, Solanaceae, Parner, Tehsil, Soil samples, Agriculture Department etc.

**Introduction**

Soil may be defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants. Soil differs from the parent material in the morphological, physical, chemical and biological properties. Also, soils differ among themselves in some or all the properties, depending on the differences in the genetic and environmental factors. Thus some soils are red, some are black; some are deep and some are shallow; some are coarse-textured and some are fine-textured. (SMSS Technical Monograph No.19 USDA,1990). They serve in varying degree as a reservoir of nutrients and water for crops, provide mechanical anchorage and favorable tilts. The components of soils are mineral material, organic matter, water and air, the proportions of which vary and which together form a system for plant growth; hence the need to study the soils in perspective. A study of the soil profile is important from crop husbandry point of view, since it reveals the surface and the sub-surface characteristic and qualities namely, depth, texture, structure, drainage conditions and soil moisture relationship which directly affect the plant growth.

A study of soil profile supplemented by physical, chemical and biological properties of the soil will give full picture of soil fertility and productivity. Physical properties of the soil include water holding capacity, aeration, plasticity, texture, structure, density and color etc. Chemical properties refer to the mineralogical composition and the content of the type of mineral such as Kaolinite, illite and montmorillonite, base saturation, humus and organic matter content. The biological property refers to a content of extent and types of microbes in the soil which include bacteria, fungi, worms and insects. Soil analysis provides an estimate of available P, K and Mg concentrations in soil to sampling depth - in practice this is equivalent to plough or cultivation depth because of the distribution of nutrients when the land is worked. Response experiments with different crop groups have provided the relationship between crop yield and soil nutrient concentration. Normally, yields increase with increasing nutrient concentration to a maximum, beyond which there is no further benefit from additional nutrient. Below this value, which will vary with crop species, there is a yield penalty. While soil analysis is not a precise guide, the lower the value the greater the risk of poor performance. To aid interpretation of the different concentrations of individual nutrients, Index or descriptive scales are used.

Organic carbon (C) must be among the most commonly analyzed soil constituents, starting with the earliest soil investigations. Already in the nineteenth century, chemists were routinely analyzing soil C (e.g., Lawes and Gilbert 1885). Initially, these analyses were done to investigate pedogenesis and to assess soil productivity, both of which are closely linked to organic C (Gregorich et al. 1997). But more recently, scientists have been analyzing soil organic C (SOC) for another reason: to measure the net exchange of C between soil and atmosphere (Janzen 2005). Indeed, building reserves of SOC has been proposed as a way of slowing the rising atmospheric CO<sub>2</sub> concentrations caused by burning fossil fuel (Lal 2004). Tomato (*Lycopersicon esculentum* Mill.) is one of the important vegetable crops grown throughout the world and ranks next to potato in terms of the area cultivated but ranks first as a processing crop (Mohammed et al., 2013). The total estimated annual global production is over 120 million metric tons (FAO, 2007). It is one of the most widely used food crops in world vegetable economy (Chapagain & Wiersman, 2004). Compared to other vegetables used in Ghana, tomatoes are normally used in large quantities (Ellis et al., 1998). Tomatoes are also very

healthy being a good source of vitamins A and C. Tomato will grow in nearly all types of soils. A light, well drained, fertile soil high in organic matter is best for producing early, high quality fruit. Tomato grows well in a soil P<sup>H</sup> of 5.5 to 7.8.

Tomatoes will grow in a wide range of soils, as long as there is adequate drainage. Adding composted organic matter to a soil will improve its productivity, especially if the soil is very sandy or clayey. A soil test may be necessary to determine the fertility level.

**Materials and Methods**

In the present work the soil samples were collected from five different localities of Parner Tehsil.

The localities like Takali Dhokeshwar, Wasunde, Khadakwadi, Padali Terfe Kanhoor Pathar, and Hiware Korda. The samples were Rhizospheric and Non Rhizospheric at a depth of one to two cm. These samples were collected from desired localities in plastic bags, and then dried in sunlight about 2-4 days. Then transferred in trays and put in oven about 30-60°C temperature about 1-2 days. Then remove from oven and sieved by fine sieve mesh and send to the Agriculture Department for Analysis.

**Results and Discussion**

Data was analyzed with respect to some physical as well as chemical properties. The properties like P<sup>H</sup>, salinity, organic carbon, phosphorus, potassium, copper, zink, manganese etc.

**1. Locality –Takali Dhokeshwar Rhizospheric soil**

Sr. No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.92	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria, Gliricidia, Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.25	Moderate	
3	Organic carbon (%)	0.62	Moderately high	
4	Phosphorus (Kg/h)	26.74	Moderately high	
5	Potassium (Kg/h)	334.88	Lots	
6	Copper (Ppm)	2.01	Enough	
7	Iron (Ppm)	0.88	Less	During cultivation along with organic fertilizers add 10-30Kg/h ferrous sulphate (hirakus).
8	Zinc (Ppm)	0.91	Enough	
9	Manganese (Ppm)	0.98	Less	During cultivation along with organic

				fertilizers add 10- 25Kg\manganese sulphate.
--	--	--	--	--

**1. Locality –TakaliDhokeshwar Non-Rhizospheric soil**

Sr.No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.85	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds\m)	0.26	Moderate	
3	Organic carbon (%)	0.55	Moderate	
4	Phosphorus (Kg\h)	19.63	Moderate	
5	Potassium(Kg\h)	489.44	Lots	
6	Copper (Ppm)	1.49	Enough	
7	Iron (Ppm)	1.65	Less	During cultivation along with organic fertilizers add 10-30Kg\h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	1.53	Enough	
9	Manganese (Ppm)	0.15	Less	During cultivation along with organic fertilizers add 10- 25Kg\manganese sulphate.

**2. Locality Wasunde -Rhizospheric soil**

Sr.No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.85	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds\m)	0.28	Moderate	
3	Organic carbon (%)	0.66	Moderately high	
4	Phosphorus (Kg\h)	54.62	Lots	
5	Potassium(Kg\h)	364.00	Lots	
6	Copper (Ppm)	1.94	Enough	
7	Iron (Ppm)	0.76	Less	During cultivation along with organic fertilizers add 25-30Kg\h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	2.15	Enough	
9	Manganese (Ppm)	0.88	Less	During cultivation along with organic fertilizers add 10- 25Kg\manganese sulphate.

**2. Locality Wasunde – Non-Rhizospheric soil**

Sr.No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.74	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds\m)	0.26	Moderate	
3	Organic carbon (%)	0.82	Lots	
4	Phosphorus (Kg\h)	3.41	Very less	
5	Potassium(Kg\h)	240.80	Moderately high	



FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

177

6	Copper (Ppm)	2.45	Enough	
7	Iron (Ppm)	0.98	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	0.08	Less	During cultivation along with organic fertilizers add 25-30Kg/h zinc sulphate.
9	Manganese (Ppm)	2.12	Enough	

### 3. Locality-Khadakwadi-Rhizospheric soil

Sr.No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.69	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria, Gliricidia, Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.14	Moderate	
3	Organic carbon (%)	0.82	Lots	
4	Phosphorus (Kg/h)	10.53	less	
5	Potassium(Kg/h)	267.68	Lots	
6	Copper (Ppm)	1.38	Enough	
7	Iron (Ppm)	1.79	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	0.27	Less	During cultivation along with organic fertilizers add 25-30Kg/h Zinc sulphate.
9	Manganese (Ppm)	27.32	Enough	.

### 3. Locality-Khadakwadi Non-Rhizospheric soil

Sr.No	Properties	Reading	Remark	Suggestion
1	P <sup>H</sup>	7.86	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria, Gliricidia, Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.13	Moderate	
3	Organic carbon (%)	0.87	Lots	
4	Phosphorus (Kg/h)	5.69	Very less	
5	Potassium(Kg/h)	194.88	Moderate	
6	Copper (Ppm)	1.30	Enough	
7	Iron (Ppm)	1.70	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	0.17	Less	During cultivation along with organic fertilizers add 25-30Kg/h Zinc sulphate.
9	Manganese (Ppm)	10.80	Enough	.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

178

#### 4. Locality Padali Terfe Kanhoorpathar-Rhizospheric soil

Sr.No	Properties	Reading	Remark	Suggestion
1	pH	7.71	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.11	Moderate	
3	Organic carbon (%)	0.77	Moderately high	
4	Phosphorus (Kg/h)	11.66	less	
5	Potassium (Kg/h)	109.76	less	
6	Copper (Ppm)	1.40	Enough	
7	Iron (Ppm)	2.83	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	0.30	Less	During cultivation along with organic fertilizers add 25-30Kg/h Zinc sulphate.
9	Manganese (Ppm)	12.27	Enough	.

#### 4. Locality Padali Terfe Kanhoorpathar -Non Rhizospheric soil

Sr.No	Properties	Reading	Remark	Suggestion
1	pH	7.57	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.14	Moderate	
3	Organic carbon (%)	0.96	Lots	
4	Phosphorus (Kg/h)	1.99	Very less	
5	Potassium (Kg/h)	332.64	Lots	
6	Copper (Ppm)	1.61	Enough	
7	Iron (Ppm)	4.25	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus) .
8	Zinc (Ppm)	0.99	Enough	
9	Manganese (Ppm)	19.06	Enough	.

**5. Locality Hiware Korda- Rhizospheric soil**

Sr.No	Properties	Reading	Remark	Suggestion
1	p <sup>H</sup>	8.10	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.17	Moderate	
3	Organic carbon (%)	0.75	Moderately high	
4	Phosphorus (Kg/h)	13.94	less	
5	Potassium (Kg/h)	231.84	Moderately high	
6	Copper (Ppm)	1.48	Enough	
7	Iron (Ppm)	2.05	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus).
8	Zinc (Ppm)	0.30	Less	During cultivation along with organic fertilizers add 25-30Kg/h Zinc sulphate
9	Manganese (Ppm)	8.44	Enough	.

**5. Locality Hiware Korda- Non-Rhizospheric soil**

Sr.No	Properties	Reading	Remark	Suggestion
1	p <sup>H</sup>	7.91	Slightly saline	Apply organic fertilizers, Use <i>Crotalaria</i> , <i>Gliricidia</i> , <i>Sesbania</i> etc. Apply green manures
2	Salinity (ds/m)	0.25	Moderate	
3	Organic carbon (%)	0.84	Lots	
4	Phosphorus (Kg/h)	0.57	Very less	
5	Potassium (Kg/h)	231.84	Moderately high	
6	Copper (Ppm)	1.72	Enough	
7	Iron (Ppm)	2.49	Less	During cultivation along with organic fertilizers add 25-30Kg/h ferrous sulphate (hirakus).
8	Zinc (Ppm)	0.43	Less	During cultivation along with organic fertilizers add 25-30Kg/h Zinc sulphate
9	Manganese (Ppm)	11.39	Enough	.

From above result the Takali Dhokeshwar Locality was selected for further study.

**ACKNOWLEDGMENTS :** The authors are thankful to Principle of New Arts Commerce and Science College, Ahmednagar, and Head of Department of Botany, New Arts Commerce and Science College Ahmednagar for providing necessary facilities for this work. The authors are also thankful to Principle of New Arts Commerce and Science College, Parner for encouragement and support.

## REFERENCES-

1. ARNOLD, R.W., 2002. Role of soils in the 21st century. In: Lal., R. (ed)Encyclopedia of soil science. Marcel Dekker, New York. p 1353-1356.
2. BOUMA, J., 2001. The new role of soil science in a network society. *Soil Science* **166**: 874-879.
3. BOUMA, J., 2005. Soil scientists in a changing world. *Advances in Agronomy* **88**: 67-96.
4. Methods. Soil Science Society of America, Inc.,Madison, WI, 159-200.
5. MULLA, D.J. and MCBRATNEY, A.B. 2000. Soil spatial variability. In M.E. Sumner, Ed. *Handbook of Soil Science*. CRC Press, Boca Raton, FL,321-A352.
6. PENNOCK, D.J. 2004. Designing field studies in soil science. *Can. J. Soil Sci.* **84**: 1-10.
7. PETERMAN, R.M. 1990. Statistical power analysis can improve fisheries research and management.
8. *CAN. J. FISH.AQUAT. Sci.* **47**: 2-15.
9. ARNOLD, S.L. and SCHEPERS, J.S. 2004. A simple roller-mill grinding procedure for plant and soilsamples. *Commun. Soil Sci. Plant Anal.* **35**:537-545.
10. BRICKLEMYER, R.S., MILLER, P.R., PAUSTIAN, K., KECK, T., NIELSEN, G.A., and ANTLE, J.M. 2005. Soil organic carbon variability and sampling optimization in Montana dry land wheat fields.
11. *J. Soil Water Conserv.* **60**: 42-51.
12. CHANG, C., ELLERT, B., HAO, X., and CLAYTON, G.2007. Elevation-based soil sampling to assess temporal changes in soil constituents. *Soil Sci. Soc. Am. J.* **71**: 424-429.
13. CONANT, R.T. and PAUSTIAN, K. 2002. Spatial variability of soil organic carbon in grasslands:
14. implications for detecting change at different scales. *Environ. Pollut.* **116**: S127-S135.
15. LEEPER, G.W., 1965. Soil science is a discipline in itself. *Soils and Fertilizers*, **2**: 99-100.
16. MARBUT, C.F. 1921. The contribution of soil survey to soil science. *Society for the Promotion of Agricultural Science Proceedings* **41**:116-142
17. PHILIP, J.R., 1991. Soils, natural science, and models. *Soil Science*, **151**: 91-98. Soil Science Society of America. 2001. Glossary of Soil Science Terms. Soil Science Society of America, Madison, WI.
18. CHRISTOU, M., DUMAS, Y., DIMIRKOU, A. and VASSILIOU, Z. (1999) Nutrient Uptake by Processing Tomato in Greece. *Act Horticulturae*, **487**, 219-223.
19. WANG, Y.T., HUANG, S.W., LIU, R.L. and JIN, J.Y. (2007) Effects of Nitrogen Application on Flavor Compounds of Cherry Tomato Fruits. *Journal of Plant Nutrition and Soil Science*, **170**, 461-468.
20. KRUESKOPF, H.H., MITCHELL, J.P., HARTZ, T.K., MAY, D.M., MIYAO, E.M. and CAHN, M.D. (2002) Soil Nitrate Testing Identifies Processing Tomato Fields Not Requiring Sidedress N Fertilizer. *HortScience*, **37**, 520-524.

### 17. Phytochemical analysis and evaluation of aerial part of the medicinal herb, *Caralluma adscendens*, Rox.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

276

#### PHYTOCHEMICAL ANALYSIS AND EVALUATION OF AERIAL PART OF THE MEDICINAL HERB, *CARALLUMA ADSCENDENS*( ROXB) HAW VAR. FIMBRIATA(WALL) FOR IN-VITRO ANTIOXIDANT AND ANTIDIABETIC ACTIVITIES.

P.B GHOGARE AND DR.R.K.AHER

New Arts ,Commerce and Science College, Parner,  
Dist- Ahmednagar, M S

#### ABSTRACT

*Caralluma adscendens* is a traditional food consumed as vegetable or pickle in arid region of India .In Indian traditional medicine,the plant is used as treat diabetes,inflammation etc. the present study was analyze to preliminary phytochemical analysis and evaluation of in vitro antioxidant properties (DPPH,TBARS) assay of the aerial part and antidiabetic properties (Amylase,Glucosidase)assay of the different extract from aerial part.

Figure:00

References:06

Table:05

**KEY WORDS:** *Caralluma adscendens* var. *fimbriata*, phytochemical analysis, antioxidant and antidiabetic activities.

#### Introduction

*Caralluma* is a genus belongs to family Apocynaceae of about hundred species was distributed in Africa,Spain,Saudi Arabia, Middle east,Pakistan and India.*Caralluma* (Roxb.) Haw var *fimbriata* (wall.) Grav.and Mayur.is a succulent perennial herb,growing wild in the states of Andhra Pradesh, Karnataka and Tamil Nadu of india (Kunert et.al, 2008) *C.adscendens* is commonly or locally known as "Makadshenguli or shengulmakad,

Ransbaharkullimudayan."There are other species *Carrallumagrow* in India, these are *C.indica*,*C.attenuata* and *C.umbellata* all these varieties of *Caralluma* are botanically and phytochemically similar to *C. fimbriata*. In Indian traditional medicine the plant is used to treat diabetes, inflammation, pain ,fever and also been used as appetite suppressant.

*C.adscendens* traditional food consumed in the form of pickle and also eaten during famines (The wealth of India 1992). Antioxident activity, antidiabetic activity and hypoglycemic effect of various extract (Tatiya et.al 2010; Mali et.al 2009 ), the phytochemical screening of *C.adscendens* revealed the presence of pregnane glycoside (Caratubersides, A and B various

boucerocides),flavonoides,saponin, and triterpene noids (Tatiya et.al 2010), pregnane and flavone glycosides were isolated from the whole plant of *C.adscendens* var. (Kunert et.al, 2008).*C.adscendens* is traditionally consumed in the form of pickle and vegetable. So our interest was to analyze the phytochemical analysis in different extract and evaluate for antioxidant activity through several biochemical assay :2,2-diphenyl - 1 - picrylhydrazyl (DPPH,) ThioBoubutric acid reactive species assay(TBARS) ,and(Alfa amylase and Alfa glucosidase) inhibitory antidiabetic activity.

#### Material and Method

##### Collection And Identification Of Plant Material

The plant material *C.adscendens* was collected from hilly region of Parner tehsil. The authenticity of the plant was confirmed in Botanical Survey of India,Western Regional Centre Pune .The voucher number of specimen is BSI/WRC/23/1/2016-IDEN .CER 2016/H3-25.

##### Phytochemical screening of extract

The powder is used for the phytochemical analysis chemical tests for the screening and identification of bioactive chemical Constituents like

9/26/22, 3:57 PM

flora and fauna


**Flora and Fauna**

An International Research Journal of Biological Sciences  
Journal recognised by DST New Delhi (NAAS RATING 4.53)

Login | Free Registration

Home Current Issue Archives Instructions to Authors Search About Us Online Submission

About Journal  
Picture Gallery



### Instructions to Authors

#### Aims & Objectives

- The international Research To provide a platform to the Scientists, Professors, Teachers, Experts and Students related with Biological Sciences for exchanging their views on NATURE and biological STRUCTURES and FUNCTIONS.
- To organize seminars, conferences, workshops etc. for encouraging close interaction among Scientists, Research Scholars, Professors and Experts.
- To disseminate the knowledge of Flora and Fauna for their improvements, conservation and management

#### Focus & Scope

- The international Research Journal FLORA AND FAUNA publishes original research and review articles, short communications and letter to the Editor. The Journal covers all aspects of Biological Sciences Viz. Animal Sciences, Plant Sciences, Microbiology, Cell Biology, Biochemistry, Biophysics, Biotechnology, Applied Biology, Toxicology, Parasitology, Environmental Sciences, Medical Sciences, Veterinary Sciences, Medicine etc. The journal also publishes reports and announcements of National and International conferences, seminars, Workshops etc. Excursion reports, Discoveries, Book reviews and Advertisements are also accepted for publication.

#### Publication Frequency

- FLORA AND FAUNA is published twice a year in the months of June and December.

#### Peer Review Policy

- Flora and Fauna international journal of biological sciences uses double blind peer review policy. It means that both the

**Feedback**-Dr. A.K.Srivastav, Executive Editor,  
Flora and Fauna, "Sukh Sadan" F-3, Surya Puram,  
Sipri Bazar, Jhansi - 284003 (U.P.) India  
Phone - 0510 - 2480424, 09415030098  
E-mail : akscks@rediffmail.com  
Copyright © 2008-2022. All rights reserved.

Sitemap  
Visitor No : 477245  
Designed & Maintained by  
www.apvtechnologies.com

## 18. Ascomycetes from mangrove ecosystem of Wandoor- Andaman, India. Int. Jr. of Life Sciences. 5(4):599-605

Int. J. of Life Sciences, 2017, Vol. 5 (4): 599-605

ISSN: 2320-7817 | eISSN: 2320-964X

### RESEARCH ARTICLE

## Ascomycetes from Mangrove ecosystem of Wandoor- Andaman (India)

Cholake JB<sup>1\*</sup> and Aher RK<sup>2</sup>

<sup>1</sup>New Arts, Commerce and Science College Ahmednagar, Tal-Ahmednagar, Dist. Ahmednagar, Maharashtra, India.

<sup>2</sup>New Arts, Commerce and Science College Parner, Tal-, Parner, Dist. -Ahmednagar, Maharashtra, India.

\*Corresponding author e-mail: jayacholake2@gmail.com

#### Manuscript details:

Received: 31.08.2017  
Accepted: 1.12.2017  
Published : 05.12.2017

#### Editor:

Dr. Arvind Chavhan

#### Cite this article as:

Cholake JB and Aher RK (2017) Ascomycetes from Mangrove ecosystem of Wandoor -Andaman (India); *International J. of Life Sciences*, 5 (4): 599-605.

#### Acknowledgment

Authors are thankful to Savitribai Phule Pune University, Principal of New Arts, Commerce and Science College, Parner and Ahmednagar for encouragement and for providing research facilities during the present work.

**Copyright:** © 2017 | Author (s). This is an open access article under the terms of the Creative Commons Attribution-Non-Commercial - No Derivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

#### ABSTRACT

The present study deals with marine fungi from Wandoor -Andaman. The dead, decaying, intertidal and submerged mangrove wood samples were collected from Wandoor. These samples examined for colonization of marine fungi. Total 10 species of marine Ascomycetes fungi were encountered. These includes *Aigialus mangrovei*, *Astrosphaeriella striatopora*, *Eutypa bathurstensis*, *Halorosellinia oceanica*, *Rimora mangrovei*, *Savoryella lignicola*, *Torpedospora radiata*, *Trematosphaeria mangrovei*, *Verruculina enalia* and *Zopfiella marina*. Out of these fungi *Halorosellinia oceanica* is very common fungus reported from most of the wood samples in Wandoor Island.

**Keywords:** Mangrove, Marine, Fungi, Ascomycetes, Wandoor and Andaman.

#### INTRODUCTION

Mangrove forests are the 'hot spots' of biodiversity and also for marine fungi. Number of species of marine fungi from mangroves have been reported in recent years [Borse and Borse (2005), Kohlmeyer and Kohlmeyer (1979), Kohlmeyer (1984), Kohlmeyer (1985), Kohlmeyer and Volkmann- Kohlmeyer (1987), Hyde, (1988), Hyde and Mouzouras (1988), Hyde and Jones (1989), Kohlmeyer and Volkmann- Kohlmeyer (1990), Scott (1988), Hyde and Lee (1995), Sridhar and Prasannaraj (2001), Borse and Borse (2005) and Borse et. al (2012)]. To some extent Chinnaraj (1993) reported some marine Fungi from different coastal area of Andaman and Nicobar Islands. Ten species of Ascomycetes marine fungi from Wandoor - Andaman were isolated and illustrated in this paper.

Wandoor is in the Andaman and it enjoys Tropical wet and dry climate. Marine ecosystem is one of the richest and most productive areas of organic detritus and form the base of the food chain. Marine fungi play an important role in nutrient generation cycles as decomposers of dead and decaying organic matter. Although mangroves are the dominant features of Indian coastline and provide niches and habitats for many marine organisms.

Cholake and Aher, 2017

**MATERIAL AND METHODS**

The samples of dead and decaying mangrove (*Avicennia alba*, *Avicennia marina*, *Avicennia officinalis*, *Rhizophora apiculata*, *Rhizophora mucronata* and *Sonneratia alba*) substrates were collected from Wandoor -Andaman coast- India. All the collected samples were observed directly for the fungal fructification under microscope and incubated in plastic boxes. Incubated material was periodically examined for the occurrence of fungi. The permanent slides were prepared as per suggested by (Volkman-Kohlmeyer and Kohlmeyer, 1996; Kohlmeyer and Kohlmeyer 1972). The measurements of various parts of fungi were taken with the help of ocular micrometer and stage micrometer. The photomicrographs were taken. The identification of the fungi were made with the help of Kohlmeyer and Kohlmeyer, 1979; Kohlmeyer and Volkman-Kohlmeyer, 1991; Hyde and Sarma 2000; Hyde et al., 2000 and other relevant literature.

**RESULTS AND DISCUSSION**

During the present work Total 10 species of Ascomycetes marine fungi were encountered from Wandoor -Andaman, These includes *Aigialus mangrovei*, *Astrosphaeriella striatopora*, *Eutypa bathurstensis*, *Halorosellinia oceanica*, *Rimora mangrovei*, *Savoryella lignicola*, *Torpedospora radiata*, *Trematosphaeria mangrovei*, *Verruculina enalla* and *Zopfiella marina*. Out of these fungi *Halorosellinia oceanica* is very common fungi reported from most of the wood samples in Wandoor of Andaman. Chinnaraj (1993) isolated 63 marine fungi from mangroves of Andaman and Nicobar Islands.

**TAXONOMIC ACCOUNT****1. *Aigialus mangrovei*** Borse (Fig. 1 A)

*Trans. Br. Mycol. Soc.*, **88**: 424, 1987c.

Ascomata: 600-850  $\mu\text{m}$  high, 600-800  $\mu\text{m}$  wide, 150-200  $\mu\text{m}$  thick. Ostioles: 40-50  $\mu\text{m}$  diam. Pseudoparaphyses: 1.5-2  $\mu\text{m}$  diam. Asci: 300-425 x 20-30  $\mu\text{m}$ . Ascospores: 35-55  $\mu\text{m}$  long, 10-16  $\mu\text{m}$  broad, muriform, with 6-7 transverse septa and 1-2 longitudinal septa in all but the end cells, slightly constricted at the septa, yellow-brown except for the hyaline or light brown apical cells, with a gelatinous cap, around the apical and sub-apical cells may present.

**Material examined:** On intertidal stem of *Rhizophora mucronata*.

Distribution in India: East coast: -Tamilnadu (Ravikumar and Vittal, 1996); Andhra Pradesh (Sarma and Vittal, 1998-99, 2000, 2001); West Bengal (Pawar et al., 2005). West coast: Maharashtra (Borse, 1987b and 1988); Kerala (Raveendran and Manimohan, 2007 and Nambiar et al., 2008) and Andaman and Nicobar Islands Chinnaraj (1993).

Remark: - The present fungus is rare in occurrence from Andaman (0.45%).

**2. *Astrosphaeriella striatopora*** (K. D. Hyde) K. D.

Hyde (Fig. 1B) *Bot. J. Linn. Soc.*, **110**: 97

*Trematosphaeria striatopora* K. D. Hyde *Bot. J. Linn. Soc.*, **98**: 142, 1988

Fruiting bodies: black, slightly raised spots, with a central neck; in section lenticular, clypeus; clypeus 390-520  $\mu\text{m}$  in diameter, black, composed of host epidermal cells, encrusted with melanin practical, 85-170  $\mu\text{m}$  in thick, ascomata; 352-528  $\mu\text{m}$  in diameter, 176-355  $\mu\text{m}$  in high, subglobose broadly conical, ostiolate, papillate, solitary or gregarious. Peridium: indistinguishable from clypeus, the side and lower layer, 42-57  $\mu\text{m}$  in thick, Necks: 193-484  $\mu\text{m}$  long, 53-82  $\mu\text{m}$  in diameter, black, periphysate. Pseudoparaphyses: 0.8-2.1  $\mu\text{m}$  in diameter, filiform, trabeculate. Asci: 100-173  $\mu\text{m}$  long, 11-23  $\mu\text{m}$  in diameter, 8 spored, cylindrical, pedunculated, bitunicate, thick-walled and with ocular chamber.

**Material examined:** on intertidal wood of *Rhizophora apiculata*, *Sonneratia alba* and *Avicennia marina*.

Distribution in India: - East coast: Tamil Nadu (Prasannaraj and Sridhar, 2001); West Bengal (Pawar et al., 2005). Andaman and Nicobar Islands (Chinnaraj and Untawale, 1992 and Chinnaraj 1993). West coast: Maharashtra (Borse, 2000 and Borse et al., 2005); Karnataka (Prasannaraj and Sridhar, 2000-2001, 2001).

Remark: - The present fungus is rare in occurrence from Andaman (0.67%).

**3. *Eutypa bathurstensis*** K. D. Hyde and Rappaz

(Fig. 1C) *Mycol. Res.* 97: 861, 1993.

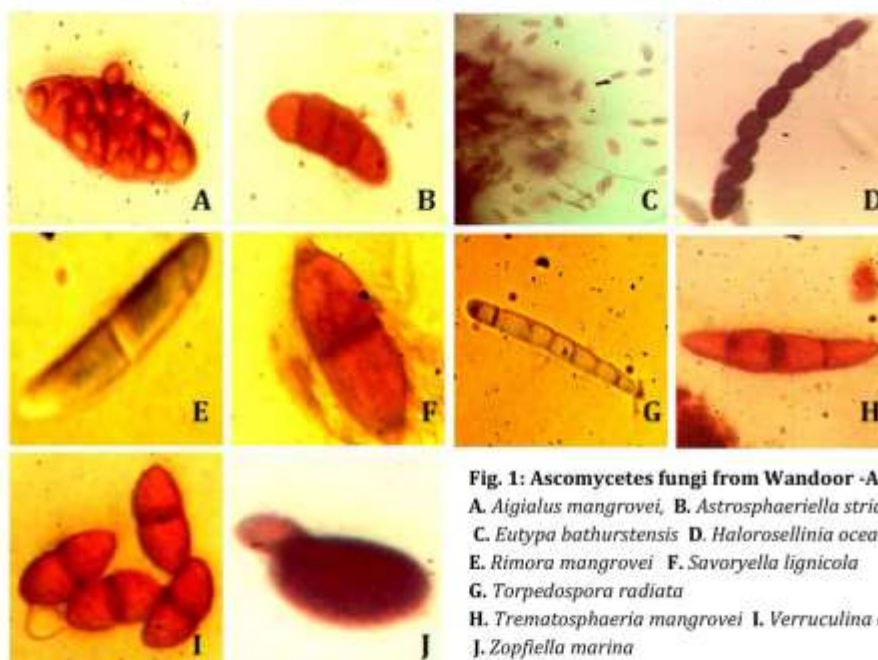
Fruiting area effuse up to 4.5-5 mm. long, blackening the wood surface. Entostroma prosenchymatous poorly developed, dorsally limited by a black zone binding the fruiting areas. Ascomata: spherical to flattened, 0.2-0.6 mm high, up to 0.8 mm wide. Necks:

600

*Int. J. of Life Sciences*, Vol. 5(4) December, 2017



## Ascomycetes from Mangrove ecosystem of Wandoor -Andaman (India)



**Fig. 1: Ascomycetes fungi from Wandoor -Andaman;**  
**A.** *Aigialus mangrovei*, **B.** *Astrosphaeriella striatapora*  
**C.** *Eutypa bathurstensis* **D.** *Halorosellinia oceanica*  
**E.** *Rimora mangrovei* **F.** *Savoryella lignicola*  
**G.** *Torpedospora radiata*  
**H.** *Trematosphaeria mangrovei* **I.** *Verruculina enalia*  
**J.** *Zopfiella marina*

up to 0.3 mm long. Peridium: enclosing fragments of crystals in the external layer, 30-43  $\mu\text{m}$  wide or wider near the ostiolar canal. Ostioles: poorly developed or conical, up to 280  $\mu\text{m}$  high, 129-177  $\mu\text{m}$  diam., not sulcate. Hymenium: lining the whole cavity. Paraphyses: numerous, persistent. Asci: clavate, 26-42  $\mu\text{m}$  x 7.5-9.5  $\mu\text{m}$ , eight-spored. Ascospores: olive-brown, containing oil droplets and limited by a thin epispore, 7 x 2-3  $\mu\text{m}$ .

**Material examined:** on intertidal stem of Mangrove wood, on intertidal stem of *Avicennia alba*.

Distribution in India: - East coast: Andhra Pradesh (Sarma and Vittal, 2000). West coast: Maharashtra (Borse, 2000b) and Gujrat (Borse *et al.*, 2000a).

Remark: - The present fungus is occasional in occurrence from Andaman (1.12%).

**4. *Halorosellinia oceanica*** (Schatz) Whalley, Jones, Hyde and Laessoe. (Fig. 1D) *Mycol. Res.*, **104**: 368, 2000.

*Hypoxylon oceanicum* Schatz, *Mycotaxon*, **33**: 413, 1988.

Pseudostromata: occasionally embedded at the base, pulvinate to hemispherical, 0.4-0.8 mm diam., single or

in clusters, linear to suborbicular, black. Ascromata: 614-785  $\mu\text{m}$  x 724-980  $\mu\text{m}$ , immersed in pseudostroma, subglobose to hemispherical, soft to leathery, black, ostioles papillate. Peridium: 25-32  $\mu\text{m}$  wide. Paraphyses: 2-3  $\mu\text{m}$  wide at the base, abundant, persistent, remotely septate. Asci: eight-spored, 168-214  $\mu\text{m}$  long, spore-bearing part 132-140  $\mu\text{m}$  long, stipe 36-78  $\mu\text{m}$  long, cylindrical, unitunicate. Ascospores: uniseriate or partially biseriate, dark grey-olive to opaque brown, ellipsoid, upper end broadly rounded, lower end slightly pointed, one-celled, 16-18  $\mu\text{m}$  x 6-8  $\mu\text{m}$ , biguttulate, wall smooth and thick, without appendages.

**Material examined:** - on intertidal stem of *Avicennia marina*.

Distribution along Indian coast: -East coast: Andhra Pradesh (Sarma and Vittal, 2000); Tamilnadu (Prasannarai and Sridhar, 2001, Nambiar *et al.*, 2008). West coast: Karnataka and Goa (Chinnaraj and Untawale, 1992); Gujrat (Borse *et al.*, 2000a and Patil and Borse, 2001); Maharashtra (Borse, 2000b); Kerala (Prasannarai and Sridhar, 2001; Raveendran and Manimohan, 2007; Nambiar and Raveendran 2007, 2008a, b, c, 2009b and Nambiar *et al.*, 2006) and Andaman and Nicobar Islands (Chinnaraj and

Cholake and Aher, 2017

Untawale 1992)

Remark: - The present fungus is common in occurrence from Andaman (13.48%).

**5. *Rimora mangrovei*** (Kohlm. and Vittal) Kohlm.

Volk- Kohlm. Suetrong, Sakayaroj and E. B. G. Jones, *Studies in mycology*, **64**:167, 2009. (Fig. 1E)

*Lophiostoma mangrovei* Kohlm. and Vittal. *Mycologia*, **78**:487, 1986.

*Astrosphaeriella mangrovei* (Kohlm. and Vittal) Aptroot and Hyde, *Fungi in Marine Environments*, *Fungal Diversity Press*, **7**:106, 2002.

Ascomata: 260-400  $\mu\text{m}$  high, 775-950  $\mu\text{m}$  wide, 450-535  $\mu\text{m}$  thick, broadly oblong with flat top in frontal view, conical to truncate in sagittal section, elongated, laterally compressed. Peridium: 69-150  $\mu\text{m}$  thick at the side, 5-18  $\mu\text{m}$  at the base, encrusted with melanin particles, thick walled. Ostioles: 10-60  $\mu\text{m}$  wide, ostiolar canal filled with hyaline paraphyses, 1.8-2.2 mm thick. Pseudoparaphyses 2mm in diam., branched, merging with the paraphyses. Asci: 155-218 x 13-19  $\mu\text{m}$ , 8 spored, cylindrical, short pedunculate, and thick walled, fissitunicate. Ascospore: 37-55 x 7-11  $\mu\text{m}$ , biseriate, fusiform, 1- septate, upon germination 3 septate, constricted at the central primary septum, hyaline.

**Material examined:** - On intertidal stem of *Avicennia officinalis*.

Distribution in India: -East coast: Tamilnadu (Ravikumar and Vittal, 1996); Andhra Pradesh (Sarma and Vittal, 1998-99, 2000, 2001, 2002 and 2004 and Vittal and Sarma, 2005)) and Andaman and Nicobar Islands (Chinnaraj 1993). West coast: Gujrat (Patil and Borse, 2001); Maharashtra (Borse, 1988, Kohlmeyer and Vittal, 1986, Shrivastava, 1995, Borse *et al.*, 2005); Goa (Maria and Sridhar, 2002a); Karnataka (Prasannarai and Sridhar, 1997, 2001, 2000-2001 and Maria and Sridhar, 2002, 2003 and 2004); Kerala (Maria and Sridhar, 2002) and Lakshadweep Islands (Chinnaraj 1992).

Remark: - The present fungus is rare in occurrence from Andaman (0.45%).

**6. *Savoryella lignicola*** Jones and Eaton (Fig. 1F)

*Trans. Br. Mycol. Soc.*, **52**: 161, 1969.

Ascomata: 212-292  $\mu\text{m}$  high, 120-264  $\mu\text{m}$  in diameter, globose, sub globose or ellipsoidal, immersed, partly immersed or superficial, ostiolate, papillate, membranous and pale to dark brown. Necks: 72-148  $\mu\text{m}$  long and upto 70  $\mu\text{m}$  in diameter, brown with

paraphyses. Peridium: brown. Paraphyses present but sparse. Asci: 106-178  $\mu\text{m}$  x 16-26  $\mu\text{m}$ , 8- spored, cylindrical or clavate, short stalked, unitunicate, persistent. Ascospores: 26-36  $\mu\text{m}$  x 9-22  $\mu\text{m}$ , uni or triseriate, ellipsoidal, tri-septate, constricted at the septa, central cells brown, apical cells smaller and hyaline.

**Material examined:** - on intertidal wood of *Avicennia marina*.

Distribution in India: - East coast: Tamilnadu (Raghukumar, 1973 and Nambiar *et al.*, 2008); Orissa and West Bengal (Borse, 2000 a); Andhra Pradesh (Sarma and Vittal, 1998-99, 2000). West coast: Maharashtra (Borse, 1987 a, 1988; Borse and Srivastava, 1988 and Shrivastava, 1995); Goa (Borse *et al.*, 1999a); Karnataka (Prasannarai *et al.*, 1999); Kerala (Raveendran and Manimohan, 2007); Daman (Borse *et al.*, 2000b); Gujrat (Patil and Borse, 2001); Kerala (Prasannarai and Sridhar, 2001; Nambiar and Raveendran; 2006, 2007, 2008a, b, c, 2009a,b and Nambiar *et al.*, 2008); Pondicherry and Mahe (Nambiar and Raveendran, 2008d); Lakshadweep Islands (Chinnaraj 1992) and Andaman and Nicobar Islands (Chinnaraj 1993).

Remark: - The present fungus is occasional in occurrence from Andaman (1.24%).

**7. *Torpedospora radiata*** Meyers (Fig. 1G)

*Mycologia*, **49**: 496, 1957.

Ascomata: 248-326  $\mu\text{m}$  high, 188-374  $\mu\text{m}$  in diameter, subglobose to pyriform, immersed or superficial, ostiolate, papillate, subcoriaceous, fuscous or dark brown above, subhyaline grey or brownish below, gregarious. Peridium: two-layered, outer layer composed of subglobose, thick-walled cells with small lumina. Papillae or Necks: up to 206  $\mu\text{m}$  long, 18-26  $\mu\text{m}$  in diameter, cylindrical, fuscous. Paraphyses: 1-2  $\mu\text{m}$  in diameter, septate, ramose, growing irregularly through the venter of the ascomata. Asci: 52-154  $\mu\text{m}$  x 10-14  $\mu\text{m}$ , eight-spored, clavate or oblong-ellipsoidal, sessile or short pedunculated, unitunicate, thin-walled, aphysoclastic, without apical apparatuses. Ascospores: 32-44 x 4-7  $\mu\text{m}$ , cylindrical or clavate, broader at the apex, tri-septate, hyaline, appendaged, 18-38  $\mu\text{m}$  x 1.5-4  $\mu\text{m}$ , semi rigid, straight or slightly curved.

**Material examined:** - on *Avicennia marina* and Ascospores in foam sample.

Distribution in India: - East coast: Tamilnadu (Raghukumar, 1973). West coast: Maharashtra (Borse, 1987 a, 1988, 2000b, Ramesh and Borse, 1989 and

602

Int. J. of Life Sciences, Vol. 5(4) December, 2017

## Ascomycetes from Mangrove ecosystem of Wandoor -Andaman (India)

Shrivastava, 1995); Karnataka (Prasannarai and Sridhar, 1997, 2001 and Prasannarai *et al.*, 1999); Goa (Borse *et al.*, 1999a and Borse and Tuwar, 2006); Gujrat (Borse *et al.*, 2000a); Kerala (Prasannarai and Sridhar, 2001); Mahe Pondicherry (Borse and Pawar, 2005) and Lakshadweep Islands (Chinnaraj 1992). Remark: - The present fungus is rare in occurrence from Andaman (0.23%).

**8. *Trematosphaeria mangrovei* Kohlm.** (Fig.1H)

*Mycopathologia and Mycolgia Applicata*- **34**: 1-2, 1968.

Ascomata: 360-440  $\mu\text{m}$  high, 520-610  $\mu\text{m}$  in diameter, ovoid, partially immersed in substratum, solitary or gregarious, black carbonaceous, ostiolate and periphysate. Hamethecium: filamentous, numerous. Asci: 174-210  $\mu\text{m}$  long, 18-26  $\mu\text{m}$  in diameter eight-spored, cylindrical, pedunculated, bitunicate and thick-walled. Ascospores: 42-48  $\mu\text{m}$  x 9-12  $\mu\text{m}$  uniseriate to biseriate with overlapping end cells, dark brown, three-septate, slightly constricted at the septa.

Material examined: - On intertidal wood *Avicennia alba*.

Distribution in India: -West coast: Mangalore (Sridhar and Prasannarai 1993).

Remark: - The present fungus is rare in occurrence from Andaman (0.56%).

**9. *Verruculina enalia* (Kohlm.) Kohlm. and Volkmann-Kohlm.** (Fig. 1I) *Mycol. Res.* **94**: 689, 1990.

*Didymosphaeria enalia* Kohlm, *Ber. Destch. Bot. Ges.*, **79**: 28, 1966.

Ascomata: 286-494  $\mu\text{m}$  high (including papilla), 265-474  $\mu\text{m}$  in diameter, subglobose, ampliform or depressed, ellipsoid, partly or completely immersed, ostiolate, papillate, clypeate, carbonaceous, black, solitary. Peridium: 8-14  $\mu\text{m}$  thick, composed of about six or more layers of irregular roundish or elongate, thick-walled cells, with usually small lumina, brown, hyphae or stromatic structures. Papillae: 72-144  $\mu\text{m}$  long, 135-310  $\mu\text{m}$  in diameter, conical, surrounded by blackish brown clypeus, ostiolar canal obturbinate, filled with long delicate, hyaline periphyses; the pore is closed by somewhat thicker, shorter, hyaline hyphae. Pseudoparaphyses: 1.5-2  $\mu\text{m}$  in diameter, septate, rarely branched, attached at both ends and reaching into the ostiolar canal. Asci: 118-134  $\mu\text{m}$  x 11-14  $\mu\text{m}$ , eight-spored, cylindrical, pedunculated, bitunicate, thick-walled, physoclastic, without apical apparatuses; develops at the base of the ascomata venter. Ascospores: 16-24  $\mu\text{m}$  x 6.5-10  $\mu\text{m}$ , obliquely

uniseriate, ellipsoidal, one-septate, constricted at the septum, dark brown, verrucose to verruculose.

Material examined: - on intertidal wood of *Avicennia marina*, *Avicennia officinalis* and *Sonneratia alba*.

Distribution in India: - East coast: Tamilnadu (Ravikumar and Vittal, 1996 and Nambiar *et al.*, 2008); Andhra Pradesh (Sarma and Vittal, 2000). West coast: Maharashtra (Patil and Borse, 1985, Borse, 2000b and Shindikar and Borse, 2002); Karnataka (Prasannarai and Sridhar, 1997); Kerala (Raveendran and Manimohan, 2007, Nambiar and Raveendran 2006, 2007, 2008a, b, 2009a, b and Nambiar *et al.*, 2006, 2008); Diu (Borse *et al.*, 1999b); Goa (Borse *et al.*, 1999a); Daman (Borse *et al.*, 2000b); Gujrat (Borse *et al.*, 2000a and Patil and Borse, 2001); Pondicherry and Mahe (Nambiar and Raveendran, 2008d); Lakshadweep Islands (Chinnaraj 1992) and Andaman and Nicobar Islands (Chinnaraj 1993).

Remark: - The present fungus is common in occurrence from Andaman (11.18%).

**10. *Zopfiella marina* Furuya and Udagawa** (Fig.1J) *J. Jpn. Bot.* 50-149, 1975.

Ascomata: 180-450  $\mu\text{m}$  in diam., globose to subglobose, superficial or immersed, nonostiolate, coriaceous, irregularly dehiscent, black, and almost glabrous or loosely covered by some curved, hyaline, septate, simple hyphae, 2-2.5  $\mu\text{m}$  in diam. at the base, solitary. Peridium: 15-28  $\mu\text{m}$  thick, semitransparent, composed of 4 layers of angular, thin walled cells of 5-14  $\mu\text{m}$  in diam., forming a *textura angularis*. Paraphyses: composed of vesicular cells, early deliquescing. Asci: 75-90  $\mu\text{m}$  x 14-20  $\mu\text{m}$ , 8 spored, clavate, broadest in the middle, short pedunculate, unitunicate, deliquescing, with an indistinct apical ring. Ascospores: biseriate, clavate, becoming 1-septate in the lower third; slightly constricted at the septum, larger upper cell (14) 15-20  $\mu\text{m}$  x 10-13 (14)  $\mu\text{m}$ , ellipsoidal, apex slightly abonate, base truncate, olivaceous to dark brown, thin walled, smooth, with a apical germ pore, 1  $\mu\text{m}$  in diam., smaller lower cell 4-10  $\mu\text{m}$  long, 3-4  $\mu\text{m}$  in diam., elongate cylindrical, apex truncate, base rounded, straight or slightly curved, hyaline.

**Material examined:**-On intertidal stem of *Avicennia officinalis*.

Distribution in India: - East coast: Andhra Pradesh (Sarma and Vittal, 1998- 99, 2000, 2001 and 2004, Sarma *et al.*, 2001 and Vittal and Sarma, 2005).

Remark: - The present fungus is rare in occurrence from Andaman (0.56%).

Cholake and Aher, 2017

## SUMMARY AND CONCLUSION

The results of our investigation Total 10 species of Ascomycetes marine fungi were encountered from Wandoor -Andaman, These includes *Aigialus mangrovei*, *Astrosphaeriella striatopora*, *Eutypa bathurstensis*, *Halorosellinia oceanica*, *Rimora mangrovei*, *Savoryella lignicola*, *Torpedospora radiata*, *Trematosphaeria mangrovei*, *Verruculina enalia* and *Zopfiella marina*. Out of these fungi *Halorosellinia oceanica* is very common fungi reported from most of the wood samples in Wandoor of Andaman.

**Conflicts of interest:** The authors stated that no conflicts of interest.

## REFERENCES

- Borse BD (1987a) New species of *Aigialus* from India. *Trans. Br. Mycol. Soc.*, 88: 424-426.
- Borse BD (1987b) Marine fungi from India - V. *Current Science*, 52: 1109-1111.
- Borse BD (1988) Frequency of occurrence of marine fungi from Maharashtra coast, India. *Indian Journal of Marine Sciences*, 17: 165-167.
- Borse BD (2000a) Marine fungi from India - X. *Savoryella* Jones and Eaton (Ascomycotina). In: *Ecology of fungi*. (Eds. Bhat D. J. and Raghukumar S.), Goa University Press, pp. 163-165.
- Borse BD (2000b) Marine fungi from Maharashtra (India) - V. A check list. *J. Phytol. Res.*, 13: 123- 128.
- Borse BD and Pawar NB (2005) Marine fungi from Mahe (Pondicherry), India. *J. Adv. Sci. & Technology*, 8(1and 2): 43-48.
- Borse BD and Shrivastava AD (1988) Marine fungi from India- VIII. *Indian bot. Repr.*, 7(1 and 2): 26-30.
- Borse BD and Tuwar AR (2006) Marine fungi from Goa coast (India) - I. *Bioinfolet*, 3: 251-264.
- Borse BD, Borse KN and Pawar NS (2005) Marine fungi from Maharashtra: Diversity and Taxonomy. In: *Fungi: Diversity and Biotechnology* [Eds. Rai M. K. & S. K. Deshmukh], Scientific Publishers (India), Jodhpur, pp. 63-92.
- Borse BD, Kelkar DJ and Patil AC (2000a) Frequency of occurrence of marine fungi from Pirotan Island (Gujrat), India. *Geobios*, 27: 145-148.
- Borse BD, Nandan SN and Shinde DN (1999a) Higher marine fungi from Goa Coast (India). *BRI'S JAST*, 2: 52-55.
- Borse BD, Patil RV and Kelkar DJ (1999b) Marine fungi from Div Island (India). *BRI'S JAST*, 11: 1-8.
- Borse BD, Patil KB, Patil RV and Kelkar, D. J. (2000b). Marine fungi in foam, intertidal wood and dead *Avicennia marina* wood from Daman Coast, India. *Geobios*, 27: 42-44.
- Borse BD, Bhat DJ, Borse KN, Tuwar AR and Pawar NS (2012) Marine Fungi of India (*Monograph*), Broadway Book Centre, Punji, Goa, pp.471.
- Borse KN and Borse BD (2005) Marine fungi from Orissa (India) III: Mitosporic fungi. In: *Frontiers in Plant Sciences* (Eds. Mukherji, K.G. et al.), I. K. International pvt. Ltd. New Delhi, pp. 35-46.
- Chinnaraj S (1992) Higher marine fungi of Lakshadweep Islands and a note on *Quintaria lignalis*. *Cryptogamie Mycol*, 13 (4): 312-319.
- Chinnaraj S (1993) Higher marine fungi from mangroves of Andaman and Nicobar Islands. *Sydowia*, 45 (1): 109-115.
- Chinnaraj S and Utawale AG (1992) Manglicolous fungi from India. *Mahasager Vol.25* (1) pp.25-29.
- Hyde KD (1988) Studies on the tropical marine fungi of Brunei. *Botanical Journal of the Linnean Society*, 98:135-151.
- Hyde KD and Jones EBG (1989) Marine fungi from Seychelles.VIII. *Rhizophila marina*, a new Ascomycetes from mangrove prop roots. *Mycotaxon*, 34:527-533.
- Hyde KD and Lee SY (1995) Ecology of mangrove fungi and their role in nutrient cycling: what gaps occurs in our knowledge. *Hydrobiologia*, 295:107-108.
- Hyde KD and Mauzouras R (1988) *Passeriniella Savoryellopsis* sp.nov A new Ascomycetes from intertidal mangrove wood. *Transactions of British Mycological Society*, 91:179-185.
- Hyde KD and Sarma VV (2000) Pictorial Key to Higher marine fungi. In: *Marine Mycology -A Practical Approach* (eds. K. D. Hyde and S. B. Pointing). *Fungal Diversity Research Series*. I. Fungal Diversity Press, Hong Kong, pp. 205 - 270.
- Hyde KD, Sarma VV and Jones EBG (2000) Morphology and Taxonomy of Higher marine fungi. In: *Marine Mycology- A Practical Approach* (eds. K. D. Hyde and S. B. Pointing). *Fungal Diversity Research Series*. I. Fungal Diversity Press, Hong Kong, pp. 172 - 204.
- Kohlmeyer J (1984) Tropical marine fungi. *Marine Ecology (F.S.Z.N.I.)* 5:339-378.
- Kohlmeyer J (1985) *Caryospora rhizophorae* gen.et sp.nov (Massariaceae). A marine Ascomycete from *Rhizophora mangal*. *Proceedings of Indian Academy Sciences (Plant Sciences)*, 84:355-361.
- Kohlmeyer J and Kohlmeyer E (1972) Permanent microscopic mounts. *Mycologia*, 64: 666-669.
- Kohlmeyer J and Kohlmeyer E (1979) *Marine Mycology: The Higher Fungi*. Academic Press, New York, pp. 698.
- Kohlmeyer J and Vittal BPR (1986) *Lophiostoma mangroves*, a new marine ascomycete from the tropics. *Mycologia*, 78: 485-489.
- Kohlmeyer J and Volkmann- Kohlmeyer B (1987) Marine fungi from Belize with a description of two genera of Ascomycetes. *Botnica Marina*, 30:195-204.
- Kohlmeyer J and Volkmann- Kohlmeyer B (1990) Revision of marine species of *Didymosphaeria* (Ascomycotina). *Mycological Research*, 94:685-690.
- Kohlmeyer J and Volkmann- Kohlmeyer B (1991) Illustrated Key to the filamentous marine fungi. *Bot. Mar.*, 34:1 - 61.
- Maria GL and Sridhar KR (2002) A new ascomycete, *Passeriniella mangrovei* sp. nov. from the mangrove forest of India. *Indian Journal of Forestry*, 25: 319 -322.
- Maria GL and Sridhar KR (2003) Diversity of filamentous fungi on woody litter of five mangrove plant species from the south west coast of India. *Fungal Diversity*, 14: 109-126.
- Maria GL and Sridhar KR (2004) Fungal Colonization of immersed wood in mangroves of the southwest coast of India. *Can. J. Bot.*, 82: 1409-1418.
- Nambiar G and Raveendran K (2006) A comparative account of Pokkali and mangrove associated marine and

604

Int. J. of Life Sciences, Vol. 5(4) December, 2017

## Ascomycetes from Mangrove ecosystem of Wandoor -Andaman (India)

- manglicolous marine fungi from Valapattanam estuary, Kannur District (Kerala). *Extended Abstract, 18<sup>th</sup>. Kerala Science Congress*, CESS, Alkulum, Thiruvananthapuram, pp. 559-561.
- Nambiar G and Raveendran K (2007) Estuaries marine mycoflora of North Malabar (Kerala). *J. Mar. Atmos. Res.*, 3(2):29-31.
- Nambiar G and Raveendran K (2008a) Impact of coir retting on manglicolous marine fungi of Kerala coastal waters. *Poll. Res.* 27: 481-483.
- Nambiar G and Raveendran K (2008b) Marine and manglicolous fungal diversity in the coastal wetlands of Kerala. *Seaweed Res. Utiln., (Special Issue)* 30: 107-111.
- Nambiar G and Raveendran K (2008c) Diversity of Mangrove fungi of North Malabar Kerala. *Proceeding Kerala (India) The Indian Forester*, Vol.134.
- Nambiar G and Raveendran K (2008d) Marine mycoflora of Pondicherry and Mahe. *Eco-Chronical*, 3: 47-50.
- Nambiar G and Raveendran K (2009a) Lignicolous marine fungi in selected wetland of North Malabar (Kerala). In: compendium on wetland Biodiversity and Conservation (Eds. Bijoy Nandan S., Salim M., Somanathan Pillai G. and Reeny Varghese), Published by LAK, *Trinjalakuda, Kerala-680125*. Pp. 136-140.
- Nambiar G and Raveendran K (2009b) Influence of coir retting on mangrove ecosystem. In: Proceeding of National Seminar on Conservation of Biodiversity in protected areas-opportunities and challenges (Ed. Antony, P. V.), Chist University Bangalore (India), pp.34-36.
- Nambiar G, Jaleel C and Raveendran K (2008) A comparative account of backwater and brackish water marine mycoflora of North Malabar Kerala (India). *C. R. Biologies*, 331 : 294-297
- Nambiar G, Pratheesh PV and Raveendran K (2006) Pokkali associated marine fungi of north Malabar of Kerala coastal waters. *Seaweed Res. Utiln.*, 28: 55-61.
- Nambiar G, Raveendran K, Zhao C and Jaleel CH (2008) A glimpse of lignicolous marine fungi occurring water bodies in coastal of Tamil Nadu (India). *C. R. Biologies*, 331:475-480.
- Patil SD and Borse BD (1985) Marine fungi from Maharashtra (India) IV: Some Loculoascomycetes. *Trans. Mycol. Soc. Japan*, 26:271-276.
- Patil KB and Borse BD (2001) Studies on higher marine fungi from Gujarat Coast (India). *Geobios*, 28: 41-44.
- Pawar NS, Pagar DV, Borse, KN and Borse BD (2005) Marine fungi from Sundarbans (India). In: *Plant Diversity and Biotechnology* (Eds. Nandan et al.), Sripushpa Press, Dhule, pp. 107-115.
- Prasannaraj K and Sridhar KR (1997) Effect of incubation period of drift wood on the occurrence of marine fungi. *Indian Journal of Marine Sciences*, 26: 380-382.
- Prasannaraj K and Sridhar KR (2000-2001) Observations on Intertidal marine fungi of islands adjacent to the west coast of India. *Kavaka*, 28 & 29 : 27-33.
- Prasannaraj K and Sridhar KR (2001) Diversity and abundance of higher marine fungi on woody substrates along the west Coast of India. *Current Science*, 81:303-311.
- Prasannaraj K, Ananda K and Sridhar KR (1999) Intertidal fungi in Magalore Harbour, Southern India. *Botanica marina*, 42: 117-122.
- Raghukumar S (1973) Marine lignicolous fungi from India. *Kavaka*, 1: 73-85.
- Ramesh CH and Borse BD (1989) Marine fungi from Maharashtra Coast (India). *Acta Botanica Indica*, 17: 143-146.
- Raveendran K and Manimohan P (2007) Marine Fungi of Kerala, A Preliminary Floristic and Ecological Study, Malbar Matorial History Society, Calicut, Kerala, India, 1-270.
- Ravikumar DR and Vittal BPR (1996) Fungal diversity on decomposing biomass of mangrove plant *Rhizophora* in Pichavaram estuary, east coast of India. *Indian Journal of Marine Sciences*, 25: 142-144.
- Sarma V and Vittal BPR (1998-1999) Ecological studies on manglicolous fungi from Godavari and Krishna deltas, East coast of India-observations on the seasonal occurrence. *Kavaka*, 26-27: 105-120.
- Sarma VV and Vittal BPR (2000) Biodiversity of mangrove fungi on different substrata of *Rhizophora apiculata* and *Avicennia sp.* from Godavari & Krishna deltas, East coast of India In: *Aquatic mycology across the Millennium* (Eds K. D. Hyde., W. H. Ho and S. B. Pointing), *Fungal Diversity*, 5: 23-41.
- Sarma VV and Vittal BPR (2001) Biodiversity of manglicolous fungi on selected plants in the Godavari and Krishna deltas, East Coast of India. *Fungal Diversity*, 6: 115-130.
- Sarma VV and Vittal BPR (2002) A preliminary study on vertical distribution of manglicolous fungi on prop roots of *Rhizophora apiculata* Blume at Krishna delta, East coast of India. *Kavaka*, 30: 21-29.
- Sarma VV and Vittal BPR (2004) Manglicolous fungi recorded from Godavari and Krishna deltas, A. P., East coast of India along with dichotomous key and notes on some taxa. *Kavaka*, 32: 65-111.
- Sarma VV, Newell SY and Hyde KD (2001) *Koorchaloma spartanicola* sp. nov., a new marine sporodochial fungus from *Spartina alterniflora*. *Botanica marina*, 44: 321-326.
- Scott Schatz (1988). *Hypoxylon oceanicum* sp.nov.from mangroves. *Mycotaxon* 33:413-418.
- Shindikar M and Borse BD (2002) Marine fungi from mangrove swamps of Vikaroli, Maharashtra, India. *BRI's JAST*, 5: 69-74.
- Shrivastava AD (1995) Marine fungi Bombay V. *Indian Bot. Repr.*, 14: 74-77.
- Sridhar KR and Prasannaraj K (1993) Marine fungi on Decaying wood from Mangalore coast. *Mahasagar*, 26: 33-38.
- Sridhar KR and Prasannaraj K (2001) Biogeography and Biodiversity of higher marine fungi in tropics- A Review. *Ecol. Env. & Cons.* 7(3):219-234.
- Vittal BPR and Sarma VV (2005) Fungal Diversity on mangroves. In: *The fungi- Diversity and conservation in India*, (Eds. Dargan J. S. et al.), Bishen Singh Mahendra Pal Singh, Dehra Dun, (India), pp. 33-45.
- Volkman-Kohlmeier B and Kohlmeier J (1996) How to prepare truly permanent microscopic slides. *Mycologist*, 10: 107-108.

© 2017 | Published by IJLSCI

## 19. Ecofriendly approach of arbuscular mycorrhizal fungi on the growth of Zea maize. *Bionano Frontier*, 10(1): 210-212.

### ECOFRIENDLY APPROACH OF ARBUSCULAR MYCORRHIZAL FUNGI ON THE GROWTH OF ZEA MAIZE L.

R. K. AHER

P.G. Dept. of Botany, New Arts, Commerce and Science College, Parner -414302 (M. S.)  
rangnathaher@gmail.com

**ABSTRACT :** The present research paper deals with the eco-friendly approach of arbuscular mycorrhizal fungus, *Glomus fasciculatum* on the growth and root colonization in zea mays at seedling and anthesis stage. The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments as 25g, 50g, 75g, and 100g of mycorrhizal soil. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Growth parameters like plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth and microbiological parameter like percentage of root colonization were determined. AM fungal associated plants showed significantly higher plant height, leaf length, leaf breadth, number of leaves, leaf area, stem girth and root colonization than non inoculated mycorrhizal plants at seedling and anthesis stage in the zea mays.

**Key words:** Mycorrhiza, *Zea mays*, plant growth, root infection

#### INTRODUCTION:

Zea mays, corn or maize, is an annual grass in the Poaceae (grass family) that originated in Central America and is one of the top three cereal crops grown in the world, along with rice (*Oryza sativa*) and wheat (*Triticum* spp.), with 2010 global commercial production of dried corn totaling 844.4 million metric tons, harvested from 161.9 million hectares. Corn is used fresh for human consumption or may be dried and ground into flour or meal, important in India and other countries dishes, or popped and eaten as a snack. Corn oil, obtained from the grain, is used in cooking as well as many industrial uses, and corn starch from processed grain is used as a thickener in sauces and puddings. Mycorrhizas are symbiotic relationships between fungi and plant roots (the term means literally 'fungus root'). Perhaps more than 80% of the species of higher plants have these relationships, and so do many peridophytes and some mosses. They are as common on crop plants (cereals, peas, tomatoes, onions, apples, strawberry, etc) as in wild plant communities, and in several cases they have been shown to be important or even essential for plant performance.

To a large degree, mycorrhizas seem to be symbiotic (mutualistic) relationships, in which the fungus obtains at least some of its sugars from the plant, while the plant benefits from the efficient uptake of mineral nutrients (or water) by the fungal hyphae. However, there can be circumstances in which the fungus is mildly detrimental, and others in which the plant feeds from the fungus. Arbuscular mycorrhizal fungi (AMF) belong to class Zygomycetae under order Glomales. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Many thousands of experiments have shown that AMF can overcome nutrient limitation to plant growth by enhancing nutrient acquisition (Clark and Zeto, 2000). The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. The general process of phosphorus uptake consists of three sub-processes: (i) absorption from soil by AMF hyphae, (ii) translocation along the hyphae from external to internal

(root cortex) mycelia, (iii) the transfer of phosphate to cortical root cells (Barea, 1991). The extensive extrametrical hyphae of AMF extend out into the soil for several centimetres so that it bridges the zone of nutrient depletion. Thus, the plant is able to exploit microhabitats beyond the nutrient depleted area where rootlets and root hair cannot thrive (O'Keefe and Sylvia, 1993). This investigation deals with the eco-friendly approach of arbuscular mycorrhizal fungus on zea mays.

#### MATERIAL AND METHOD :

Present study carried out in the Research centre, Department of Botany, New Arts, Commerce and Science College, Ahmednagar. The authentic seeds of zea mays early maturing hybrids FH-3211 were used for experimental work.

The pure culture of AM fungus, *Glomus fasciculatum* procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil (1:1 v/v) mixture (Sylvia, 1994). After 84 days under green house conditions a density of 25-29 spores per g soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16 kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (18kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Plants were watered as required. The said experiment was replicated three times. The effect of AM fungi was analyzed for various growth parameters at seedling and anthesis stage



## 20. Influence of groundnut to seed inoculation with AMF. Bionano Frontier10(1)

## INFLUENCE OF GROUNDNUT TO SEED INOCULATION WITH AMF

R. K. AHER

New Arts, Commerce and Science College, Parner, Dist- Ahmednagar, M.S., India  
rkaher69@gmail.com

**ABSTRACT** → Soil inoculation with various AM fungi in general resulted in significantly higher infection than that of uninoculated control although the differences among AM fungi were significant. Seed inoculation with *Rhizobium* combined with soil inoculation with AM fungi significantly increased the root infection by the AM fungi over its correspond control. However, *Rhizobium* application alone did not show any significant increase in root infection by AM over uninoculated control. Among the different AM fungi tested, *Glomus fasciculatum* and *G. mosseae* produced the highest root infection. Inoculation of seeds with *Rhizobium* increased the root nodulation significantly in terms of the number and biomass of nodules and ARA values over uninoculated control.

**Keywords:**

**INTRODUCTION:**

The oil seed crop of groundnut (*Arachis hypogea*, L) is an important crop. Oil seed crops are important crops of a very high economic and commercial values and are reported to have a mycorrhizal association. The symbiotic association between fungi and roots of plants is called mycorrhiza means fungus root. The mutualistic association of plant roots and fungus for which the term "Mycorrhiza" was coined. The involvement in mineral uptake from soil, they are referred as 'phosphorus gathering fungi. Mycorrhizal fungi are well distributed in every environmental condition and do not show physiological specialization. Now a days, lot of problems appear in the agriculture, like soil pollution, plant diseases, low productivity etc. therefore to solve these problems the VAM fungi plays an important role in sustainable agriculture. Hence this project was taken for the present investigation.

The importance of vesicular-arbuscular mycorrhizal (VAM) fungi has received considerable attention in recent years owing to their beneficial response in improving the crop productivity (Hayman and Mosse 1977; Tilak 1993). Information on the selective association of VAM with groundnut is meagre. Under natural soil conditions, groundnut is reported to be highly mycorrhizal. Significant response of groundnut to inoculation with VAM fungi in phosphorus-deficient soils has been reported (Ross 1970; Ravekar, Tilak 1988) Abdel-Fathah, 1997. The present report deals with the field evaluation of different AM fungi on groundnut.

**MATERIALS AND METHODS:**

A soil and sand mixture containing extramatrical chlamydo spores and infected root with either *Glomus fasciculatum*, *G. mosseae*, *Gigasporacalaspota*, *G. margarita*, *Glomushalon*, or *G. versiforme* grown for 80 days served as inoculum. The inoculum contained 100-125 spores per 100 g soil. A thin layer of inoculum (200 ml) was placed 2 cm below the soil surface in rows, 1 m long, before sowing to produce mycorrhizal plant.

The seeds of *A. hypogea* were treated with a carrier-based (soil charcoal—1:3) inoculant of *Rhizobium* having a

population of  $1.0 \times 10^8$  cells/g air dry carrier at the rate of 100 g/100 kg seed. The seeds were sown immediately. The uninoculated control received neither AM nor the *Rhizobium* application. The experiment was laid out in a randomized block design consisting of seven VAM and two *Rhizobium* treatments. Each treatment was replicated three times. The plot size was 4 m. Phosphorus was applied at the rate of 250 g  $P_2O_5$  h<sup>-1</sup> in the form of single superphosphate at the time of seeding.

**RESULTS AND DISCUSSIONS:**

The percentage of mycorrhizal infection was determined 70 days from the time of the slide technique. The total number of nodules, dry weight of nodules, and nitrogenase activity were recorded after 80 days of plant growth. The Abdel-Fathah, (1997) yield was recorded at the time of plant maturity. Soil inoculation with various AM fungi in general resulted in significantly higher infection than that of uninoculated control although the differences among AM fungi were significant (Table 1). Seed inoculation with *Rhizobium* combined with soil inoculation with AM fungi significantly increased the root infection by the AM fungi over its correspond control (soil inoculation with AMF alone). However, *Rhizobium* application alone did not show any significant increase in root infection by AM over uninoculated control. Among the different AM fungi tested, *Glomus fasciculatum* and *G. mosseae* produced the highest root infection (Table 1).

Inoculation of seeds with *Rhizobium* increased the root nodulation significantly in terms of the number and biomass of nodules and ARA values over uninoculated control. Various AM fungi did not bring any significant variation in root nodulation. A similar trend was noticed on groundnut yield also (Table 2). Soil inoculated with *Glomus fasciculatum* and *G. mosseae* in the presence of *Rhizobium* produced significantly higher groundnut yield than their corresponding controls. The observed responses to inoculation with *G. fasciculatum* and *G. mosseae* can be ascribed to better compatibility and the establishment of the endophyte with groundnut. Aher et al., (2005) also observed comparative efficacy of different AMF species on





TOGETHER WE REACH THE GOAL



**SJIF Evaluation on Request**

The Editorial Staff who decide to use of this option will receive the SJIF Value within 7 days.

**SJIF Publishers Panel**

**Register journal - (Free Service)**  
in a scored and prestigious database of scientific journals.

**Manage journal - (Free Service)**  
This section allows you to place information about the journal, editors, and publisher, etc.

**SJIF Journal Rank**

Full list of journals from database of SJIFactor.com. It contains currently over **23000 journals** from all over the world.

**Certificate**

A proof of being indexed in SJIF Journal Rank List.

**Evaluation methodology**

**FAQ**

**BIONANO FRONTIER**

**SJIF 2022:**

**Previous evaluation SJIF**

**Under evaluation**

2021: Not indexed

Area: Multidisciplinary

2020: 6.673

Evaluated version: online

2019: 6.435

2018: 7.231

**The journal is indexed in:**

SJIFactor.com

**Basic information**

Main title	<b>BIONANO FRONTIER</b>
ISSN	2320-9593 (E) / 0974-0678 (P)
URL	<a href="http://www.bionanofrontier.org">http://www.bionanofrontier.org</a>
Country	India
Journal's character	Scientific
Frequency	Biannual
License	Free for non-commercial use
Texts availability	Free

**Contact Details**

Editor-in-chief	Dr. Prabhakar Dongre Department of Biophysics University of Mumbai India
Publisher	Dr. Vinod Jamdhade 203 Vimala Plaza Plot-16 Sector-5 Ghansoli Navi Mumbai 400 701

**Journal's description**

The main objective of this peer reviewed multidisciplinary journal is to encourage the academicians and researchers those who are actively engaged in research specially in Botany, Zoology, Microbiology, Bio-Physics, Biotechnology, Nanotechnology, Bio-Chemistry, Applied biology, Hydrology, Food Chemistry, Environmental Chemistry, Biopharmaceutics, Pharmacology, Bioinformatics,

21. To determine the sensitivity of wheat to water stress and changes in yield of wheat.  
Indo Asian research Journal. 3(5):1-4.

<b>Indo Asian Research Reporter (IARR)</b>		<b>IMPACT FACTOR 1.77</b>
		ISSN 2454-3306
Indo Asian Research Reporter (IARR)		Issue : III, Vol.V
		June 2016 To May 2017
		www.Irasg.com
Research Paper	47	Botany
<b>TO DETERMINE THE SENSITIVITY OF WHEAT TO WATER STRESS AND CHANGES IN YIELD OF WHEAT</b>		
<p><b>Rangnath Aher</b> Dept. of Botany, New Arts, Commerce and Science College, Parner, Dist- Ahmednagar (MS) India</p>		
<b>ABSTRACT</b>		
<p><i>A field experiment was conducted to determine the sensitivity of wheat to water stress and changes in water relations and yield of wheat (<i>Triticumaestivum</i> L.) under water stress conditions applied at different growth stages. The effect of different levels of moisture stress on number of leaves and leaf area at seedling and anthesis stage. The results clearly showed that with increase in water stress, under water stress conditions the total chlorophyll content of leaves decreased. The water stress enhanced proline content in leaves. The highest proline content was observed in the cultivar under 20% FC at seedling and anthesis stage. Increase in phenolic content under water stress due to the triggered metabolism of shikimic acid pathway for phenol synthesis.</i></p>		
<p><b>Introduction:</b></p> <p>Wheat (<i>Triticumaestivum</i> L.), a member of family Poaceae, is an important cereal for staple food. It plays an important role in human nutrition and agriculture economy of country. Food security in the world is challenged by increasing</p>	<p>food demand and threatened by declining water availability (Zwart and Bastiaanssen 2004). Water deficit is considered to be among the most severe environmental stresses and the major constraint on plant productivity: losses in crop yield due to water stress probably exceed the loss from all</p>	
Indo Asian Scientific Research Organization (IASRO) (A Division of Indo Asian Publication)		

The screenshot displays the ISSN Portal interface. At the top, it features the ISSN logo and the text 'ISSN PORTAL for Cataloging Resources'. Navigation links include 'AREA DE EDITORES', 'DESCUBRIR LOS SERVICIOS DE ISSN', 'BUSCAR RECURSOS EN ACCESO ABIERTO', 'KEEPERS REGISTRY', and 'EL CENTRO INTERNACIONAL DEL ISSN'. A search bar contains the text 'Todo, ISSN, Título' and 'Todo', with a 'Buscar' button. Below the search bar are links for 'Búsqueda avanzada', 'Búsqueda ROAD', and 'The Keepers search'. The main content area shows search results for 'Indo Asian research reporter' with the following details:

- Identificadores:** ISSN:2454-3306, ISSN de enlace (ISSN-L): 2454-3306
- Información del recurso:**
  - Título propiamente dicho: Indo Asian research reporter.
  - País: India
  - Medio: Impresa

On the right side, there is a 'Mis herramientas' section with options: 'Compartir el registro', 'Imprimir', and 'Mostrar datos vinculados'. Below this is a section for 'Disfrute de las funcionalidades Premium' with the option 'Desbloquear las funciones'. At the bottom left, there is an 'Enlaces' section with links for Google, Bing, and Yahoo.

22. The Underutilized Vegetables from Parner Tahsil of Maharashtra (India): A Review

# REPRINT

ISSN 0970-3586Registration No. 47893/08


Parner, Dist. Ahmednagar-414302 (MS) India.  
E-mail : dr.skaher@yahoo.com

The present study reveals about the vast diversity of rarely used vegetable plants by the tribes as well as the members of Parner tahsil of Maharashtra, India. The information given here is collected from the knowledge of the informants through verbal and informal interviews at their working place. These vegetables form a distinct group which includes roots, leaves, tubers, shoot, fruits, flowers, seeds, etc. Analysis of the infamilial data revealed that fifty six plant species belonging to forty seven genera representing twenty eight families are reported to be rarely used vegetables. Out of all the plant species, majority of genera belongs to family I (Solanaceae), followed by Cucurbitaceae (7 Species), Amaranthaceae (6 Species), Anacardiaceae (5 Species), Solanaceae (4 Species), Asclepiadaceae, Brassicaceae and Asteraceae (2 species each) and rest of the families (1 species each).

## Advances in Plant Sciences

(An International, Biannual Research Journal Published under the auspices of Academy of Plant Sciences, India)

This publication is included in the abstracting and indexing coverage of Medicinal and Aromatic Plant Abstracts, Indian Science Abstracts, C.A.B. International Horticultural Abstracts, C.A.B. International Plant Pathology Abstract, Parvavaran Abstract, Bio Science Information Service (Biological Abstracts), Current Indian Forestry Environment and Wild life Abstracts and others.



**Editor-in-chief :**  
**Dr. S.K. Gupta**  
*M.Sc., Ph.D.*  
Retd. Head, Department of Botany  
D.A.V. College, Muzaffarnagar-251001, U.P. India

**Mailing Address :**  
Chief Editor,  
Advances in Plant Sciences  
770, South Civil Lines,  
Muzaffarnagar-251001, U.P. India  
☎ (0511) 2621276

1/2

ISSN 0970-3586

Ad. Plant Sci. 30 (I) 17 - 20, 2017



## The Underutilized Vegetables from Parner Tahsil of Maharashtra (India) : A Review

S.K. Aher

Post Graduate Department of Botany, New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar-414302 (MS) India.  
E-mail : dr.skaher@yahoo.com

The present study reveals about the vast diversity of rarely used vegetable plants by the tribes as well as poor villagers of Parner tahsil of Maharashtra, India. The information given here is collected from the knowledgeable informants through verbal and informal interviews at their working place. These vegetables formed the largest group which includes roots, leaves, tubers, shoot, fruits, flowers, seeds, etc. Analysis of the information revealed that fifty six plant species belonging to forty seven genera representing twenty eight families were found to be rarely used vegetables. Out of all the plant species, majority of genera belongs to family Fabaceae (14 Species), followed by Cucurbitaceae (7 Species), Amaranthaceae (6 Species), Anacardiaceae, Convolvulaceae, Asclepiadaceae, Brassicaceae and Asteraceae (2 species each) and rest of the families include one species each. Underutilized species hold a great genetic diversity and are a vast heritage of traditional indigenous knowledge. Due to modernization, the knowledge and importance of these traditional delicacies is missing. Present study was initiated to document the basic information of these food plants and for popularizing these valuable plants in future.

**Keywords :** Rare vegetable plants, Local inhabitants, Wild resources, Parner Tahsil.

### INTRODUCTION

Since time immemorial, man is utilizing wild plants for food, fodder, medicine, vegetable, agricultural tools, house construction, etc. Dietary use of wild fruits, nuts, seeds, leaves, tubers, corms appear in numerous record from ancient Egypt. The nutritional value of traditional wild plants is higher than several known vegetables and fruits (Nordeide *et al.*, 1996). Therefore it's our prime duty to document all these rarely used wild plants scientifically and investigate their importance.

The knowledge of consumption of vegetables and fruits and their use is only limited to senior peoples of this area. On the other hand the younger generation has very insufficient or quite knowledge about the plant parts used. There is need to develop awareness as well as interest in younger generation about the use of these plants. Unless efforts are made to educate the younger generations about their importance, this traditional knowledge may be lost in near future.

Exploration of natural resources and documentation of traditional knowledge is necessary. Several attempts has been to list out the wild edibles of India (Arinathan *et al.*, 2007; Reddy, 2012; Ballabh *et al.*, 2007; Kayang, 2007; Bhogaonkar *et al.*, 2010; Sinha and Lakra, 2005; Deshmukh and Shinde, 2010). Present work is an attempt to explore the traditional knowledge of rarely used edible plants of Parner tahsil of Maharashtra State.

Indigenous people have long history and expertise in the use of plants for various purposes, but information on these plants and their uses is mainly passed from one generation to other orally and even to date is poorly documented. The lack of organised documentation for various vegetable plant knowledge may also contribute to the loss of vegetable plants knowledge. Like every communities in the developing nations, the people of Parner tahsil uses various vegetable plants to meet their domestic and health needs. However, the area remains unexplored and no comprehensive account of local tradition is available. Hence to fill the gap the present investigation has been undertaken.

### MATERIAL AND METHODS

The present study is based on the field survey of Parner tahsil of Maharashtra. For the purpose the voucher specimens used for vegetables were collected and documented. The plant specimens were collected by knowing their vernacular names through the knowledge informants (Schulte, 1962 and Jain and Rao, 1967). The specimens were maintained in herbarium of the postgraduate department of Botany. The plant parts used for preparations are enumerated in Table 1 with correct botanical name followed by vernacular name, family, habit of the plant as well as their occurrence. The literature available (Cooke, 1967; Hooker 1872-1897; Naik, 1998; Singh and Kartikeyan, 2000; Pradhan and Singh, 1999) were also

23. Aerobiological Studies with Special Reference to Ascospores Over Groundnut Field at Ahmednagar, Maharashtra

**REPRINT**


ISSN 0970-3586 Registration No. 47893/88

**S.K. Aher**  
 Post Graduate Department of Botany, New Arts, Commerce and Science College,  
 Parner, Dist. Ahmednagar - 414 302 (MS) India.  
 E-mail : dr.skaher@yahoo.com

natural survey of airborne microbial components was conducted over the groundnut field (var. SB 11) at Walunj, Ahmednagar (M.S.) in order to access the incidence and prevalence of Ascomycotina flora and its relevance with the meteorological data. During the study a total 25 types of Ascomycotina spores were identified over groundnut field by using Venturieri's method. *Phringshemia* contributed maximum number of spores 2.74% and 32.49% in winter and summer respectively. *Ascostricha* contributed 24.80% and 7.72 %.

**Advances in Plant Sciences**  
 U.G.C. APPROVED JOURNAL with NAAS SCORE - 2.90 (w.e.f. January 2017)  
 (An International, Biannual Research Journal Published under the auspices of Academy of Plant Sciences, India)

This publication is included in the abstracting and indexing coverage of Medicinal and Aromatic Plant Abstracts, Indian Science Abstracts, C.A.B. International Horticultural Abstract, C.A.B. International Plant Pathology Abstract, Panayaran Abstract, Bio Science Information Service (Biological Abstracts), Current Indian Forestry, Environment and Wild life Abstracts and others.



<p><b>Editor-in-chief :</b>  <b>Dr. S.K. Gupta</b>                  M.Sc., Ph.D.                  Retd. Head, Department of Botany                  D.A.V. College, Muzaffarnagar - 251001, U.P., India</p>	<p><b>Mailing Address :</b>                  Chief Editor,                  Advances in Plant Sciences                  770, South Civil Lines,                  Muzaffarnagar - 251001, U.P., India                  Tel: 01331-2621270</p>
---	--

# REPRINT

ISSN 0970-3586

Registration No. 47893/88

**S.K. Aher**

Post Graduate Department of Botany, New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar - 414 302 (MS) India.

E-mail : dr.skaher@yahoo.com

nural survey of airborne microbial components was conducted over the groundnut field var. SB 11) at Walunj, Ahmednagar (M.S.) in order to access the incidence and pe on of Ascomycotina flora and its relevance with the meteorological data. During the on total 25 types of Ascomycotina spores were identified over groundnut field by using V color. *Phringshemia* contributed maximum number of spores 2.74% and 32.49% in voler. *Phringshemia* contributed 24.80% and 7.72 %, *Ascotricha* c

## Advances in Plant Sciences

**U.G.C. APPROVED JOURNAL** with **NAAS SCORE - 2.90** w.e.f. January 2017

*(An International, Biannual Research Journal Published under the auspices of Academy of Plant Sciences, India)*

This publication is included in the abstracting and indexing coverage of Medicinal and Aromatic Plant Abstracts, Indian Science Abstracts, C.A.B. International Horticultural Abstract, G.A.B. International Plant Pathology Abstract, Panavaran Abstract, Bio-Science Information Service (Biological Abstracts), Current Indian Forestry Environment and Wild life Abstracts and others.



**Editor-in-chief :**

**Dr. S.K. Gupta**

M.Sc., Ph.D.

Retd. Head, Department of Botany

D.V.V. College, Mozamamagar-251001, U.P. India

**Mailing Address :**

Chief Editor,

Advances in Plant Sciences,

770, South Civil Lines,

Mozamamagar - 251001, U.P. India

© (0131) 2621276



## Aerobiological Studies with Special Reference to Ascospores Over Groundnut Field at Ahmednagar, Maharashtra

S.K. Aher

Post Graduate Department of Botany, New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar - 414 302 (MS) India.  
E-mail : dr.skaher@yahoo.com

An extramural survey of airborne microbial components was conducted over the groundnut field (*Arachis hypogea* L. var. SB 11) at Walunj, Ahmednagar (M.S.) in order to access the incidence and percentage contribution of Ascomycotina flora and its relevance with the meteorological data. During the present investigation total 25 types of Ascomycotina spores were identified over groundnut field by using Volumetric Tilak Air Sampler. *Phringshemia* contributed maximum number of spores 2.74% and 32.49% in first and second summer crop seasons respectively. *Sordaria* contributed 24.80% and 7.72 %, *Ascotricha* contributed 14.75% and 10.98%, *Amphisphaerella* occurred 13.71 % and 7.80% while *Cheatomium* contributed 9.40% and 8.63% in first and second summer seasons respectively. Meteorological data throughout the period of investigation was maintained to correlate with the incidence of pathogen, time of liberation of spores and disease incidence.

**Keywords :** Ascomycotina flora, Percentage contribution, Meteorological parameters, Summer seasons, Ahmednagar.

### INTRODUCTION

Groundnut (*Arachis hypogea* L.) is an important food and oil seed crop in tropical and subtropical regions of the world. It is world's fourth most important source of edible oil and third most important source of vegetable protein. In Maharashtra, it is grown in Kharif and summer seasons. About 75 million hector of land is under groundnut cultivation and the production is about six million tonnes. However, it is subjected to various airborne fungal diseases like tikka disease caused by *Cercosporidium arachidicola* Hori and *Cercosporidium personatum* (Berk and Curt) Deighton, rust disease caused by *Puccinia arachidis* Speg., leaf spot of *Leptosphaevulina crassica* (Sachet) Jackson & Bell, *Alternaria Alternata* (fr.) Keissiel and *Myrothecium roridium* Rode ex. Fr, etc. which causes extensive damage in the quality as well as quantity of the yield. The forecasting of airborne fungal diseases could be attempted if the information on the airspora of this crop is available.

It is proposed to carry out the aerobiological investigation over the groundnut to find out the time and date of the onset of the pathogen and subsequent inset of the disease, severe epiphytic, if any and the role of the environmental factors for the survival and dissemination of the pathogen, Kalkar and Patil, 1997; Arsule and Pande, 2011; Aher et al., 2002; Shinde and Mahajan, 2014; Sreenivasulu, 1970; Rajlaxmi and Shakila, 2008; Mall and Gaikawad., 2011;

Kadam et al., 2008 studied the influence of climatic and other factors and growth stages of crop and the incidence of disease on various crop. In the present communication, an attempt has been made to explore the quantitative and qualitative assessment of Ascomycotina spores and its relevance with the meteorological parameters over the groundnut field at Ahmednagar.

### MATERIAL AND METHODS

The aerobiological investigations have been carried out with the help of Tilak continuous air sampler (Tilak and Kulkarni, 1970) over the groundnut field. The sampler continuously runs with 320V current and the drum present inside the sampler completes one rotation in eight days. The air sampler was operated over the groundnut fields for two consecutive summer seasons i.e., first season from 12<sup>th</sup> May 1990 to 31<sup>st</sup> August 1990 and second season from 5<sup>th</sup> May 1991 to 20<sup>th</sup> August 1991 at Walunj, Ahmednagar (Table 1), Regular visits to the field were arranged for assessing the disease incidence in the field during the period of present investigation.

The culture plates were also exposed periodically for the study. In order to understand the exact morphology of the fungal spores, the petriplates of PDA media were exposed at every eight days interval for 15 minutes, at the sampling site. Thus the reference slides were prepared for comparative study of the fungal spores.



24. Study of Some Sacred Plants of Ahmednagar District, Maharashtra

12/31/2019 ABOUT THE JOURNAL | International Journal of Current Research

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**  
 (PEER-REVIEWED OPEN ACCESS JOURNAL: FAST PUBLICATION) ISSN: 0975-833X; IMPACT FACTOR: 7.749

ISSN-0975-833X Quality Scientific Publishing: Frequency: Monthly

Crossref

HOME ABOUT US EDITORIAL BOARD INSTRUCTION TO AUTHOR CURRENT ISSUE ARCHIVE SUBMIT ARTICLE CERTIFICATE REVIEWERS FORM CONTACT

CATEGORIES

- Indexing & Abstracting
- Editorial Board
- Submit Manuscript
- Instruction to Author
- Current Issue
- Past Issues
- Special Issue
- Call for papers November 2019
- Ethics and Malpractice
- Conflict of Interest Statement
- Statement of Informed Consent
- Final Proof Correction and Submission
- Publication Ethics
- Peer review process
- Cover image - October 2019
- Index Copernicus ICV 2016
- Quick Response - Contact Us

- People
- Contact
- Editorial Board
- Policies
- Focus and Scope
- Section Policies
- Open Access Policy
- Memberships
- Submissions
- Online Submissions
- Author Guidelines
- Conferences
- Books
- Other
- Site Map
- Editorial and Publishing Process
- Statistics

CALL FOR PAPERS

**Call For Paper**

**ARTICLE SUBMISSION**

AUTHOR INFORMATION

- Copyright Form
- Join Editor & Peer Reviewers
- Paper Submission
- Impact Factor
- Policy of Screening

CERTIFICATE

**CERTIFICATE**  
 International Journal of Current Research  
 2019

IMPACT FACTOR 2018

**CERTIFICATE OF INDEXING-IJCR 2018**

SUBJECT AREA

journalra.com/about-journal

IMPACT SJIF IMP

INTEP MED

CHEF EC Rosane C ASSOCIA

Jean-Mar Chief Sa



ISSN: 0975-833X

Available online at <http://www.journalsri.com>International Journal of Current Research  
Vol. 9, Issue, 10, pp.59706-59709, October, 2017INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

## RESEARCH ARTICLE

## STUDY OF SOME SACRED PLANTS OF AHMEDNAGAR DISTRICT, MAHARASHTRA, INDIA

\*Aher S. K.

Department of Botany, New Arts, Commerce and Science College, Parner, Dist. Ahmednagar - 414 302  
(MS), India

## ARTICLE INFO

## Article History:

Received 29<sup>th</sup> July, 2017  
Received in revised form  
17<sup>th</sup> August, 2017  
Accepted 29<sup>th</sup> September, 2017  
Published online 31<sup>st</sup> October, 2017

## Key words:

Plant, Worship, Tradition, Ahmednagar  
District.

## ABSTRACT

Biodiversity is an important gift of nature that provides all basic requirements for human existence. Since time immemorial plants have played an important role in human civilization. It has been observed that large number of plants being used for the worshipping of gods and goddesses as well as for socio-religious functions which serve as a useful tool for conservation of plants. A present article attempts to highlight the importance of some sacred plants which are traditionally used in Ahmednagar District of India. A total of about 57 species under 54 genera and 33 families were recorded during the study. People of the study area are highly religious. These beliefs are not only showing the human relation with plant diversity, but also help in the conservation of species.

Copyright © 2017, Aher. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Aher S. K. 2017. "Study of some sacred plants of Ahmednagar district, Maharashtra, India", *International Journal of Current Research*, 9, (10), 59706-59709

## INTRODUCTION

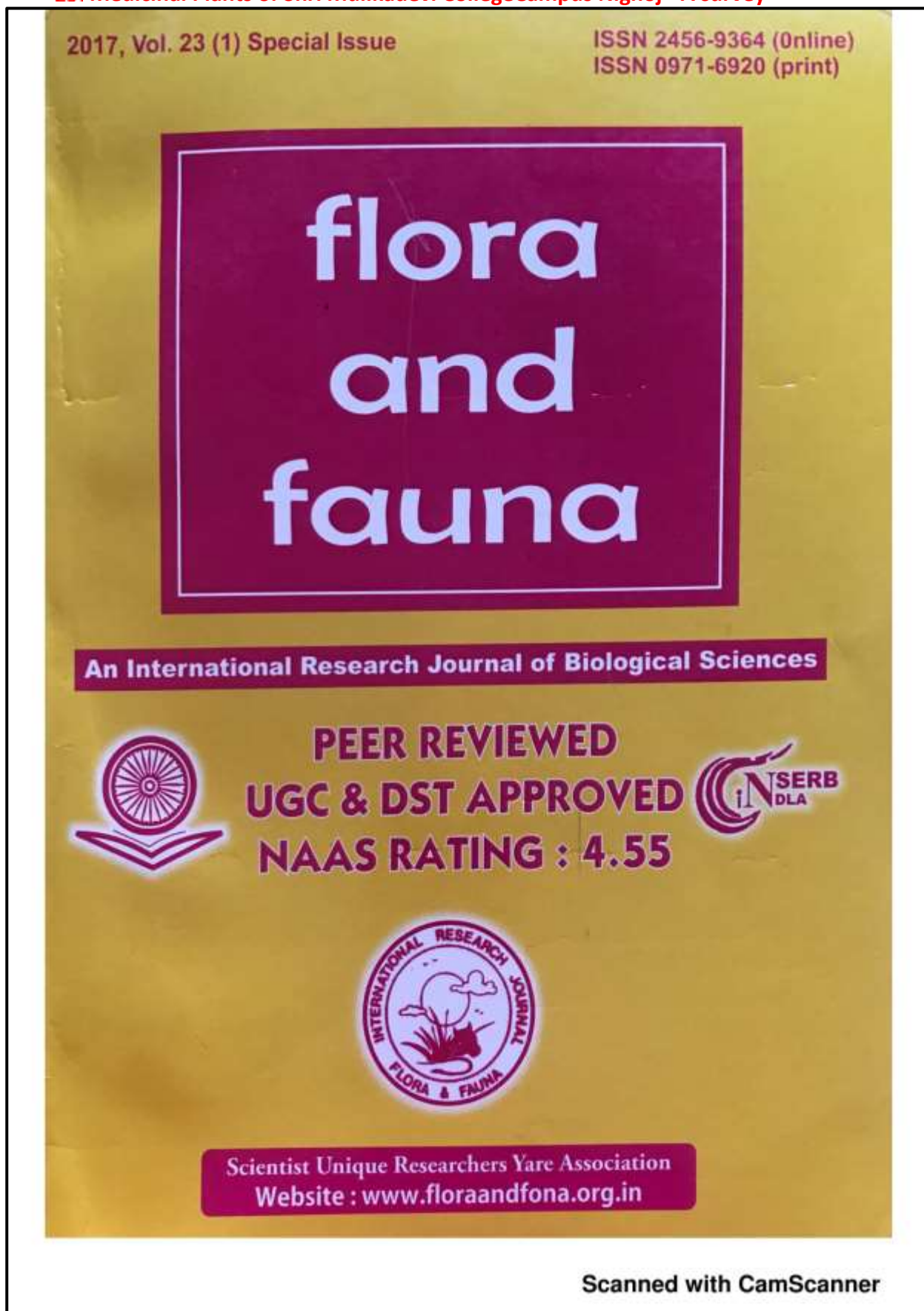
Plant biodiversity has gained immense importance in traditional rituals in India since Vedic period. Sacrifice, in fact has immense importance not only in Hindu religion but in many other religions also. Breaking of coconut to please a God is the form of sacrifice. Similarly many different forms of sacrifice are popular in Hindu religion that includes use of flowers, fruits, leaves or seeds. People of this country have been worshipping various plants, animals and rivers since ancient time. India is famous for its rich heritage and rituals. Some ceremonial and ritual acts are common in every religions, which focused on sacred objects and symbols with the supernatural power (Sapkota, 2013). People worship them as icons of Gods and Goddesses, thereby grown or protected with special care (Manandhar, 2012). Sacred plants have been conserved by the people on the basis of their category, habitat, need and availability (Poudel, 2009). Plants like *Azadirachta indica*, *Ocimum sanctum*, *Cocos nucifera*, *Saraca indica*, *Ficus benghalensis*, *Ficus religiosa*, *Aegle marmelos*, *Terminalia arjuna* are highly respected and are planted in the public places like temple or even in the private area. People belonging to different religions have different priorities of conservation and ultimately large number of species are conserved (Shrestha et al., 2010). *Ber* (*Zizyphus jujuba*) and *bel* (seeds of *Elaeocarpus*) are considered dear to Lord Siva;

\*Corresponding author: Aher, S. K.  
Department of Botany, New Arts, Commerce and Science College, Parner,  
Dist. Ahmednagar - 414 302 (MS), India

*kadamba* (*Anthocephalus cadamba*) to Lord Krishna; *pipal* (*Ficus religiosa*) and *sala* (*Shorea robusta*) to Lord Vishnu; *ashoka* (*Polyalthia longifolia*) to Kamdeva; *Cynodon dactylon* to Lord Ganpati; *mango* (*Mangifera indica*) to Lord Hanuman; *silk cotton* (*Bombax malabaricum*) to the goddess Laxmi; and *sriphala* or coconut (*Cocos nucifera*) to Varuna or the Lord of waters, and to many other gods and goddesses. Coconut is also used while performing all the Hindu rituals and offered in all kinds of pujas. Flowers, leaves and fruits of many plants have also been regarded as a sacred and beloved of Gods and Goddesses, and hence are used in various types of worships or pujas and Yagyas. Leaves of ashoka and banana are the most common materials for decorating places for sacred rituals and for festivals. The coconut or the fruiting branch of the *supari* (*Areca nut palm*) are also commonly used. Rice and seeds such as sesame are associated with many rites. When proper statues are lacking for *puja* to the *navgraha*, the nine planets of Hindu astrology, Brahmin priests may invoke each planet by using the specific seed, spice or dal that is ritually associated with it. For the performance of *havana*, or *homa*, the Vedic fire ceremony, the twigs of some plant species are recommended. Bamboo is associated with the Brahmin thread ceremony and for worship ancestors.

Chandan, sandalwood is among the elite and most renowned of sacred trees. The wood is rubbed on stone and paste is widely used for anointing the forehead as well as for the incense and in ayurvedic preparations. Mango is another very sacred tree in India whose leaves, wood as well as fruits are used in many

25. Medicinal Plants of Shri Mulikadevi College Campus Nighoj - A survey



FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

109

**MEDICINAL PLANTS OF SHRI MULIKADEVI COLLEGE NIGHOJ CAMPUS (MS),  
INDIA: A SURVEY**  
AHER S.K.<sup>1</sup> AND A.A. ADSUL<sup>2</sup>

<sup>1</sup>Post Graduate Department of Botany,  
New Arts Commerce and Science College Parner,  
Dist. Ahmednagar (MS) - 414 302.

<sup>2</sup>Shri Mulikadevi College, Nighoj,  
Tal. Parner, Dist. Ahmednagar (MS) - 414 602.

**ABSTRACT**

The Present paper focus on identification and documentation of wild and cultivated medicinal plant diversity in the Shri Mulikadevi College, Nighoj Campus (Maharashtra). It was found that a total of 56 plant species (Monocot and Dicot) belonging to 36 families are medicinally important. It was found that root, leaves, flowers, fruits, wood, seeds and even bark of many plants are medicinally used. On the basis of collected plants and its information regarding medicinal uses through the field survey and literature studies, it is observed that they are used as tonics, anti-oxidants, antifungal against skin diseases, asthma, swelling, cancer, cough etc. Thus indirectly they act as a alternate source of medicinal drugs, which are easily available in natural habitat. Hence during upcoming time by analyzing these plants for available bioactive contents they may be introduced as future herbal medicine.

Figure:02

References:17

Table:00

**KEYWORDS:** Survey, Medicinal value, College campus.

**Introduction**

India is one of the 12 mega diverse countries of the world with 16 agro climatic zones, 12 vegetative zones, 15 biotic provinces and 426 biomes with 15000 medicinal plants, out of which 600 used in *siddha*, 700 in *unani* and 7000 in *ayurveda* (Hota and Chatterjee, 2016). World Health Organization estimate over 80 % of the people in developing countries depend on traditional medicines for their primary health needs. In the developed countries, 25% of the medicinal drugs are based on plants and their varieties (Sivaranjani and Ramakrishnan, 2012). In India, over 400 difference tribes and other ethnic groups are constituting about 7.5 % of the total population. There are many ethnic groups with rich cultured heritage still using traditional herbal medicine for treating various diseases ( Hota and Chatterjee, 2016; Newman et al., 2007, Ghosh, 2007, Mondal, 2008; Rollinger et al., 2006 ).

The market for ayurvedic medicines is estimated to be expanding at 20% annually in India (Subrat, 2002). Only 15%

pharmaceutical drugs are consumed in developing countries and relatively more affluent people take a large proportion of even this small percentage (Toledo, 1995). From ancient times various types of skin diseases fever, asthma, headache, vomiting, cough, cold, dental problems, hair problems, wound, liver diseases etc. are treated with plant origin medicines.

There is huge collection of Indian medicinal plants used for treating various diseases. This study therefore attempts to compile traditional knowledge of the local people. This would help the proper management and conservation of these plants that provide a base which can offer immense scope for researchers engaged in validation of the traditional claims and development of new bio-actives for cure or management quite prevalent diseases.

**Material and Methods**

The studies on medicinal plants were carried out by survey and collection of data as well as observation on medicinal plants. The

## 26. Influence of water stress on protein profile on promising sorghum cultivars

INFLUENCE OF WATER STRESS ON PROTEIN PROFILE ON PROMISING *SORGHUM* CULTIVARS

**Ravindra N. Deshmukh**  
Department of Botany and Research Centre,  
New Arts, Commerce and Science College  
Parner, Ahmednagar,

drought condition.

**KEYWORDS:** *Sorghum bicolor*, Water stress, Field Capacity, Protein Profile, SDS-PAGE.

**INTRODUCTION:**

The most popular and economically important rainfed cereal crop *Sorghum bicolor* (L.) Moench, popularly called as "camel crop" because of its drought resistance, ranks 1<sup>st</sup> in the state of Maharashtra, 3<sup>rd</sup> in India and 5<sup>th</sup> in the world among the major food crops (Deshmukh Ravindra, 2017)

This crop is widely grown in the states like Maharashtra, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Rajasthan, Karnataka, Gujarat and Tamilnadu in both the seasons, i.e. *kharif* and *rabi*. In India, sorghum occupied an area of 6180000 hectares, which is highest in the world, with the production of 5280000 metric tons of grains and an average productivity of 854 kg ha<sup>-1</sup>. In the state of Maharashtra, sorghum is the major cereal crop occupying an area of about 1935.3 thousand hectares with the annual production of 3162 thousand tons and an average productivity of 612 kg ha<sup>-1</sup> (Deshmukh Ravindra, 2017).

*Rabi* sorghum predominately grown in the states of Maharashtra usually on the residual soil moisture and the yield is a function of *kharif* rains. Thus, *rabi* sorghum generally suffers from severe moisture stress. This situation totally disturbs the *rabi* production levels especially on light and medium soils, where grain and fodder yields are drastically reduced (Bapat and Gujar, 1990).

**ABSTRACT**

The present investigation was aimed to study the influence of water stress on protein profile on promising *Sorghum* (*Sorghum bicolor*) cultivars e.g. RSV-669, RSV-626, RSV-623 and RSV-629 along with check RSLG-262, under different levels FC % (Field Capacity) at seedling as well as anthesis stage.

The drought tolerant promising cultivar RSV-669 has synthesized a new protein of □35.5 KD at 40% FC. The same band was also noted in another probable drought tolerant cultivar RSV-629 and RSV-626, but the intensity and width of band was less. The cultivar RSV-623 was also having this band but its intensity was very low, indicating its susceptible nature. The drought tolerant nature of promising cultivar RSV-669 is strengthened, because exactly similar type of band appeared in RSLG-262 (released drought tolerant) cultivar of sorghum. At 20% FC almost all the bands became very faint and invisible, indicating very high degradation of proteins at the extreme water stress level in all the cultivars. However the cultivars RSV-623 and RSV-669 both had shown new bands of very high intensity □17.5 KD, which indicate that these varieties should give comparatively better performance even under extreme

Available online at [www.lbp.world](http://www.lbp.world)

1

**INFLUENCE OF WATER STRESS ON PROTEIN PROFILE ON PROMISING SORGHUM CULTIVARS****MATERIALS AND METHODS:**

The present investigation planned for to study the impact of water stress induced different levels of field capacity (Deshmukh Ravindra, 2017) was studied in various promising cultivars of sorghum. The influence of water stress on protein profile was investigated. The pot culture experiments were conducted at the Department of Botany, Savitribai Phule Pune University. The authentic seeds of promising and released cultivars of sorghum were procured from the Senior Sorghum breeder, Sorghum Improvement Project, Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for this investigation. The four promising cultivars i. e. RSV-669, RSV-626, RSV-623 and RSV-629 and check cultivar RSLG-262 were selected for this investigation.

**SDS-PAGE ELECTROPHORESIS:-**

Proteins of control and stressed plants were separated on 10% SDS-PAGE as per method described by Laemmli (1970). The leaves (0.2gm) were crushed in 2 ml of ice cold phosphate buffer (pH 7.0). Samples were spun at 15000 rpm at 4°C for 15 min. Supernatants were taken in other tube and stored at -20°C. These supernatants were used as protein samples for gels. The protein content of samples were quantified by method described by Lowery *et al.* (1951). Equal amount of proteins (30µg) were denatured in sample buffer at 100°C in water bath and loaded in wells. Gels were run at 30mA and at constant voltage.

**SILVER STAINING PROCEDURE:**

Silver staining relies on differential reduction of silver ions that are bound to side chains of amino acids. Thus, free silver ions ( $Ag^+$ ) are reduced to metallic silver on the surface of protein molecules. The metallic silver is deposited to give blackish brown bands. Silver staining is 100 times more sensitive than CBB staining, i.e. it can detect as little as 0.1 to 1.0 ng of polypeptide in a single band. The procedure of the same is summarized below.

1. After the completion of electrophoresis, protein gels were fixed by incubating the gel for 4-12 hours at room temperature with gentle shaking in a solution of ethanol : glacial acetic acid : water in ratio.
2. Fixing solution was discarded and the gels were transferred in 30% ethanol, shake gently for 30 min at room temperature.
3. Repeat step 2.
4. Ethanol was discarded and the gels were rinsed thoroughly with double distilled deionized water. The gels were incubated for 10 min at room temperature with gentle shaking.
5. Repeat step 4.
6. The gels soaked in a freshly prepared 0.02% sodium thiosulphate solution for 1 min.
7. The gels washed with double distilled deionized water for 1 min.
8. Water was discarded and, gels were transfer into 0.2% solution of silver nitrate for 30 min at room temperature with gentle shaking.
9. Silver nitrate solution was discarded and both sides of the gels were washed with deionized water.
10. The gels were transferred and developed in (2.5% sodium carbonate containing 0.02% formaldehyde). The gels were incubated at room temperature with gentle agitation. The gels were watched carefully. Stained bands of proteins should appear within a few minutes. Incubation was continued until the desired contrast is obtained.
11. The reaction was stopped by washing the gel in 1% acetic acid for few minutes. Then, the gels were washed several times with deionized water.
12. The gels were stored in 50% methanol.

**RESULTS AND DISCUSSION:**

To confirm the drought tolerant or susceptible nature of the cultivars under investigation, their protein profile was studied with the aid of SDS-PAGE by using flag leaf at anthesis stage. The results shown in Photograph I and II indicated considerable differences in the protein profile pattern of the probable drought tolerant and susceptible cultivars at different levels of water stress, compared at 60 and 40% FC (Photograph I) as well as 100 and 20% FC (Photograph II) in all the cultivars like RSV-669, RSV-626, RSV-623, RSV-

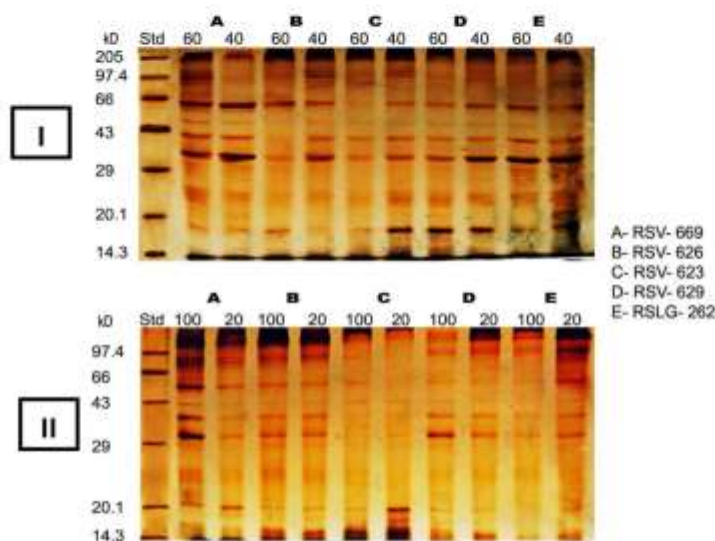
Available online at [www.lbp.world](http://www.lbp.world)

**INFLUENCE OF WATER STRESS ON PROTEIN PROFILE ON PROMISING SORGHUM CULTIVARS**

629 and the check cultivar RSLG-262. Water stress causes both reductions in rate of protein synthesis as well as changes the type of proteins produced. These stress induced proteins allow plants to make biochemical and structural adjustments that enable the plants to cope up with the stress. Thus understanding the molecular as well as biochemical basis of drought tolerance will help in developing strategies for improving drought tolerance. Identification of molecular markers link to drought tolerance traits may provide plant breeders with a new tool for selecting cultivars with improved drought tolerance.

The present analysis will help to screen the drought tolerant or susceptible nature of the sorghum cultivars on the basis of molecular parameters. The protein profile shows some qualitative and quantitative differences.

**Photograph I & II: Protein Profile of Sorghum cultivars**



**I & II: Protein profile of five selected cultivars of sorghum under different levels of FC % (20,40,60& 100) at anthesis stage.**

From the Photograph I it is clearly observed that a very intense band is marked in probable drought tolerant promising cultivars RSV-669 having 35.5 KD at 40% FC. This band was showing maximum intensity in this cultivar supporting its drought tolerant nature, predicted on the basis of physiological, biochemical, enzymological, morphological and yield parameters. The same KD band is noticed in another probable drought tolerant cultivar RSV-629, but the intensity and width of band was slightly less than RSV-669. Compared to these two cultivars, lowest intensity and width of same band was noted in RSV-626, which was also considered as moderate drought tolerant cultivar on the basis of above mentioned parameters.

The cultivar RSV-623 showed very faint nature of the same band of the same KD, indicating its susceptible nature. The drought tolerant nature of RSV-669 on this band is strengthened, because of exactly similar type of band appeared in RSLG-262 (released drought tolerant) cultivar of sorghum.

Available online at [www.lbp.world](http://www.lbp.world)

## INFLUENCE OF WATER STRESS ON PROTEIN PROFILE ON PROMISING SORGHUM CULTIVARS

The cultivars RSV-623, RSV-629 and even the check cultivar RSLG-262 showed all together different and a new band of 17.5 KD. However in RSV-669 and RSV-626 its intensity and width was comparatively less. The other bands showed the difference only in the intensity during the stress levels.

Jadhav *et al.* (2001) reported that the effect of seed treatment with abscisic acid and putrescine on drought tolerance of *rabi* sorghum cultivars and monitor the differences in SDS-PAGE electrophoretic pattern of soluble proteins. The soluble protein showed 10 to 11 bands of different molecular weights between 6 to 68 KD. They further noted that extra band of 12 protein subunits (33 KD) increased due to drought stress. In the present investigation also 36.5 KD band was induced in RSV-669, RSV-629 and RSV-626 with different intensity. The stress responsive proteins resolved from SDS-PAGE indicate that these newly synthesized protein under water stress might be providing drought tolerance to these cultivars, which may be called as dehydrin proteins as mentioned by Singh *et al.* (1987), Close *et al.* (1993). Ahire *et al.* (2005) noted a newly synthesized protein band of 17.78 KD size in drought tolerant cultivar of chick pea. Tyagi *et al.* (1995) also reported a polypeptide band 22 KD in *Lathyrus sativus*. Similarly Close *et al.* (1993) identified a dehydrin protein of 17 KD size in drought tolerant maize. In the present investigation also the sorghum cultivars RSV-629 and RSV-623 had shown same size of band (17.78 KD). Similarly Lee *et al.* (2002) also reported a 18 KD band as a major protein band induced by drought stress in white clover. Thus the results obtained in present investigation are in agreement with a result reported by earlier researchers.

According Shinozaki and Yamaguchi-shinozaki (1997) genes induced during drought stress thought to function not only in protecting the cell from water deficit by the production of important metabolites but also in the regulation of genes for signal transduction in drought stress response.

The Photograph I clearly indicate that another new protein band 35.5 KD is synthesized under water stress condition (60 and 40% FC) in the cultivars RSV-669, RSV-629, RSV-626 and in check cultivar RSLG-262. It appeared even in RSV-623 but its intensity was very less.

The highly intense nature of this band in RSV-669 clearly indicates its drought tolerant nature because the intensity of band in this cultivar was exactly similar to the band noted in drought tolerant check cultivar RSLG-262. The intensity of band in RSV-669 was followed by RSV-629 which we have categorized as moderate drought tolerant cultivar of sorghum. The results of biochemical, physiological and morphological as well as yield parameters are highly supportive to the conclusion drawn on the basis of molecular studies and *vice versa*. The moderately drought tolerant cultivar RSV-626 follows the cultivar RSV-629 while the probable susceptible cultivar RSV-623 had very less band intensity of this type of protein.

Ahire *et al.* (2005) recorded a newly synthesized protein band of 36.3 KD in drought tolerant chick pea cultivar. The results of the present investigation are in agreement with the above finding.

Dure *et al.* (1989) postulated that such type of newly synthesized protein may be belonging to a family of hydrophilic proteins, which play a role in the acquisition of desiccation tolerance or water stress tolerance. These stress induced proteins are confirming the probable drought tolerant, moderately drought tolerant and susceptible nature of the promising cultivars of sorghum investigated in the present study.

The occasional better performance in response to water stress shown by RSV-623 may be assigned to the additional protein band of 17.5 KD recorded in it, but it requires further confirmation.

The Photograph II shows the comparison of different protein bands at 100% FC and 20 %FC, from the same photograph it was noted that at 20% FC almost all the bands become very faint and as good as invisible. Indicating very high degradation of proteins at the extreme water stress level. However the cultivars RSV-623 and RSV-669 had shown few bands of very high intensity 17.5 KD which indicate that these varieties should give comparatively better performance even under extreme drought conditions, if supported by physiological, biochemical, enzymological, morphological and yield parameters.

**REFERENCES:**

- Ahire R. K., A. A. Kale, S. V. Munjal and B. M. Jamdagni. (2005): Induced water stress influencing proline accumulation, protein profiles and DNA polymorphism in chick pea cultivars. *Indian J. Plant Physiol.* **10(3)**,218-224.

Available online at [www.lbp.world](http://www.lbp.world)



## INFLUENCE OF WATER STRESS ON PROTEIN PROFILE ON PROMISING SORGHUM CULTIVARS

- Bapat D. R. and A. R. Gujar. (1990): Effect of soil moisture stress on yield and yield attributes of different sorghum genotypes. *J. Maha. Agri. Uni.* **15**: 185-188.
- Close T. J., R. D. Fenton, A. Yang, R. Asghar, D. A. Demason, D. E. Crone, N. C. Meyer and F. Moonan. (1993): Dehdriin: The protein. In: T. J. Close, E. A. Bray (eds), Plant responses to cellular dehydrin during environmental stress. *Am. Soc. Plant Physiol, Rockville, MD.* 104-114.
- Deshmukh Ravindra (2017): Enzymatic antioxidant defence mechanism of sorghum under water stress. *Flora and Fauna*, 23 (1),: 455-463.
- Dure L., M. L. Crouch, J. Harada, T. H. D. Ho, J. Mundy, R. S. Quatrano, T. Thomos and Z. R. Sung. (1989): Common amino acid sequence domains among the leaf protein of higher plants. *Plants Mol. Biol.* **12**:475-486.
- Jadhav P. G., R. M. Naik and B. B. Desai. (2001): Effect of seed treatment with abscisic acid and putrescine on drought response of rabi sorghum cultivars. *J. Maha. Agric. Univ.* **26(1)**, 123-124.
- Laemmli U. K. (1970): Cleavage of structural proteins during the assembly of the head of bacteriophage T<sub>4</sub>. *Nature (London)*. **227**: 680-685.
- Lee B. R., W. J. Jung, D. H. Kim, K. Y. Kim and T. H. Kim. (2002): Effect of drought stress on concentration of nitrogen metabolites in white clover. *Korean J. Crop Sci.* **47**:95-101.
- Lowry, O. H. Rosenbrough, N. J. Farr, A. L. and Randall, R. J., 1951. Protein measurement with Folin Phenol reagent. *J. Biol. Chem.* **193**: 265-275.
- Shinozaki K. and K. Yamaguchi- shinozaki. (1997): Gene expression and signal transduction in water stress response. *Plant physiol.* **115**:327-334.
- Singh N. K., C. A. Bracker, P. M. Hasegawa, A. K. Handa, S. Buckel, M. A. Hermodson. (1987). Characterization of osmotin. A Thaumatin-like protein associated with osmotic adaptation in plant cells. *Plant Physiol.* **85**:529-536.
- Tyagi A., I. M. Santha and S. L. Mehata. (1995): Molecular responses to water stress in *Lathyrus sativus*. *J. Plant Biochem. Biotech.* **4**:47-49.
- Deshmukh Ravindra (2017): Enzymatic antioxidant defense mechanism of sorghum under water stress. *Flora and Fauna*, 23 (1), 455-463.

## 27. Role of mineral content in sorghum cultivars under water stress.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

218

**ROLE OF MINERAL CONTENT IN SORGHUM CULTIVARS UNDER WATER STRESS**

RAVINDRA DESHMUKH

Department of Botany and Research Center,  
New Arts, Commerce and Science College Parner,  
Ahmednagar, MS, India 414 302  
([sorghumws@gmail.com](mailto:sorghumws@gmail.com))

**ABSTRACT**

The present investigation was aimed to study the important mineral constituents in sorghum (*Sorghum bicolor*) cultivars e.g. RSV-669, RSV-626, RSV-623 and RSV-629 along with check RSLG-262, under different levels FC % at anthesis stage.

Abiotic stress like water limits the absorption and translocation of various mineral nutrients. The sufficiency or deficiency of major and minor nutrients had a profound influence on physiology, biochemistry, enzymology and various metabolic processes along with growth, development and yield of the plants. The uptake and availability of essential nutrients has a great role during stress conditions. The rainfed crop like sorghum generally suffers to a great extent under water stress. Due to non-availability and low uptake of nutrients, affect majority of the metabolic processes. On the basis N, P, K, Ca and Mg the sorghum cultivar RSV -669 drought tolerant, RSV-629 as moderate and RSV-623 as susceptible to water stress.

**Figure:00**

**References:18**

**Table: 05**

**Key Words:** *Sorghum, water stress, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium*

**Introduction**

The most popular and economically important rainfed cereal crop *Sorghum bicolor* (L.) Moench, popularly called as "camel crop" because of its drought resistance, ranks 1<sup>st</sup> in the state of Maharashtra, 3<sup>rd</sup> in India and 5<sup>th</sup> in the world among the major food crops (Verma and Anand Kumar, 2005)

This crop is widely grown in the states like Maharashtra, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Rajasthan, Karnataka, Gujarat and Tamilnadu in both the seasons, i.e. *kharif* and *rabi*. In India, sorghum occupied an area of 6180000 hectares, which is highest in the world, with the production of 5280000 metric tons of grains and an average productivity of 854 kg ha<sup>-1</sup>. In the state of Maharashtra, sorghum is the major cereal crop occupying an area of about 1935.3 thousand hectares with the annual production of 3162 thousand tons and an average productivity of 612 kg ha<sup>-1</sup>. (Anonymous, 2012).

*Rabi* sorghum predominately grown in the states of Maharashtra usually on the residual soil moisture and the yield is a function of *kharif* rains. Thus, *rabi* sorghum generally suffers from severe moisture stress.

This situation totally disturbs the *rabi* production levels especially on light and medium soils, where grain and fodder yields are drastically reduced (Bapat and Gujar, 1990).

Fertilizer requirement for Jowar cultivation differs from season to season. Jowar is heavy surface feeder and exhausts the fertility of the soil. For a rainfed crop 6-8 tons of FYM or compost hectare<sup>-1</sup> and for irrigated Jowar, 8-12 tons of FYM hectare<sup>-1</sup> should be added to the soil before sowing. For good crop of sorghum fertigation is essential in rainfed area. The first dose of N and P should be applied @ 37.5 Kg hectare<sup>-1</sup> along with 35 kg of K hectare<sup>-1</sup>.

**Material Methods**

The mineral investigation were carried out by using randomly selected third leaf from top of five different plants at anthesis stage from sorghum plants grown at different levels of moisture regimes (i.e. field capacity). The methodology used for such analyses is briefly described. For mineral analysis the leaf samples were oven dried and made into powder. The powdered samples were acid

digested by triple acid digestion method (Toth *et al.*, 1948). The mineral contents like N, P,

#### Results and Discussion

##### 1) Nitrogen:-

The results recorded in Table 1 indicated that different levels of water stress (FC %) had adversely influenced the uptake of nitrogen during grain maturity stage in all the four promising cultivars of sorghum along with the check cultivar. From the same table it was noted that at 80% FC there was slight increase in N content over 100% FC and other moisture regimes. However there was severe decrease in nitrogen content at 20% FC as compared to other moisture regimes.

Minimum decrease in nitrogen content was recorded in cultivar RSV-669 which was at par with check cultivar RSLG-262; it was followed by RSV-629 which showed about -68% decreases in N content at 20% FC. The cultivars RSV-626 and RSV-623 showed maximum decrease in N content. On the basis of reduction in nitrogen content the cultivar RSV-669 may be considered as drought tolerant, while RSV-626 and RSV-623 may be grouped under the category of susceptible cultivars.

As nitrogen is the major mineral nutrient in plants and constituent of many important biomolecules like proteins, nucleic acids, nucleoprotein, chlorophylls etc. It regulates the photosynthetic efficiency, water use efficiency, NR activity, carbohydrate metabolism and biosynthesis of chlorophyll pigments as well as several secondary metabolites. According to Vyas *et al.* (1999) and Bhalerao (2003) the availability of nitrogen to crop governs the growth, canopy development, LA, DM accumulation, crop productivity and yield. Batagliya *et al.* (1985) reported that nitrogen has a great impact on osmotic adjustment in maize and sorghum.

##### 2) Phosphorus:-

The results tabulated in Table 2 revealed that different levels of water stress (FC%) had adversely influenced the uptake of phosphorus during grain maturity stage in all the four promising cultivars of sorghum along

K, Ca and Mg were analyzed.

with the check cultivar. From the same table it was observed that at 20% FC all the cultivars showed the reduction in P content. However, as compared to check cultivar all the promising cultivars showed less reduction. The maximum content of phosphorus was recorded in RSV-623 (0.29%) which was followed by RSV-629 (0.27%), RSV-669 (0.24%) and RSV-626 (0.21%).

Phosphorus plays an important role in energy metabolism of plants and its demand is associated with the rate of plant growth and level of metabolic activities (Teiz and Zeiger, 1998). Ogata *et al.* (1985) noted that leaf water potential and nutrient absorption particularly N and P were decreased with increased water stress in sorghum and other crop plants. All the above results support the present finding in all the promising cultivars of sorghum under investigation.

Pandey *et al.* (2005) indicated that P is one of the major limiting nutrient next to N in crop production, its deficiency seriously limits crop production. Patel *et al.* (2004) studied the P partitioning under moisture stress conditions in winter wheat and reported that moisture stress affects P distribution in plants, and causes imbalance in nutrient dynamics. Padhiyar *et al.* (2005), Bhyresappa *et al.* (2005) reported the influence of P supply on growth and yield in fenugreek and ajowan respectively. Similar may be the impact of P reduction in sorghum cultivars investigated on the yield and nutrient balance.

##### 3) Potassium:-

The results recorded in Table 3 revealed that the content of potassium was increased with increasing water stress up to 40% FC in all the cultivars at grain filling stage, however at 20% FC it was decreased. Maximum decrease at 20% FC was noted in RSV-623 (-19.7%), which was followed by RSV-629 (-18.6%). But different trend was noted in RSV-626 and RSV-669 in which the K content was increased. The maximum content of potassium was recorded in RSV-

669 (1.46%), which was followed by RSV-626 (1.17%), RSV-623 (1.01%) and RSV-629 (1.01%). The range of potassium content in all the cultivars was 0.52% to 1.77% under different levels of water stress.

Mengel and Kirkby (1980) explained the involvement of K in various physiological, biochemical and enzymological processes. Not only this but it also improves the WUE, by maintaining the turgor potential, root growth and stomatal movement. According to Singh *et al.* (1997); Sharma and Kuhad (1999) K has many beneficial effects on plants under maintains RWC, osmoregulation, osmotic potential and water uptake. The comparatively lesser reduction in K content in the sorghum cultivars RSV-669 and RSV-629 might be providing them higher RWC, osmotic potential and water retaining capacity. According to Vyas *et al.* (2001) as compared to various growth stages in sorghum the effects of reduction in K level is more pronounced at flowering stage. Chow *et al.* (1990) reported that the plants exposed to drought had higher K requirement which may be one of the factor for the increased level of K in stressed sorghum cultivars.

#### 4) Calcium:-

The results recorded in Table 4 indicated that different levels of water stress (FC %) had positively influenced the uptake of Ca during grain maturity stage in all the four promising cultivars of sorghum along with check cultivar. The content of Ca increased in all the promising cultivars up to 40% FC except RSV-629. The maximum increase was recorded in RSV-669 (+160%), which was followed by RSV-623 (+70%), RSV-626 (+30%) and RSV-629 (+8.3%) at 40% FC. The maximum content of Ca ( $\text{g Kg}^{-1}$  DM) was recorded in RSV-669 (0.712), which was followed by RSV-623 (0.53), RSV-626 (0.46) and RSV-629 (0.26). The effect of water stress on Ca content was ranged from 0.22 to 1.04 in all the cultivars.

Agarwal (1994) reported the role of Ca in protein metabolism. As stated by Marinos Swamy (1991) calcium is required for

physical integrity and normal functioning of cell membrane, maintains of ionic balance, cellular organizations and regulations of various physiological processes in plant body such as auxin transport, absorption and translocation of mineral elements, growth, development and yield.

Cousins *et al.* (2002) reported that in sorghum grown under drought condition Ca enhanced the photosynthetic rate during drought. In the present investigation the cultivar RSV-669 showed increased content of chlorophylls and PEP Case activity at 80% FC, it might be due to increased availability of Ca. Same results were also noted by Grant *et al.* (2004) in sorghum.

#### 5) Magnesium:

The results recorded in Table 5 clearly revealed that under different levels of moisture regime. The Mg content decreased from 80% to 20% FC, in all the cultivars except RSV-623 in which the Mg content was slightly increased. The maximum reduction in Mg content was recorded at 20% FC in RSV-623 (-55.8%), which was followed by RSV-629 (-46.7%), RSV-626 (-45.9%) and RSV-669 (-40%). The reduction of Mg contents in cultivars RSV-629 and RSV-626 are at par with check cultivar RSLG-262 at 20% FC. Under different levels of water stress (FC %) the range of Mg content was 0.16 to 0.82  $\text{g Kg}^{-1}$  DM in all the cultivars.

The effect of magnesium nutrition on chlorophyll content was studied by Ananthanarayana and Rao (1980). Magnesium acts as cofactor in biosynthesis of sucrose, it activates both the carboxylating enzymes like RuBPCase and PEPCase enhancing the net assimilation rate (NAR).

In the present investigation due to different levels of water stress Mg content was decreased with increasing water stress. However at mild water stress (80% FC) in cultivars like RSV-669, RSV-626 and RSV-629 Mg content was increased. Same trend was noted in check cultivar RSLG-262. The probable drought susceptible cultivar showed

decrease in Mg content from 100%FC to 20% FC.

Chetti *et al.* (2003) studied the influence of Mg nutrition and moisture regimes on photosynthesis, yield and quality in groundnut. They have concluded that with higher Mg level even under drought stress the photosynthetic rate, stomatal conductance, RWC, NR activity and chlorophyll contents

were better. Finally they concluded that Mg is having the positive role in overcoming the effect of water stress like that of K. The comparatively minimum reduction in Mg content in the cultivars like RSV-669 and RSV-629 might be responsible for showing higher chlorophyll content, higher NR activity and higher RWC values in these cultivars under various degree of water stress.

**TABLE 1.0: Effect of different levels of water stress at grain filling stage on (%) nitrogen (N) content in leaves of sorghum cultivars**

Cultivars	Field Capacity (%)						PIDOC				
	100	80	60	40	20	Mean	80	60	40	20	mean
	RSV-669	0.84	0.96	0.56	0.28	0.21	<b>0.57</b>	+12.5	-29.2	-58.3	-65.6
RSV-626	0.70	0.68	0.35	0.28	0.21	<b>0.44</b>	-2.9	-51.5	-61.8	-72.1	-37.6
RSV-623	0.56	0.49	0.35	0.28	0.22	<b>0.38</b>	-14.3	-42.9	-57.1	-69.4	-36.7
RSV-629	0.74	0.82	0.51	0.22	0.18	<b>0.49</b>	+9.8	-28.0	-63.4	-68.3	-30.0
RSLG-262	1.21	1.33	0.77	0.63	0.35	<b>0.86</b>	+8.7	-33.2	-43.8	-64.9	-26.6
Mean	<b>0.81</b>	<b>0.86</b>	<b>0.51</b>	<b>0.34</b>	<b>0.23</b>						

Average of three determinations

**TABLE 2.0: Effect of different levels of water stress at grain filling stage on (%) phosphorus (P) content in leaves of sorghum cultivars**

Cultivars	Field Capacity (%)						PDOC				
	100	80	60	40	20	Mean	80	60	40	20	mean
	RSV-669	0.31	0.27	0.23	0.21	0.19	<b>0.24</b>	-14.8	-29.6	-37.0	-44.4
RSV-626	0.26	0.23	0.21	0.18	0.15	<b>0.21</b>	-13.0	-21.7	-34.8	-47.8	-23.5
RSV-623	0.35	0.32	0.31	0.27	0.21	<b>0.29</b>	-9.4	-12.5	-25.0	-43.8	-18.1
RSV-629	0.33	0.31	0.27	0.23	0.19	<b>0.27</b>	-6.5	-19.4	-32.3	-45.2	-20.6
RSLG-262	0.36	0.34	0.31	0.23	0.19	<b>0.29</b>	-5.9	-14.7	-38.2	-50.0	-21.8
Mean	<b>0.32</b>	<b>0.29</b>	<b>0.27</b>	<b>0.22</b>	<b>0.19</b>						

**TABLE 3.0: Effect of different levels of water stress at grain filling stage on (%) potassium (K) content in leaves of sorghum cultivars**

Cultivars	Field Capacity (%)						PIDOC				
	100	80	60	40	20	Mean	80	60	40	20	mean
	RSV-669	1.15	1.22	1.77	1.75	1.40	<b>1.46</b>	+5.7	+50.8	+49.2	+20.5
RSV-626	0.98	1.00	1.22	1.60	1.05	<b>1.17</b>	+2.0	+24.0	+62.0	+7.0	+19.0
RSV-623	0.75	1.17	1.20	1.40	0.52	<b>1.01</b>	+35.9	+38.5	+55.6	-19.7	+22.1
RSV-629	0.95	1.02	1.25	1.05	0.76	<b>1.01</b>	+6.9	+29.4	+9.8	-18.6	+5.5
RSLG-262	1.02	1.42	1.61	1.47	1.12	<b>1.33</b>	+28.2	+41.5	+31.7	+7.0	+21.7
<b>Mean</b>	<b>0.97</b>	<b>1.17</b>	<b>1.41</b>	<b>1.45</b>	<b>0.97</b>						

Average of three determinations

**TABLE 4.0: Effect of different levels of water stress at grain filling stage on calcium (Ca) content in leaves of sorghum cultivars (g Kg<sup>-1</sup> DM)**

Cultivars	Field Capacity (%)						PIOC				
	100	80	60	40	20	Mean	80	60	40	20	mean
	RSV-669	0.40	0.60	0.76	1.04	0.76	<b>0.71</b>	+50.0	+90.0	+160.0	+90.0
RSV-626	0.40	0.44	0.48	0.52	0.46	<b>0.46</b>	+10.0	+20.0	+30.0	+15.0	+15.0
RSV-623	0.40	0.44	0.60	0.68	0.53	<b>0.53</b>	+10.0	+50.0	+70.0	+32.5	+32.5
RSV-629	0.24	0.28	0.32	0.26	0.22	<b>0.26</b>	+16.7	+33.3	+8.3	+8.3	+10.0
RSLG-262	0.32	0.40	0.56	0.36	0.32	<b>0.39</b>	+25.0	+75.0	+12.5	0.0	+22.5
<b>Mean</b>	<b>0.35</b>	<b>0.43</b>	<b>0.54</b>	<b>0.57</b>	<b>0.46</b>						

Average of three determinations

**Table 5.0: Effect of different levels of water stress at grain filling stage on magnesium (Mg) content in leaves of sorghum cultivars (g Kg<sup>-1</sup> DM)**

Cultivars	Field Capacity (%)						PIDOC				
	100	80	60	40	20	Mean	80	60	40	20	mean
	RSV-669	0.29	0.31	0.25	0.23	0.17	<b>0.25</b>	+6.5	-11.6	-20.6	-
RSV-626	0.35	0.37	0.25	0.19	0.18	<b>0.27</b>	+5.4	-27.0	-43.2	-	-22.2
RSV-623	0.30	0.22	0.19	0.17	0.17	<b>0.21</b>	-31.7	-48.7	-54.5	-	-38.1
RSV-629	0.33	0.38	0.25	0.17	0.16	<b>0.26</b>	+11.7	-21.6	-43.2	-	-19.9
RSLG-262	0.74	0.82	0.56	0.47	0.36	<b>0.59</b>	+8.9	-22.8	-33.3	-	-18.8
<b>Mean</b>	<b>0.40</b>	<b>0.45</b>	<b>0.30</b>	<b>0.25</b>	<b>0.21</b>						

Average of three determinations

## References

1. AGARWAL, S. (1994). Mineral nutrition and plant growth. S. S. Purohit (Ed.), *Agro's Ann. Rev. Plant Physiol.* C B & A Agro Botanical Publishers (India), Bikaner. **1**: 189-242.
2. ANANTHANARAYANA, R. AND RAO, B. V. (1980). Effect of magnesium on total chlorophyll content of hybrid maize. *Curr. Res.* **9**(1),8-9.
3. BATAGLIYA, O. C., QUAGGIO, J. A., BRUNINI, O. AND CIARELLI, D. M. (1985). Effect of nitrogen fertilizer on osmotic adjustment in maize and sorghum. *Inst. Agron. De. Campinas, SP, Brazil.* **20** (6),659-665.
4. BHALERAO, E. B. (2003). Physiological studies in some crop plants with reference to application of fern frond extracts. *Ph. D. thesis. University of Pune.*
5. BHYRESAPPA, K. B. (2005). Effect of nitrogen, phosphorus and potassium fertilizers on growth, seed and oil yield of ajowan (*Trachyspermum ammi* L.) *National symposium on current trends in onion, garlic, chillies and seed spices. Rajgurunagar, Pune.* **3.1.10** -40.
6. CHETTI, M. B., M. KALPANA, A. SURWENSHI AND HIREMATH, S. M. (2003). Influence of magnesium nutrition and moisture regimes on photosynthesis, yield and quality in groundnut. *Indian j. Plant Physiol.* (Special issue) 418-425.
7. CHOW, W. S., BALL, M. C. AND NADERSON, J. M. (1990). Growth and photosynthetic response of spinach to salinity: Implication for K nutrition for salt tolerance. *Aust. J. Plant Physiol.* **17**:563-578.
8. CHOW W. S., M.C. BALL AND NADERSON, J. M. (1990). Growth and photosynthetic response of spinach to salinity: Implication for K nutrition for salt tolerance. *Aust. J. Plant Physiol.* **17**:563-578.
9. GRANT R. F., KIMBALL, B. A., WALL, G. W., TRIGGS, J. M., BROOKS, T. J., PRINTER, P. J., CONLEY, M. M., OTTMAN, M. J., LAMORTE, R. L., LEAVITT, S. W., THOMPSON, T. L. AND MATTHIAS, A. D. (2004). Modeling elevated CO<sub>2</sub> effects on water relations, water use and growth of irrigated sorghum. *Agron. J.* **96**(6),1693-1705.
10. MENGEL K. AND KIRKBY, E. A., (1980). Potassium in crop production. *Adv. Agron.* **33**:59-11
11. OGATA, S., SANEOKA, H. AND MATSUMOTO, K. (1985). Nutritio-physiological evaluation of drought resistance of warm season forage species. I. Species differences of drought resistance under field conditions. *J. Jap. Soc. Grassland-Sci.* **31**(1),34-42.
12. PADHIYAR, G. M., PATEL, R. H. AND USADADIA, V. P. (2005). Influence of bi-fertilizer, phosphorus and sulphur on growth and yield of fenugreek (*Trigonella foenum-graecum* L.) *National symposium on current trends in onion, garlic, chillies and seed spices. Rajgurunagar, Pune* **3.1.7**-40.
13. PANDEY, R., SINGH, B. AND NAIR, T. V. R. (2005). Phosphorus efficiency of wheat, rye and triticale under deficient and sufficient levels of phosphorus. *Indian j. Plant Physiol.* **10** (3):292-29
14. PATEL, A. L., KUMAR, N., PANNU, R. K., KIRAN AND MAHAJAN, A. (2004). Phosphorus partitioning under nutrient and moisture stressed winter wheat. *National Seminar on Plant Physiol. Pune, India.* **161**-89.
15. SHARMA K.D. AND KUHAD, M. S. (1999). Influence of potassium on plant water relations and yield of clusterbean under soil moisture stress. In: A. S. Faroda, N. L. Joshi, S. Kathju and A. Kar. (eds), *Management of Arid Ecosystem. Arid Zone Res. Assoc. of India and Scientific publ., Jodhpur.* 267-270.
16. SINGH N., CHHOKAR, V., SHARMA, K. D. AND KUHAD, M. S., (1997). Effect of potassium on water relations, CO<sub>2</sub> exchange and plant growth under quantified water stress in chickpea. *Ind. J. Plant. Physiol.* **2**:202-206.
17. TEIZ L. AND ZEIGER, E. (1998). *Plant physiology.* Sinauer Associates, Inc., Publishers sunderland, Massachusetts. 103-124.
18. VYAS S. P., GARG, B. K., KATHJU, S. AND LAHIRI, A. N., (2001). Influence of potassium on water relations, photosynthesis, nitrogen metabolism and yield of clusterbean under soil moisture stress. *Ind. J. Plant. Physiol.* **6**(1),30-37.

## 28. Enzymatic antioxidant defense mechanism of sorghum under water stress.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

455

### ENZYMATIC ANTIOXIDANT DEFENCE MECHANISM OF SORGHUM UNDER WATER STRESS

RAVINDRA DESHMUKH

Department of Botany AND Research Center,  
New Arts, Commerce and Science College Parner, Ahmednagar, 414 302  
([sorghumws@gmail.com](mailto:sorghumws@gmail.com))

#### ABSTRACT

The present investigation was aimed to study the antioxidant enzymes in sorghum (*Sorghum bicolor*) cultivars e.g. RSV-669, RSV-626, RSV-623 and RSV-629 along with check RSLG-262, under PEG-6000 water stress and during different levels FC % at seedling as well as anthesis stage. With increase in moisture stress antioxidant enzymes like superoxide dismutase (SOD), peroxidase (PER) and polyphenol oxidase (PPO) progressively increased at different stages of growth.

The activity of SOD was highly stimulated under water stress. On this basis the response of varieties towards water stress can be categorized as RSV-669 > RSV-629 > RSV-626 > RSV-623. On the basis of stimulation in PER activity the scavenger of ROS, drought tolerant nature of the sorghum cultivars can be predicted in the sequence of RSV-626 > RSV-669 > RSV-623 > RSV-629. On the basis of stimulation in PPO activity the cultivars' response towards drought stress can be as mentioned below: RSV-626 > RSV-669 > RSV-623 > RSV-629.

**Figures:** 09

**References:** 33

**Tables:** 00

**KEY WORDS:** *Sorghum*, Superoxide Dismutase, Peroxidase, Polyphenol Oxidase, Water Stress

#### Introduction

The most popular and economically important rainfed cereal crop *Sorghum bicolor* (L.) Moench, popularly called as "camel crop" because of its drought resistance, ranks 1<sup>st</sup> in the state of Maharashtra, 3<sup>rd</sup> in India and 5<sup>th</sup> in the world among the major food crops (Verma and Anand Kumar, 2005)

This crop is widely grown in the states like Maharashtra, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Rajasthan, Karnataka, Gujarat and Tamilnadu in both the seasons, i.e. *kharif* and *rabi*. In India, sorghum occupied an area of 6180000 hectares, which is highest in the world, with the production of 5280000 metric tons of grains and an average productivity of 854 kg ha<sup>-1</sup>. In the state of Maharashtra, sorghum is the major cereal crop occupying an area of about 1935.3 thousand hectares with the annual production of 3162 thousand tons and an average productivity of 612 kg ha<sup>-1</sup>. (Anonymous, 2012).

*Rabi* sorghum predominately grown in the states of Maharashtra usually on the

residual soil moisture and the yield is a function of *kharif* rains.

Thus, *rabi* sorghum generally suffers from severe moisture stress. This situation totally disturbs the *rabi* production levels especially on light and medium soils, where grain and fodder yields are drastically reduced (Bapat and Gujar, 1990).

#### Material and Methods

The authentic seeds of RSV-669, RSV-626, RSV-623 and RSV-629 and check cultivar RSLG-262 were selected for the present study. The cultivars of sorghum were procured from the Senior Sorghum breeder, Sorghum Improvement Project, Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS)

Uniformly grown thirty days old seedlings of all the promising and check cultivars were used for PEG-6000 induced water stress treatment (Sairam and Kumari, 1998). The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture



regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method described by Narkhede (1989) was followed with some modifications. The varieties exposed to different water stress levels were used for antioxidant enzyme activities.

The PEG-6000 induced water stressed (-2, -4, -6 and -8 bar) and control seedlings (30 days old) were analyzed for enzymological parameters. Similarly enzymological investigation were carried out by using randomly selected third leaf from top of five different plants at 30 days after transplantation and at anthesis stage from sorghum plants grown at different levels of moisture regimes

**Super oxide dismutase (SOD):-**

Reactive oxygen species (ROS) are produced in stressed cells of plants, to get rid from these SODs constitute the first line of defense against ROS. Hence, analysis of such enzymes becomes essential during stress condition.

The activity of SOD increased significantly with increase in PEG induced water stress in all the cultivars of sorghum. The perusal of results presented in Fig. 1 a illustrate that the cultivar RSV-669 had shown minimum SOD activity and it was followed by RSV-629, RSV-626 and RSV-623 sequentially. The cultivar RSV-669 had increasing SOD activity with increasing moisture stress i.e. ranging from +21% to +79% at -2 to -8 bar respectively. The same trend was followed by other cultivars except RSV-623. All the results are statistically significant. The increase in SOD activity was more than the check cultivar RSLG-262 at all the stress levels ranging from -2 to -8 bar.

(i.e. field capacity). The methodology used for such analyses is briefly described below.

**Superoxide dismutase (EC 1.15.1.1):-**

The enzyme activity was determined according to the method of Dhindsa *et al.* (1981).

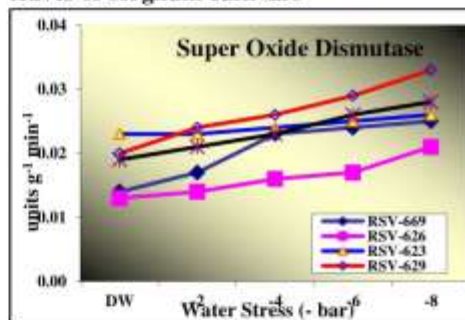
**Extraction and assay of enzyme peroxidase (E.C. 1.11.1.7.) and polyphenol oxidase (EC 1.14.18.1):-**

The enzyme activity was assayed by using Vidyasekharan and Durairaj, (1973) method.

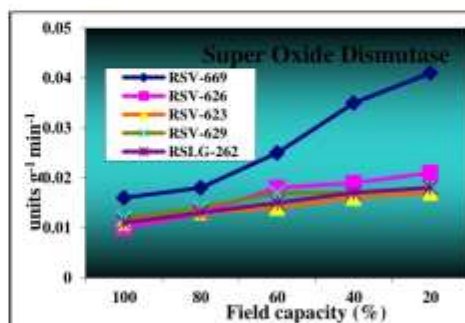
**Results and Discussion:**

**Influence of water stress on antioxidant enzymes:-**

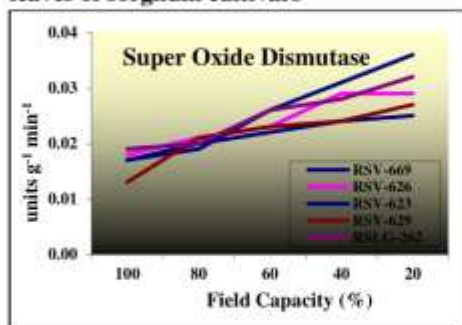
**Fig. 1a Effect of PEG-6000 induced water stress at seedling stage on superoxide dismutase activity in the leaves of sorghum cultivars**



**Fig. 1b Effect of different levels of water stress (FC%) at seedling stage on superoxide dismutase activity in the leaves of sorghum cultivars**



**Fig. 1c Effect of different levels of water stress (FC%) at anthesis stage on superoxide dismutase activity in the leaves of sorghum cultivars**



The effect of water stress applied in terms of different field capacity ranging from 80% to 20% FC to the seedlings of different cultivars of sorghum on SOD activity presented in Fig. 1b clearly indicated that the enzyme activity linearly increased with the increasing water stress level. The cultivar RSV-669 which was leading for SOD activity maintained its superiority during this experiment also. The activity of SOD was ranging from +12.5 % (80%FC) and reached up to +156% (20% FC), this was followed by RSV-626 which was at third rank during PEG induced water stress, while cultivar RSV-623 and RSV-629 showed better performance than the check cultivar RSLG-262

The results in all the four promising cultivars of sorghum along with the check cultivar at anthesis stage shown in Fig.1c. Clearly indicated that the SOD activity had same trend under increasing water stress like that of previous experiments. At anthesis stage slight increasing in SOD activity was noted as compared to the seedling stage. The activity of SOD at all the stress levels increased, but the highest increase was noted at 20% FC in all

Thippeswamy *et al.* (2005) reported that during water stress i.e. 100, 75, 50 and 20% FC level the activity of SOD was increased in safflower. Li *et al.* (2003) studied the changes in SOD activity in liquorice

the cultivars. At anthesis stage the promising cultivar RSV-669 was shifted to second position, which was followed by RSV-623 and RSV-629.

The activity of SOD when compared at different stages, it was noted that SOD activity was very high at anthesis stage. Deshmukh and Dhupal (2005; 2005c) reported that under water deficit condition SOD activity at anthesis stage and seedling stage was highly increased in all the four promising cultivars of sorghum, which might be providing the drought tolerance to the sorghum. Durai *et al.* (2004) reported that the activity of SOD is located in bundle sheath cells of sorghum under water stress.

Many research workers have concentrated on activity of SOD in large number of plants during stress conditions, as it is the main protective enzyme during the oxidative. Bowler *et al.* (1992) and Scandalios (1993) proposed that SOD has a key role in the defense against oxidative stress. However, very scanty literature is available regarding the changes in SOD activity in sorghum under water stress conditions. SOD mainly catalyses the rapid removal of super oxide radicals, causing dismutation of superoxide to hydrogen peroxide and oxygen. According to Bast *et al.* (1991) and Yim *et al.* (1990), SOD acts as a pro-oxidant in the presence of hydrogen peroxide. According to Alscher *et al.* (2002) SODs are present in mitochondria, chloroplast, glyoxysomes, peroxisomes, apoplasts and even in cytosol. Takahashi and Asada (1983) reported that phospholipid membranes are impermeable to O<sub>2</sub> molecules, therefore it is crucial that SODs are present for the removal of charged O<sub>2</sub><sup>-</sup> in the compartment where O<sub>2</sub><sup>-</sup> molecules are formed and thus it protects the cells from oxidative damage.

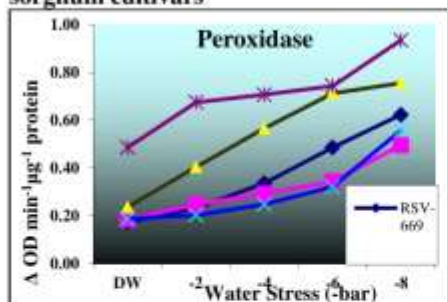
(*Glycyrrhiza uralensis*) under PEG induced water stress and claimed that the activity of SOD along with CAT and POD was significantly very high under water stress conditions. Li and Wang (2002) supported the

above findings. In the present investigation the activity of SOD under PEG induced water stress and at different FC during seedling as well as anthesis stages showed same type of variations in the four different promising cultivars of sorghum, indicating varietal difference in response to water stress level.

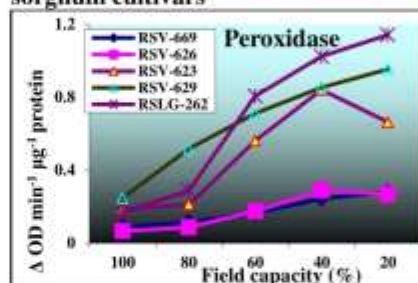
Kalir *et al.* (1984) explained that the increase in SOD activity was due to the increased enzyme synthesis, which was useful for the plant under stress to prevent peroxidation of membrane lipids. Same may be the role played by the increased activity of SOD in different cultivars of sorghum, when exposed to water stress. The level of stimulation of SOD in response to different water stress levels by different cultivars of sorghum may be used as a screening parameter for assessing them as drought tolerant or susceptible once. On the basis of various explanations and studies by different workers it can be predicted that RSV-669 and RSV-629 may come out as the future drought tolerant cultivars.

**Peroxidase:-**

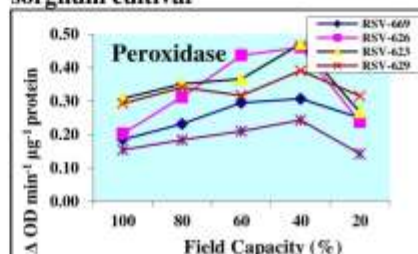
**Fig. 2a** Effect of PEG-6000 induced water stress at seedling stage on peroxidase activity in the leaves of sorghum cultivars



**Fig. 2b** Effect of different levels of water stress (FC%) at seedling stage on peroxidase activity in the leaves of sorghum cultivars



**Fig. 2c** Effect of different levels of water stress (FC%) at anthesis stage on peroxidase activity in the leaves of sorghum cultivar



The response of promising sorghum cultivars along with check cultivar to water stress with respect to peroxidase activity (Fig. 2a) indicated that its activity was significantly stimulated with an increase in water stress from -2 to -8 bar. The peroxidase activity was significantly lower in RSV-629 followed by RSV-626 and RSV-669. The range of  $\Delta OD \text{ min}^{-1} \mu\text{g}^{-1} \text{ protein}$  was 0.172 to 0.935 in all the cultivars. The interaction between the cultivars and water stress showed 0.253 to 0.674  $\Delta OD \text{ min}^{-1} \mu\text{g}^{-1} \text{ protein}$  at -2 and -8 bar water stress respectively. All the results are statically significant.

The effect of water stress given in terms of different FC on peroxidase activity presented in Fig. 2b clearly indicated that with decreasing FC from 80 % to 20 % the activity of peroxidase was increased. Highest activity was recorded in RSV-626 which was followed by RSV-623, RSV-629 and RSV-669. The

cultivars RSV-626, RSV-623 and RSV-629 were at par with each other.

The results presented in Fig. 2c regarding peroxidase activity at different levels of FC during anthesis stage clearly indicated that with increasing moisture stress peroxidase activity was also increasing, but at higher moisture stress (20 % FC) the activity was decreased in all the cultivars. The promising cultivar RSV-626 had maintained top most position as in seedling stage and this was followed by RSV-669, RSV-623 and RSV-629. All the results are statistically significant.

According to Durai *et al.* (2004) the activity of peroxidase is located in bundle sheath cells of sorghum under water stress. Deshmukh (2000); Deshmukh and Dhupal (2005a; 2005c) reported that the activity of peroxidase during PEG induced water stress in different cultivars of sorghum was significantly higher. The varietal response regarding stimulation in peroxidase activity was different. The cultivar CSH-15R, RSLG-262 and M 35-1 showed very high activity of peroxidase but the cultivars like Swati, Sel-3 and Phule Yashoda recorded lower activity of peroxidase. Deshmukh and Dhupal (2005) reported that under water deficit condition PER activity at anthesis stage was increased in promising cultivars of sorghum. Similarly Jagtap and Bhargava (1995) and Kadlag (1996) have registered enhanced peroxidase activity in drought tolerant sorghum cultivars.

Zhang and Kirkham (1996) reported increased activity of peroxidase in water stressed sorghum. They further reported that peroxidase activity was not much influenced by drought stress, during early and middle stage of drought, however at late stage of drought the activity was very high. They further added that the response of C<sub>3</sub> and C<sub>4</sub> plants during drought towards peroxidase was different. In present investigation the activity of peroxidase was very high at seedling stage and it was followed by anthesis stage.

Sairam *et al.* (1998 a) recorded increased activity of peroxidase in wheat

genotypes. Similarly Joshi *et al.* (2005) reported that under PEG-6000 induced water stress peroxidase activity was increased with increasing water stress in wheat genotypes at germination stage. Chander *et al.*, (2003) found that peroxidase activity was higher in drought susceptible cultivars of chilly. Thippeswamy *et al.* (2005) reported that during water stress i.e. 100, 75, 50 and 20% FC level the activity of peroxidase was increased in safflower. Li *et al.* (2003) reported stimulated activity of peroxidase during water stress in *Glycyrriza* sps. The activity of peroxidase increased in the beginning, but it was again declined slowly. Similar pattern was noted at anthesis stage in all the sorghum cultivars, when they were exposed to different levels of FC. At 20% FC the activity of peroxidase was less than 40% FC level.

The peroxidase has scavenging role during oxidative stress, it scavenges the H<sub>2</sub>O<sub>2</sub> and protects the plants from stress injuries. Same must be the role played by peroxidase in the four different cultivars of sorghum, when they were exposed to water stress. The level of changes in its activities may be used as an important enzymological parameter for recognizing the cultivars as drought tolerant or susceptible.

Jha and Singh (1997) reported that different levels of moisture stress in different cultivars of rice favored positive increase in the activity of peroxidase. They further claimed that the drought tolerant genotypes were highly superior with reference to peroxidase activity in comparison to susceptible genotypes.

Sairam and Saxena (2000) studied the oxidative stress and antioxidants in wheat genotypes and noted that the peroxidase activity was increased significantly under water stress. Sairam *et al.* (1997) studied the impact of drought and temperature stress in wheat genotypes and noted increased activity of peroxidase. They further explained that the stimulation in peroxidase activity was involved in the detoxification of active oxygen

species, especially H<sub>2</sub>O<sub>2</sub>, because of which the drought tolerant genotypes exhibited comparatively higher increase in peroxidase activity compared to the susceptible ones.

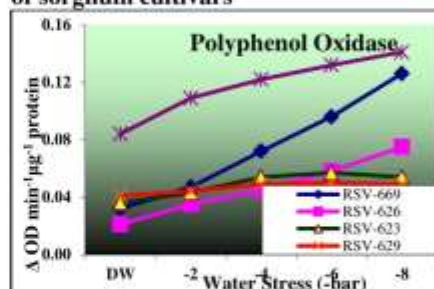
**Polyphenol oxidase:-**

Phenolic compounds under stress conditions are accumulated in crop plants, the oxidation and degradation of toxic substances occur due to the activity of polyphenol oxidase.

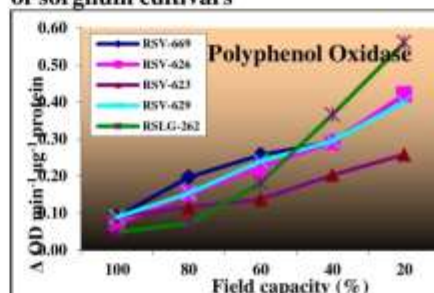
The data on polyphenol oxidase activity in seedlings of sorghum cultivars as influenced by PEG induced water stress presented in Fig. 3a indicated that the increased levels of water stress caused the increase in polyphenol oxidase activity significantly. The activity of PPO was significantly lower in RSV-629 and highest in RSV-669 on the basis of percent increase over control. However, the sorghum cultivars RSV-626 and RSV-623 occupied second and third positions respectively. The maximum activity of PPO was recorded at -8 bar which was +294% in RSV-669, +50% in RSV-623, +19.5% in RSV-629 and +257% in RSV-626. All the results were statistically significant and all the cultivars were showing very high activity as compared to check cultivar RSLG-262. The interaction between the sorghum cultivars and water stress showed significant effect on PPO activity. In general the drought tolerant sorghum cultivars had higher PPO activity than the susceptible once.

The results presented in Fig. 3b showed that under decreasing levels of FC % the PPO activity was linearly increasing. The maximum increase was noted at 20% FC. It was +485% in RSV-626 followed by RSV-669 (+366%), RSV-629 (+349%) and RSV-623 (+184%) as compared to 80% FC. The interaction of water stress treatment and varieties regarding PPO activity was increased from 0.078 to 0.412 at 100% FC and 20% FC respectively.

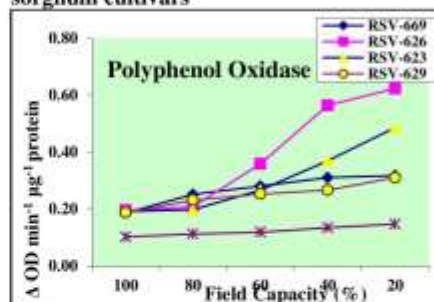
**Fig. 3 a** Effect of PEG-6000 induced water stress at seedling stage on polyphenol oxidase activity in the leaves of sorghum cultivars



**Fig. 3b** Effect of different levels of water stress (FC %) at seedling stage on polyphenol oxidase activity in the leaves of sorghum cultivars



**Fig. 3c** Effect of different levels of water stress (FC %) at anthesis stage on polyphenol oxidase activity in the leaves of sorghum cultivars



But cultivars RSV-623 and RSV-629 have shown different pattern. The maximum increase in PPO activity was noted at 20% FC in RSV-626 (+219%) and minimum in RSV-623 (+3.1%) at 80% FC over control. The interaction between water stress and variety with reference to PPO activity was ranging

from 0.172 to 0.377 for 100% FC to 20% FC respectively. All the results are statistically significant.

The overall results regarding PPO activity in the promising cultivar RSV-626 showed better performance and it was followed by RSV-669, RSV-623 and RSV-629 at PEG induced water stress and water stress imposed by FC during seedling and anthesis stages.

Deshmukh (2000); Deshmukh and Dhupal (2005a; 2005c) reported significant increase in PPO activity in different cultivars of sorghum under PEG induced water stress. The activity of PPO was very high in cultivar CSH-15R and lowest in Sel-3. He further explained that PPO activity was more in drought tolerant cultivars as compared to the susceptible and unstressed control plants. Venkatesan and Chellappan (1999) proposed that PPO activity under stress condition indicates the oxidation and degradation of toxic substances like phenols.

Agarwal and Pandey (2003) in their studies on influence of water stress in *Cassia* sps. claimed that under stress conditions these plants have enzymic mechanism for protection. The enzymatic defense includes PPO along with SOD. They have reported significant increase in PPO activity during radiation stress. According to Dwivedi (1990) the increased activity of PPO might be due to increased polyphenols. Same may be true for the promising cultivars under study because they had shown very high accumulation of phenols under water stress.

#### Conclusion:

On the basis of activity of SOD the response of varieties towards water stress can be categorized as shown like RSV-669>RSV-629>RSV-626>RSV-623. On the basis of stimulation in PER and PPO activity, the drought tolerant nature of the sorghum cultivars can be predicted as RSV-626 > RSV-669> RSV-623 > RSV-629

#### References

1. AGARWAL, S. AND PANDEY, V. (2003). Stimulation of stress-related antioxidative enzymes in combating oxidative stress in *Cassia* seedlings. *Indian J. Plant Physiol.* **8**: 263-268.
2. ALSCHER, R. G., ERTURK, N. AND HEATH, L. S. (2002). Role of superoxide dismutases (SODs) in controlling oxidative stress in plants. *J. Exper. Bot.* **53** (372): 1331-1341.
3. ANONYMOUS, (2005). Area, production and productivity of sorghum in epitome of agriculture. Maharashtra state, Pune.
4. BAPAT, D. R. AND. GUJAR, A. R (1990). Effect of soil moisture stress on yield and yield attributes of different sorghum genotypes. *J. Maha. Agri. Uni.* **15**: 185-188.
5. BAST, A., HAENEN, G. R. AND DOLEMAN, C. J. (1991). Oxidants and antioxidants: state of the art. *American J. Med.* **91**:2-13.
6. BOWLER, C., MONTAGUE, M. V. AND INZE, D. (1992). Superoxide dismutase and stress tolerance. *Ann Rev. Plant Mol. Biol.* **43**: 83-116.
7. CHANDER, M. S., SRINIVASA RAO, N. K. AND BABU, B. (2003). Biochemical response to water stress in chilly. *National Seminar on Plant Physiology held at Tirupati.* S1-O2: **53**.
8. DESHMUKH, R. N. AND DHUMAL, K. N. (2000). Effect of PEG-6000 induced water stress on physiological attributes of drought tolerance in sorghum. *National seminar on Plant Physiol. Lucknow, India.* **3**: 47: 69.
9. DESHMUKH, R. N. AND DHUMAL, K. N. (2005 ). Evaluation of promising genotypes of sorghum for drought stress tolerance. *National Seminar on Plant Physiology*, NAU, Navsari. III-P12. 67.

10. DESHMUKH, R. N., DHUMAL, K. N. AND JADHAV, S. S. (2005c) Role of osmolytes and antioxidant enzymes in promising sorghum cultivars under PEG-6000 induced water stress. *Life Sciences Symposium (LSS-2005). BARC Trombay, Mumbai PO-13*: 67.
11. DHINDSA, R. S., DHINDSA, P. P. AND THORNE, T. A. (1981). Leaf senescence: Correlated with increased levels of membrane permeability and lipid peroxidation, and decreased levels of superoxide dismutase and catalase. *J. Expt. Bot.* **32**: 93-101.
12. DURAI, S., PERIANAYAGUY, B. AND REDDY, A. R. (2004). Localization of antioxidant enzymes in the cellular compartments of sorghum leaves. *Plant Growth Regu.* **44(2)**: 157-163.
13. DWIVEDI S.N., (1990). Changes in concentration of total phenolic compound in gram seeds as influenced by fungal invasion during storage. *Indian. Phytopath.* **43**: 96-98.
14. JAGTAP, V. AND BHARGAVA, S. (1995). Variation in the antioxidant metabolism of drought tolerant and drought susceptible varieties of *Sorghum bicolor* (L.). Exposed to high light, low water potential and high temperature stress. *J. Pl. Physiol.* **145**: 195-197.
15. JHA, B. N. AND SINGH, R. A. (1997). Physiological responses of rice varieties to different levels of moisture stress. *Indian J. Plant Physiol.* **2(1)**: 81-84.
16. KADLAG A. D. (1996). Studies on carbon monoxide sensitivity of cytochrome c oxidase and gibberellin (GA3) Sensitivity of sorghum cultivars as related to their yield and stress tolerance. *Ph. D. Thesis, Agri.Chem. M. P. K. V. Rahuri.*
17. KALIR, A., OMRI, G. AND POLJAKOFF, M. A.(1984). Peroxidase and catalase activity in leaves of *Helimione portulacoides* L. exposed to salinity. *Physiol. Plant.* **62**: 238-244.
18. LI M, AND WANG, G. X. (2002). Effect of drought stress on activities of cell defence enzymes and lipid peroxidation in *Glycyrrhiza uralensis* seedlings. *Acta Ecologica Sin.* **22**: 503-507.
19. LI, G. M., TANG, L. S. SHANG, Z. Q. AND. CHI, S. M. (2003). Effect of osmotic stress on protective enzyme systems in maize seedlings and its relationship to drought resistance. *J. Hebei Agril. Univ.* **17** (2): 1-5.
20. NARKHEDE, P. L. (1989). Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolites of *rabi* sorghum and soil factors controlling conservation of moisture. *Ph. D. Thesis, M. P. K. V. Rahuri*
21. SAIRAM, R. K. AND SAXENA, D. C. (2000). Oxidative stress and antioxidants in wheat genotypes: possible mechanism of water stress tolerance. *J. Agro. Crop. Sci.* **184**: 55-61.
22. SAIRAM, R. K. AND KUMARI, S. (1998). Measurements of water potential, relative water content and membrane stability. A short course on "Physiological analysis of yield in crop plants". *JCAR, IARI, New Delhi.* 131-137.
23. SAIRAM, R. K., SHUKLA, D. S. AND SAXNA, D. C. (1998 a). Stress induced injury and antioxidant enzymes in relation to drought tolerance in wheat genotypes. *Biol. Planta.* **40** (3), 357-364.
24. SAIRAM, R. K., DESHMUKH, P. S. AND SHUKLA, D. S. (1997). Tolerance of drought and temperature stress in relation to increased antioxidant enzyme activity in wheat. *J. Agronomy & Crop Sci.* **178**: 171-178.
25. SCANDALIOS JOHN, G. (1993). Oxygen stress and Superoxide dismutases. *Plant Physiol.* **101**: 7-12.
26. TAKAHASHI M. AND K. ASADA. (1983). Superoxide anion permeability of phospholipids membranes and thylakoids. *Archives Biochem and Biophy.* **226**: 558-566
27. THIPPESWAMY, M., KUMARI, G. J., REDDY, P. C. O., RANGANAYAKULU, G. S., MALLAIAH, G. V. N. AND SUDHAKAR, C. (2005). Water use efficiency traits and

- antioxidative efficacy in safflower (*Carthamus tinctorius* L.) during water stress. *National Seminar on Plant Physiology, NAU, Navsari*. **III-P5**. 63.
28. THIPPESWAMY, M., KUMARI, G. J., REDDY, P. C., RANGANAYAKULU, G. S., MALLAIAH, G. V. AND SUDHAKAR, C. (2005). Water use efficiency traits and antioxidative efficacy in safflower (*Carthamus tinctorius* L.) during water stress. *National Seminar on Plant Physiology, NAU, Navsari*. **III-P5**. 63.
  29. VENKATESAN, A. AND CHELLAPPAN, K. P. (1999). Salinity effect on the activities of certain antioxidant enzymes in *Ipomea pes-caprae* Sweet, a halophyte. *Indian J. Plant Physiol.* **4(1)**. 40-42.
  30. VERMA, A. AND ANANDA KUMAR, P. (2005). *In vitro* plant regeneration from different explants of sorghum (*Sorghum bicolor* L.) Moench. *Plant Cell Biotec. Mol. Biol.* **6(3 &4)**. 101-108.
  31. VIDYASEKHARAN, P. AND DURAIRAJ, P. (1973). Shot-hole syndrome in mango. *Indian Phytopath.* **26**: 49-55.
  32. YIM, M. B., CHOCK, P. B. AND STADTMAN, E. R. (1990). Copper zincsuperoxide dismutase catalyzes hydroxyl radical production from hydrogen peroxide. *Proc. Natl Acad Sci. USA.* **87**: 5006-5010.
  33. ZHANG, J. AND. KIRKHAM, M. B. (1996). Enzymatic responses of the ascorbate-glutathione cycle to drought in sorghum and sunflower plants. *Plant Sci.* **113**: 139-147.



## 29. Yield Components of wheat (*Triticum aestivum* L.) under AMF and water stress conditions

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

212

### IMPACT OF ARBUSCULAR MYCORRHIZAL FUNGI ON YIELD COMPONENTS AND BIOCHEMICAL CHANGES IN WHEAT (*TRITICUM AESTIVUM* L.)

S. L. KHAPKE

Dept. of Botany,  
New Arts, Commerce and Science College, Parner -414302 (M. S.)  
E-mail: [sajankhapke@gmail.com](mailto:sajankhapke@gmail.com)

#### ABSTRACT

This research article aimed at determining the impact of AM fungi on changes in biochemical and yield components of wheat plants at seedling and anthesis stage. The pot culture experiment was carried out in three replications by using four treatments as 25g, 50g, 75g and 100g of mycorrhizal soil along with control. Chlorophyll a, Chlorophyll b, total Chlorophyll content, chlorophyll stability index and yield components were assessed during study. Results obtained clearly indicated that, increase in mycorrhizal treatment show enhancement in chlorophyll a, b and total chlorophyll content over control at seedling and anthesis stage. Chlorophyll a, b and total chlorophyll content were recorded more in anthesis stage than seedling stage. Chlorophyll stability index in mycorrhizal soil treated plants was found more than non- treated mycorrhizal plants. The yield parameters like, ear head length, no. of seeds/ear head, yield/plant and 100 seed weight were increased in all mycorrhizal soil treatment as compare to control.

Figure:02

References:21

Table:01

Key words: - AM fungi, *Triticum aestivum*, Chlorophyll, CSI, Yield components.

#### Introduction

Wheat (*Triticum aestivum* L.) is a cereal grain that belongs to family Poaceae. Wheat is the second largest cereal grain consumed on earth. It is the most important agricultural good in international market and also it is one of the strategic agricultural productions which have daily and universal consumption (Mollasadeghi *et al.*, 2011). Wheat is the main food for majority of worldwide increasing population (Habibpor *et al.*, 2011). In India it is second important staple food crop, which contain a high percentage of carbohydrates and proteins.

Arbuscular mycorrhizal (AM) fungi have symbiotic relationship with roots of plants in terrestrial ecosystems and associating with about 80% of plant families' worldwide. AM fungi recognized as an important, widespread component of most terrestrial ecosystems and benefiting plant's well establishment by enhancing plant nutrient acquisition, improving soil quality and

increasing resistance to environmental stresses (Smith and Read, 1997). The AM fungi can increase plant uptake of nutrients and consequently increase root and shoot biomass and improve plant growth and yield (Ryan and Angus, 2003). The inoculation of AM fungi improves the physico-chemical and biochemical properties of amended soil (Caravaca *et al.*, 2004). However, the uptake and transfer of nutrients to the host plant is not the only physiological role of AM symbiosis. Indeed, in most cases studied, the association between an AM fungus and a plant makes the host plant more tolerant to abiotic stresses (Dodd and Ruiz-Lozano, 2012). Arbuscular mycorrhizal fungi are important in sustainable agriculture because they improve plant water relations and thus increase the drought resistance of host plants, they improve disease resistance and they increase mineral uptake by increased acquisition of phosphorus and other low mobile mineral nutrients, which reduce the use of fertilizers. The root colonization by the Mycorrhiza increases active absorptive

surface area and stimulates water uptake even in water stress conditions. Chlorophyll is most prominent and important pigment in plants. The chlorophyll has a key role in photosynthesis process. From physiological point of view leaf chlorophyll content is a parameter to know the limit of photosynthetic potential and primary production. The lower concentration of chlorophyll content of leaf can directly control the photosynthetic ability (Curran *et al.*, 1990, Filella *et al.*, 1995). Chlorophyll stability index is an ability of the plants to withstand the adverse conditions and hence it most important parameter of the plants. The degree of degradation of chlorophyll varies from plant to plant. In certain plants chlorophylls are more stable under adverse conditions. Such plant species shows high chlorophyll stability index (Pawar and Kamble, 2015). The main aim of this work was to investigate the biochemical changes at seedling and anthesis stage and yield components at anthesis stage during maturity in wheat by using arbuscular mycorrhizal fungi.

#### Material and Methods

The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

#### Mycorrhizal fungus inoculum

The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil (1:1 v/v) mixture (Sylvia, 1994). After 90 days under green house conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

#### Experimental design for AM fungi

The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (16.5kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Plants were watered as required.

#### Analysis of biochemical parameters

The methodology used for such analyses is briefly described below.

#### Estimation of chlorophyll pigments

Chlorophyll were extracted and estimated by Arnon's (1949) method. The leaves from treated and control seedlings were cut into small pieces and one g of sample was homogenized in chilled 80 % acetone in mortar and pestle. The acetone extract was filtered through Whatman No. 1 filter paper. The final volume of the extract was made to 100ml with 80 % acetone. The absorbance of acetone extract was read at 645 and 663 nm using UV-visible spectrophotometer 117 (Systronics) using 80 per cent acetone as a reference.

#### Chlorophyll Stability Index (CSI)

Chlorophyll Stability Index was estimated by using the method of Murthy and Majumdar (1962) and calculated by following formula, CSI= Total Chlorophyll of treated plant / Total Chlorophyll of control plant

#### Analysis of yield parameters

The randomly selected ear heads of five different plants were collected and their length was determined. The dried and matured ear heads were selected randomly and the seeds harvested from each ear head were counted. The weight of seeds per head and 100 seeds

weight was measured from the seeds obtained from ear heads.

#### Statistical analysis

The data obtained from yield and biochemical parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients (Snedecor and Cochran, 1980). CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

### Results and Discussion

#### Chlorophyll content

Chlorophyll is the imperative pigment for increase in photosynthetic activity. The content of photosynthetic pigments (chlorophyll a, b and total chlorophyll) of mycorrhizal plants is estimated. Obtained results reveals that, increase in mycorrhizal treatments show enhancement in chlorophyll a, b and total chlorophyll content over control. At the seedling stage of wheat, maximum content of chlorophyll-a ( $4.69 \text{ mg g}^{-1} \text{ Fr. wt}$ ), chlorophyll-b ( $4.03 \text{ mg g}^{-1} \text{ Fr. wt}$ ) and total chlorophyll ( $3.56 \text{ mg g}^{-1} \text{ Fr. wt.}$ ) was recorded in 100 gm mycorrhizal soil treatment, while at the anthesis stage maximum content of chlorophyll-a ( $12.14 \text{ mg g}^{-1} \text{ Fr. wt}$ ), chlorophyll-b ( $8.15 \text{ mg g}^{-1} \text{ Fr. wt}$ ) and total chlorophyll ( $7.20 \text{ mg g}^{-1} \text{ Fr. wt.}$ ) was recorded in same treatment (Fig.1). In the present study, chlorophyll a, b and total chlorophyll content were recorded more in anthesis stage than seedling stage. This effect may be due to long durational mycorrhizal effect on wheat. Abo-Ghalia and Khalafallah (2008) reported significantly greater chlorophyll content in mycorrhizal plants compare to non-mycorrhizal plants. Saed-Moucheshi *et al.* (2012) reported increase in chlorophyll contents in the mycorrhizal wheat plants compare to non inoculated wheat plants. The increase in chlorophyll content in mycorrhizal plants could be associated with higher rate of

photosynthesis or due to the increase in nitrogen and magnesium contents which are the major components of chlorophyll pigment (Mathur and Vyas, 1995; Abo-Ghalia and Khalafallah, 2008).

#### Chlorophyll Stability Index (CSI)

Chlorophyll stability index is depends on total chlorophyll content of stressed/treated and non-stressed/control plants.

Chlorophyll stability index in mycorrhizal soil treated plants was found more than non- treated mycorrhizal plants (control). In the present investigation it was observed that, increase in Chlorophyll stability index as increase in mycorrhizal soil treatment to wheat plants. It was recorded maximum (1.42 and 1.40) in 100 gm mycorrhizal soil treated plants at seedling stage and anthesis stage respectively (Fig.2). The high chlorophyll stability indices help the plants to withstand stress through better availability of chlorophyll. This leads to increase in photosynthetic rate and more dry matter production (Madhan Mohan *et al.*, 2000).

#### Yield contributing parameters

In the present study plant yield was calculated at the anthesis stage during maturity on the basis of yield contributing characters such ear head length, number of seed/ear head, yield/plant and 100 seed weight.

The yield parameters like, ear head length, no. of seeds/ear head, yield/plant and 100 seed weight were increased in all mycorrhizal soil treatment as compare to control (Table 1). The treatment 75 gm mycorrhizal soil was found more effective for ear head length (7.18 cm), no. of seeds/ear head (26.50) and yield/plant (0.88 gm) than other remaining treatments, while the treatment of 75 gm mycorrhizal soil was found more effective for seed weight (3.65 gm) than control and other remaining treatments. The maximum values of SE (1.22) and CD (3.39) was found for no. of seeds/ear head.

The results of present study are supported by the results of Miri *et al.* (2013) where the authors reported highest wheat grain

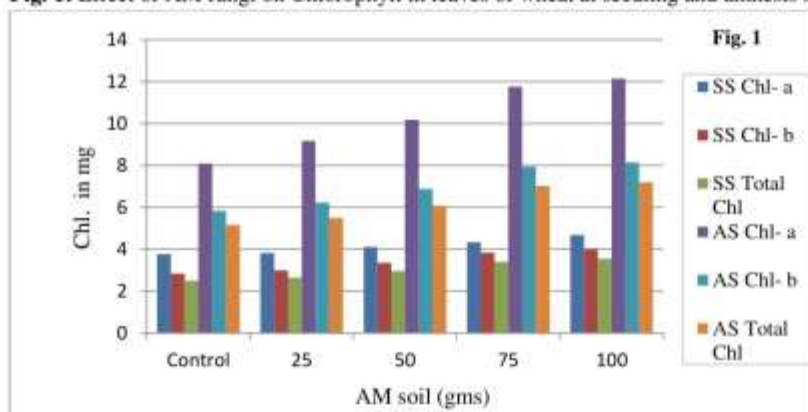
yield obtained with mycorrhiza treatment as well as the combine treatment of mycorrhiza and *Azotobacter* in normal irrigation conditions. In concerned with other plant species, Khaliq and Mirhassan (2010) reported increase in yield of *Mentha piperita* with the treatments of mycorrhiza. Similar observations were reported by Khalil and Yousef (2014a) in *Hibiscus sabdariffa* and Khalil and Yousef (2014) in *Lipidium sativum*.

**Conclusion**

AM fungi are ecologically important symbiont of most terrestrial plant's root system. Most terrestrial plants associate with root colonizing mycorrhizal fungi. The results from this study

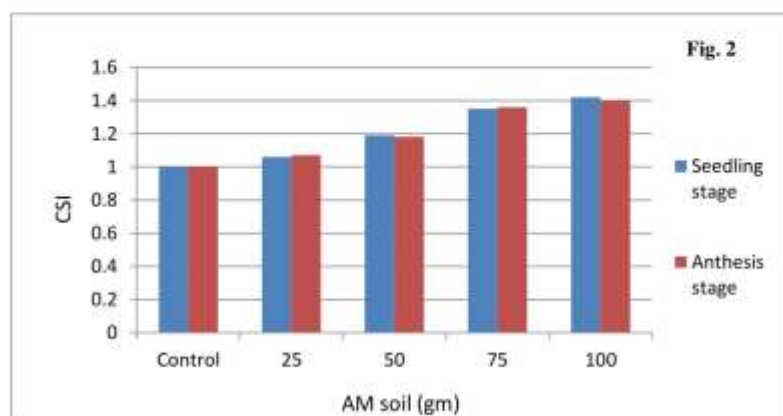
showed that inoculation of AM fungi *Glomus mosseae* to wheat plants, the chlorophyll content, chlorophyll stability index and the yield parameters like, ear head length, no. of seeds/ear head, yield/plant and 100 seed weight were increased in all mycorrhizal soil treatments as compare to control. This study suggested that the AM fungi (*Glomus mosseae*) application in agricultural fields of economically important crops can yield higher quantity and quality of seeds compare to non-inoculated crops. They were considered as environment friendly fertilizers and do not cause any kind of pollution for a generation to come.

**Fig. 1:** Effect of AM fungi on Chlorophyll in leaves of wheat at seedling and anthesis stage



SS: Seedling Stage; AS: Anthesis Stage

**Fig. 2:** Effect of AM fungi on Chlorophyll Stability Index (CSI) in leaves of wheat at Seedling and anthesis stage.



**TABLE I:** Effect of AM fungi on yield parameters of wheat.

AM Soil (gm)	Ear Head length (cm)	No. of Seeds / Ear Head	Yield / Plant (gm)	100 Seeds Weight (gm)
Control	5.00	20.00	0.68	3.44
25	5.88	20.40	0.74	3.50
50	6.52	22.00	0.70	3.57
75	7.18	26.50	0.88	3.65
100	6.88	24.20	0.87	3.62
<b>SE</b>	<b>0.39</b>	<b>1.22</b>	<b>0.04</b>	<b>0.04</b>
<b>CD at 5%</b>	<b>1.08</b>	<b>3.39</b>	<b>0.11</b>	<b>0.11</b>

#### References

1. ABO-GHALIA, H.H. and KHALAFALLAH, A.A. (2008). Responses of wheat plants associated with Arbuscular mycorrhizal fungi to short-term water stress followed by recovery at three growth stages. *J. Appl. Sci. Res.* **4**(5):570-580.
2. ARNON, D. I. (1949). Copper enzymes in isolated chloroplasts polyphenol oxidase in *Beta vulgaris* (L.). *Plant Physiol.* **24**:1-15.
3. CARAVACA, F., ALGUACIL, M.M., AZCON, R., DIAZ, G. and ROLDAN, A. (2004). Comparing the effectiveness of mycorrhizal inoculation and amendment with sugar beet, rock-phosphate and *Aspergillus niger* to enhance field performance of the leguminous shrub *Dorycnium pentaphyllum* L. *Appl. Soil Ecol.* **25**, 169-180.
4. CURRAN, P.J., DUNGAN, J.L. and GHOLZ H.L. (1990). Exploring the relationship between reflectance red edge and chlorophyll content in slash pine. *Tree Physiology* **7**:33-48.
5. DODD, I.C. and RUIZ-LOZANO, J.M. (2012). Microbial enhancement of crop resource use efficiency. *Curr. Opin. in Biotech.* **23**:236-242.
6. FILELLA, I., SERRANO, L., SERRA, J. and PEÑUELA, S. J. (1995). Evaluating wheat nitrogen status with canopy reflectance indices and discriminant analysis. *Crop Science* **35**:1400-1405.
7. HABIBPOR, M., VALIZADEH, M., SHAHBAZI, H. and AHMADIZADEH, M. (2011). Genetic diversity and correlation among agronomic and morphological traits in wheat genotypes (*Triticum aestivum* L.) under influence of drought. *Adv. Environ. Biol.*, **5**(7): 1941-1946.
8. KHALIL, S. E. and YOUSEF, R. M. M. (2014). Interaction effects of different soil moisture levels, arbuscular mycorrhizal fungi and three phosphate levels on: i- growth, yield and photosynthetic activity of garden cress (*Lepidium sativum* L.) plant. *Int.Jr. Adv. Res.* **2**(6):723-737.
9. KHALIL, S. E. and YOUSEF, R. M. M. (2014a). Study the effect of irrigation water regime and fertilizers on growth, yield and some fruit quality of *Hibiscus sabdariffa* L. *Int. J. of Adv. Res.* **2**(5):738-750.
10. KHALIQ, A. and MIRHASSAN, K.K. (2010). Influence of vesicular arbuscular mycorrhizal fungi on the productivity of cultivated mints. *J. Med. Arom. Plant Sci.* **19**:7-10.
11. MADHAN MOHAN., LAKSHMI NARAYAN, M. S. and IBRAHIM, S. M. (2000). Chlorophyll Stability Index (CSI): Its impact on salt tolerance in rice. *Int.Rice Res. Notes.* **25**:38-39.

12. MATHUR, N. and VYAS, A. (1995). Influence of VAM on net photosynthesis and transpiration of *Ziziphus mauritiana*. *J. Plant Physiol.* **147**:328-330.
13. MIRI, M.R., TOHIDI MOGHADAM, H.R., GHOOSHCHI, F. and ZAHEDI, H. (2013). Effect of *Azotobacter* and arbuscular mycorrhizal colonization enhance wheat growth and physiological traits under well-watered and drought conditions. *Adv.in Envi.Bio.* **7**(14):4630-4636.
14. MOLLASADEGHI, V., R. SHAHRYARI, A.A. IMANI and KHAYATNEZHAD. (2011). Factor analysis of wheat quantitative traits on yield under terminal drought. *Am. Eur. J. Agric. Environ. Sci.*, **10**(2): 157-159.
15. MURTHY, K.S. and MAJUMDHAR, S.K. (1962). Modification of technique for determination of chlorophyll stability index in relation to studies of drought resistance in rice. *Curr. Sci.* **31**:470-471.
16. PAWAR, S.G. and KAMBLE, V.M. (2015). Evaluation of chlorophyll content and chlorophyll stability index of some antiallergenic medicinal plants. *Asian Journal of Multidisciplinary Studies* **3**(1):17-19.
17. RYAN, M.H. and ANGUS, J.F. (2003). Arbuscular mycorrhizae in wheat and field pea crops on a low P soil: increased Zn-uptake but no increase in P uptake or yield. *Plant Soil.* **250**: 225-239.
18. SAED-MOUCHESHI, A., HEIDARI, B., ZAREI, M. EMAMY, and PESSARAKLI, M. (2012). Changes in antioxidant enzymes activity and physiological traits of wheat cultivars in response to arbuscular mycorrhizal symbiosis in different water regimes. *Iran Agri. Res.* **31**(2):35-50.
19. SMITH, S.E. and READ, D.J. (1997). Mineral nutrition, heavy metal accumulation and water relations in VA mycorrhizas. In: mycorrhizal symbiosis (eds.) Smith S.E., D.J. Read, 2nd edn. Academic press, San Diego, pp. 126-160.
20. SNEDECOR, C.W. and COCHRAN, W.G. (1980). *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press.
21. SYLVIA, D. M. (1994). Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2-microbiological and Biochemical Properties*, 351-378.

### 30. Ameliorative effect of am fungi on wheat (*triticum aestivum* L.) Under water stress conditions.

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

260

#### AMELIORATIVE EFFECT OF AM FUNGI ON WHEAT (*TRITICUM AESTIVUM* L.) UNDER WATER STRESS CONDITIONS

S. L. KHAPKE

Dept. of Botany and Research Center,  
New Arts, Commerce and Science College, Parner -414302 (M. S.)  
E-mail: [sajankhapke@gmail.com](mailto:sajankhapke@gmail.com)

#### ABSTRACT

The present study investigated the ameliorative effect of arbuscular mycorrhizal (AM) fungi under water stress conditions in wheat at seedling stage. The pot culture experiment was laid out in a randomized block design with three replications and four mycorrhizal treatments, five water stress treatments and combination of AM fungi and water stress treatments. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Growth parameters like plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth were determined. AM fungal plants had significantly higher plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth than non AM plants at seedling stage in the wheat. Plant height was greatly affected at 20% FC water stress treatment at seedling stage. When water stress induce along with combination treatments of AM fungi it showed increase in all morphological parameters as compare to only water stress treatments.

Figures : 00

References: 30

Tables: 03

**KEY WORDS:** - AM fungi, *Triticum aestivum*, growth parameters, water stress

#### Introduction

Wheat (*Triticum aestivum* L.) is the second most important cereal just after rice. It is eaten in various forms by more than one thousand million human beings in the world. In India it is second important staple food crop, which contain a high percentage of carbohydrates and proteins.

Stress is an altered physiological condition caused by factors that tend to disrupt the equilibrium. Plants are frequently exposed to many stresses such as drought and low temperature, salt, flooding and heat, which severely affect plant growth and food productivity. Water, comprising 80% - 90% of the biomass of plants, is the central molecule in all the physiological processes of plants by being the major medium for transporting metabolites and nutrients. Drought is the most severe abiotic stress factor limiting plant growth and crop

production (Rohbakhsh, 2013). Water deficit is considered as a major environmental factor affecting many aspects of plant physiology and biochemistry (Charles *et al.*, 1994).

Arbuscular mycorrhizal fungi show symbiotic association with roots of terrestrial plants belonging to approximately 80% of plant families worldwide. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Many thousands of experiments have shown that AMF can overcome nutrient limitation to plant growth by enhancing nutrient acquisition (Clark and Zeto, 2000). The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. AMF also play an important role in the water economy. Drought is a complex phenomenon, and is considered one of the most important factors limiting crop yields around the

world. Arbuscular mycorrhizal fungi symbiosis contributes to enhance growth and vigor of plants, and can alter plant water relations, particularly during water stress periods (Ruiz-Lozano *et al.*, 1995; Augé, 2001). The root colonization by the mycorrhiza increases active absorptive surface area and stimulates water uptake in water stress condition (Kyriazopoulos *et al.*, 2014). The extensive extrametrical hyphae of AMF extend out into the soil for several centimeters so that it bridges the zone of nutrient depletion. Thus, the plant is able to exploit microhabitats beyond the nutrient depleted area where rootlets and root hair cannot thrive (O'Keefe and Sylvia, 1993). The main purpose of this experiment was to investigate the effects of arbuscular mycorrhizal fungus (*Glomus mosseae*) on the growth parameters and percentage of root colonization in wheat plants.

#### Material and Methods

The pot culture experiment was conducted at the Research centre, Department of Botany, New Arts, Commerce and Science College, Ahmednagar. The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (MS) for experimental work.

#### Mycorrhizal fungus inoculum

The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil (1:1 v/v) mixture (Sylvia, 1994). After 90 days under green house conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

#### Experimental design for AM fungi

The pot culture experiment was laid out in a randomized block design with three replications

and four mycorrhizal treatments as 25g, 50g, 75g and 100g of mycorrhizal soil. Five plastic buckets each of 30 X 30 X 27 cm size were serially numbered and weighed (0.5 kg). At the bottom of each bucket small holes were made to drain excess water. In each bucket 16 kg (garden soil and well-decomposed compost in 3:1 proportion) was filled. The weights of all buckets along with soil were recorded (16.5kg). AM inoculum were placed 3 cm below the seeds at the time of sowing. The non-mycorrhizal treatment had equal amount of sterilized soil to provide the same microflora without mycorrhizal fungi. Plants were watered as required.

#### Experimental design for water stress

The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method described by Narkhede (1989) was followed.

#### Experimental design for combinational treatment of AM fungi and water stress on wheat cultivar

The above prepared FC (100% FC, 80% FC, 60% FC, 40% FC and 20% FC) set and one AM fungi treatment (75g) i.e. (75g + 100% FC, 75g + 80% FC, 75g + 60% FC, 75g + 40% FC, 75g + 20% FC) were used for the combinational experiments.

**Plant growth parameters-** The effect of AM fungi, water stress and combinational treatment of AM fungi and water stress were analyzed for various growth parameters at seedling stage by using randomly selected third leaf from top of five different plants for each treatment. The methodology used for such analyses is briefly described below.

**Plant height-** The plant height of five randomly selected plants from each bucket was recorded from the base of the plant near the ground level up to the tip of fully expanded leaf. After



emergence of ear head, the height was measured up to the top of the ear head.

**Numbers of leaves per plant-** The total numbers of leaves were recorded.

**Leaf area per plant-** The leaf area per plant was calculated by taking maximum length and width of the selected leaf and it was multiplied by the factor 0.747 (Stickler *et al.*, 1961). From this the total leaf area was calculated.

**Stem Girth-** Stem girth was recorded.

#### Statistical analysis

The data obtained from morphological parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients (Snedecor and Cochran, 1980). CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

### Results and Discussion

#### Effect of AM fungi treatment on growth parameters

The influence of AM fungi treatments (*Glomus mosseae*) on wheat was assessed on the basis of parameters like plant height, leaf length, leaf breadth, no. of leaves, leaf area and stem girth against control. All AM fungi treatments showed positive effect on plant height, leaf length, leaf breadth, leaf area except leaf numbers per plant and stem girth compare to control at seedling stage.

In the present study plant height increased significantly ( $p=0.1$ ) along with increase in AM fungi treatment. The highest plant height 24.42 cm was measured in 75 gm AM fungi treatment compare to control plants 14.86 cm at seedling stage (Table 1).

Leaf length and leaf breadth also increases significantly with increase in AMF treatment. Leaf length was observed highest i.e.

17.30 cm, while leaf breadth increased larger i.e. 1.20 cm at 75 gm AMF treatment to control at seedling stage. All AMF treatments showed more effect on leaf area at seedling stage. It was observed more i.e. 83.04 cm<sup>2</sup> (Table 1) in 75 gm. mycorrhizal treatment at seedling stage. Among all the morphological parameters, leaf area shows more variation than other parameters like plant height, leaf length, leaf breadth, no. of leaves and stem girth, therefore its SE is more i.e. 9.72 and CD also high i.e. 27.02 at seedling stage (Table 1).

It is well established that mycorrhizal infection improves the growth and yield of plant. El-Amri *et al.* (2013) reported with the inoculation of mycorrhiza there was increased in growth parameters of wheat like, stem length, number of leaves and leaf area as compared to control. Recently Abd-Allah *et al.* (2015) observed that addition of AM fungi significantly increased growth parameters of wheat such as plant height as compared to non inoculated wheat plants. Hafez *et al.* (2013) noted similar observation in mycorrhiza treated olive plants. Lenin *et al.* (2010) noted increase in growth parameters of four vegetable crops, *Lycopersicum*, *Solanum*, *Capsicum* and *Abelmoschus* with the inoculation of AM fungi. According to Sharifi *et al.* (2007), the increase in growth parameters can be resulted from the effect of AM fungi on better absorption of various nutrients. Shrihari and Shrinivasa (1998) evaluated the effect of arbuscular mycorrhiza by using 0 to 100 gm mycorrhizal soil and he reported the optimum dose was 70 gm mycorrhizal soil. At this dose they reported that plant phosphorus concentration increases significantly. Therefore the parameters like growth and yield was maximum at this concentration.

#### Effect of water stress treatments on growth parameters

Water stress has great influence on various morphological parameters like plant height, leaf

area, leaf length, leaf breadth, number of leaves and stem girth. In this experiment wheat plant was exposed to various levels of water stress ranging from 100% FC to 20% FC. To know the effect of water stress on wheat cultivar was analyzed at seedling stage.

In the present study, plant height was greatly affected at 20% FC water stress treatment at seedling stage compared to control. On the other hand 40% FC and 20 % FC shows more negative effect in the form of decrease in plant height, leaf length, leaf breadth, leaf area and stem girth over control at seedling stage (Table 2).

Like mycorrhizal treatment, leaf area shows more variation in water stress treatment than other parameters such as plant height, leaf length, leaf breadth, no. of leaves and stem girth., therefore its SE is more i.e. 9.29 and CD also high i.e. 25.83 at seedling stage (Table 2). Among all water stress treatment, the treatment 80% FC shows more positive effect in the form of increase in plant height, leaf length, leaf breadth, number of leaves, leaf area and stem girth over control at seedling stage. It indicates that maximum growth of wheat plant could be achieved in 20% decreased water level. It could be due to the necessary water requirement for maximum growth of selected wheat variety is lower than it's considered need of water. The further decrease in water level affects the growth of wheat plant. Similar observations were recorded by Kilic and Yagbasanlar (2010), where the authors reported decrease in growth parameters of wheat due to water stress. Although they noted differential response from different wheat cultivars based on individuals water stress tolerant ability. Similarly Akram (2011) reported that little water shortage just before anthesis stage does not adversely affect the leaf area of wheat plant. In concern with *Stevia rebaudiana* plant, Srivastava and Srivastava (2014) reported not much reduction in plant height at mild and moderate water stress

condition as the plants were able to tolerate that much water deficit conditions.

#### **Combinational effect of AM fungi and water stress on growth parameters**

With the combination treatment of mycorrhiza and water stress, plant height was greatly affected and reduced at high concentration as compared to control at seedling stage. The combination treatment of mycorrhiza with water stress i.e. 75 gm AM soil + 60% FC and 75 gm AM soil + 80% FC showed significantly enhancement in plant height i.e. 25.22 cm and 22.62 cm compare to control at seedling stage. Among all combination treatment of mycorrhiza with water stress, the treatment 75 gm +80% FC shows more positive effect in the form of increase in leaf length, leaf breadth, no. of leaves, leaf area, stem girth and stem height over control at seedling stage (Table 3).

Like mycorrhizal treatment and water stress treatment, this combination treatment also shows more variation in SE and CD values at seedling stage. From this investigation we can conclude that, the parameter like leaf area has great significance while leaf breadth and stem girth has less significance during evaluation effect of treatments at seedling stage.

In conclusion, when water stress induce along with combination treatments of mycorrhiza it showed increase in all morphological parameters as compare to only water stress treatments. The positive influence of mycorrhiza were might be attributed to improvement in phosphorus nutrition (Bethlenfalvay *et al.* 1988), the increased water uptake by hyphae network (Faber *et al.* 1991) and increase in root length density (Bryla and Duniway 1997). In conformity with the findings of present study, Abo-Ghalia and Khalafallah (2008) reported that presence of mycorrhizal fungi stimulated the morphological parameters at all growth stages of wheat plants under water stress condition. Khalil and Yousef (2014) subjected *Lepidium sativum* plants to treatments

of AM fungi and water stress along with different phosphate levels and noted that combinational treatment of all of three have the

significant effect on all the morphological parameters.

**Table 1:** Effect of AM fungi on growth parameters of wheat at seedling stage.

AM Soil (gm)	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
Control	14.86	14.18	0.76	3.00	32.34	0.98
25	20.06	15.76	0.70	3.00	33.11	0.96
50	23.10	15.98	0.98	4.00	62.66	1.08
75	24.42	17.30	1.20	4.00	83.04	1.42
100	21.88	16.22	0.96	4.00	62.31	1.32
SE	1.66	0.50	0.09	0.24	9.72	0.09
CD at 5%	4.63	1.39	0.25	0.67	27.02	0.25

**Table 2:** Effect of water stress on growth parameters of wheat at seedling stage.

Field Capacity %	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
100	16.26	15.10	0.86	3.00	38.95	1.08
80	22.36	16.20	0.94	4.00	60.91	1.22
60	22.84	15.04	0.82	4.00	49.33	0.82
40	16.56	14.10	0.62	3.00	26.23	0.56
20	11.14	8.66	0.38	2.20	7.28	0.40
SE	2.17	1.33	0.10	0.34	9.29	0.15
CD at 5%	6.03	3.70	0.28	0.95	25.83	0.42

**Table 3:** Effect of AM fungi and water stress on growth parameters of wheat at seedling stage.

AM Soil (gm) and Field Capacity %	Plant Height (cm)	Leaf Length (cm)	Leaf Breadth (cm)	No. of Leaves/ Plant	Leaf Area (cm <sup>2</sup> )	Stem Girth (cm)
Control + 100	16.84	15.04	0.96	3.00	43.31	1.12
75 +80	22.62	16.30	1.14	4.00	74.32	1.36
75+60	25.22	16.08	1.02	4.00	65.60	1.14
75+40	17.24	15.10	0.74	3.40	38.04	0.86
75+20	13.66	11.98	0.48	3.00	17.25	0.74
SE	2.10	0.77	0.12	0.22	10.17	0.11
CD at 5%	5.84	2.14	0.33	0.61	28.27	0.31

**Conclusion**

Drought is a major constraint which affects wheat productivity and it can be improved using AM fungi. Impact of water stress can be improved by treating the soil @ 5 g/kg of the AM soil for enhancing the number of seeds/ear head, 100 seed weight and yield/plant under water stress. On the basis of growth results obtained during study, the

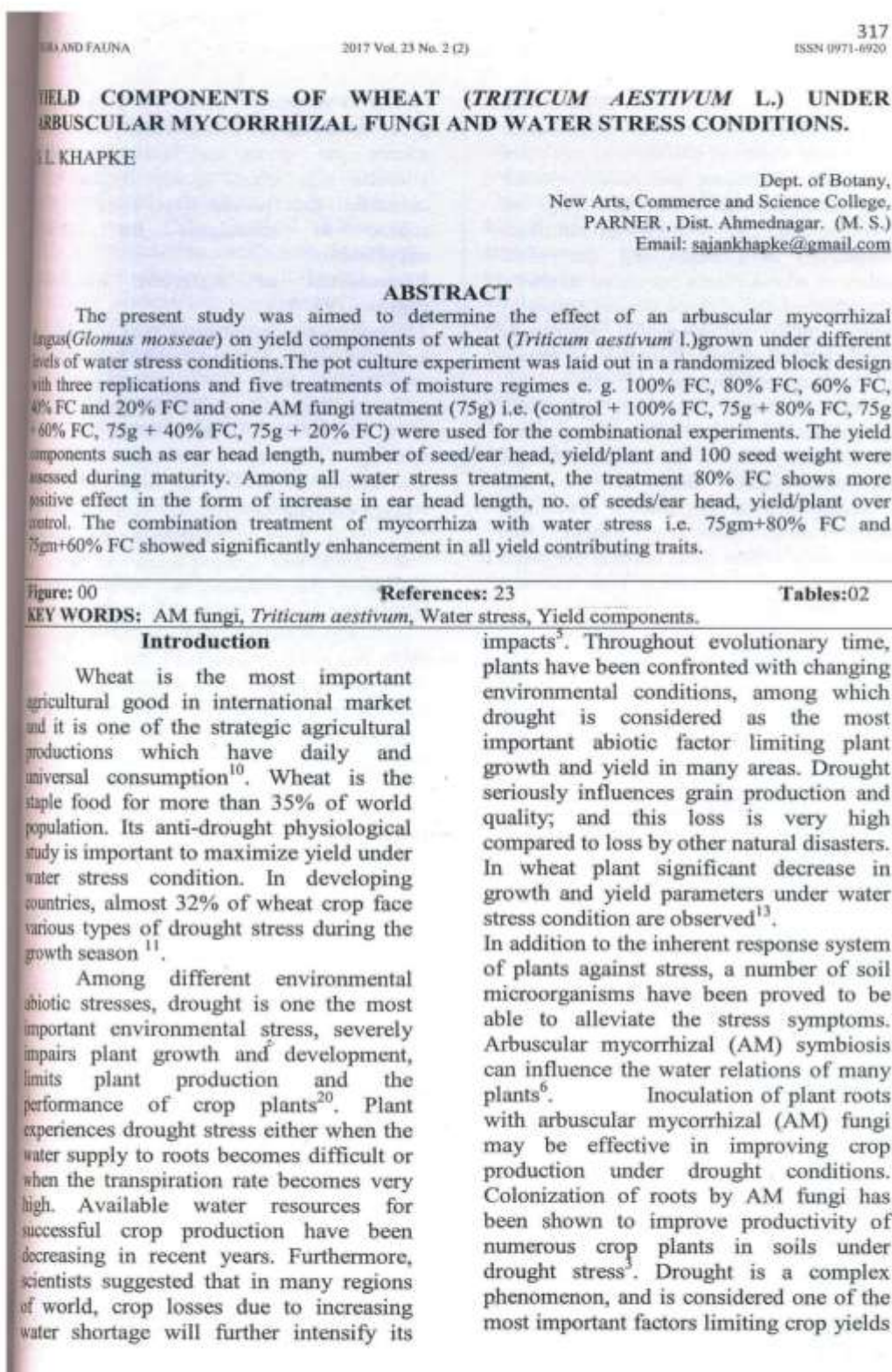
optimum dose of 75 gm mycorrhizal soil treatment is the best. During stress experiment the treatment 80% FC was found best for improvement in growth parameters over 100 % FC (control) and other stress treatments. The current investigation confirms that mycorrhizal symbioses can play a vital role in the improvement of the growth in wheat plants.

**References**

1. ABD-ALLAH, M. M., SAFWAT, EL-B., BAKRY, A. B. AND MERVAT, S.S. (2015): Effect of arbuscular mycorrhiza and glutamic acid on growth, yield, some chemical composition and nutritional quality of wheat plant grown in newly reclaimed sandy soil. *Res.J. Pharm., Bio. and Chem. Sci.* **6**(3):1038-1054.
2. ABO-GHALIA, H. H. AND KHALAFALLAH, A. A. (2008): Responses of wheat plants associated with Arbuscular mycorrhizal fungi to short-term water stress followed by recovery at three growth stages. *J. Appl. Sci. Res.* **4**(5):570-580.
3. AKRAM, M. (2011): Growth and yield components of wheat under water stress of different growth stages. *Bangladesh J. Agril.* **36** (3):455-468.
4. AUJE, R. M. (2001): Water relations, drought and vesicular-arbuscular mycorrhizal symbiosis. *Mycorrhiza*. **11**:3-42.
5. BAREA, J.M. (1991): Vesicular-arbuscular mycorrhizae as modifiers of soil fertility. *Adv. Soil Sci.* **15**:1-40.
6. BETHLENFALVAY, G.J., BROWN, M.S., AMES, R.N. and THOMAS, R.E. (1988): Effects of drought on host and endophyte development in mycorrhizal soybeans in relation to water use and phosphate uptake. *Physiol. Plant.* **72**:565-571.
7. BRYLA, D.R. and DUNIWAY, J.M. (1997): Effects of mycorrhizal infection on drought tolerance and recovery in sunflower and wheat. *Plant Soil*. **97**:95-103.
8. CLARK, R.B. and ZETO, S.K. (2000): Mineral acquisition by arbuscular mycorrhizal plants. *J. Plant Nutr.* **23**:867-902.
9. CHARLES, O., JOLY, R. and SIMON, J.E. (1994) Effect of Osmotic Stress on the Essential Oil Content and Composition of Peppermint. *Phytochemistry*, **29**, 2837-2840.
10. EL-AMRI, S.M., MOHAMED, H.A., GAMAL, M.A. and MANZER, H.S. (2013): Role of mycorrhizal fungi in tolerance of wheat genotypes to salt stress. *Afr. J. Microbiol.* **7**(14):1286-1295.
11. FABER, B.A., ZASOSKE, R.J., MUNNS, D.N. and SHACKEL, K. (1991): A method for measuring hyphal nutrition and water uptake in mycorrhizal plants. *Can. J. Bot.* **69**:87-94.
12. GIOVANNETTI, M. and MOSSE, B. (1980): An evaluation of techniques for measuring vesicular arbuscular mycorrhizal infection in roots. *New Phytol.* **84**:489-500.
13. HAFEZ, O.M., SALEH, M.A. and EL-LETHY, S.R. (2013): Response of some seedlings olive cultivars to foliar spray of yeast and garlic extracts with or without vascular arbuscular mycorrhizal fungi. *World Appl. Sci. J.* **24** (9): 1119-1129.

14. KHALIL, S.E. and YOUSEF, R.M.M. (2014): Interaction effects of different soil moisture levels, arbuscular mycorrhizal fungi and three phosphate levels on: i- growth, yield and photosynthetic activity of garden cress (*Lepidium sativum* L.) plant. *Int.Jr. Adv. Res.* **2** (6):723-737.
15. KILIÇ, H. and YAĞBASANLAR, T. (2010): The Effect of Drought Stress on Grain Yield, Yield Components and some Quality Traits of Durum Wheat (*Triticum turgidum* ssp. *durum*) Cultivars. *Not. Bot. Hort. Agrobot. Cluj.* **38** (1):164-170.
16. KYRIAZOPOULOS, A.P., MICHAIL, O., ELENI, M. A., ZOI, M. P. and NIKOLETA, S. (2014): Effects of arbuscular mycorrhiza fungi on growth characteristics of *Dactylis glomerata* L. under drought stress conditions. *Not. Bot. Horti. Agrobot.* **42**(1):132-137.
17. LENIN, M., SELVAKUMAR, G., THAMIZHINIYAN, P. and RAJENDIRAN, R. (2010): Growth and biochemical changes of vegetable seedlings induced by arbuscular mycorrhizal fungus. *J. of Exp. Sci.* **1** (4):27-31.
18. NARKHEDE, P.L. (1989): Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolic of *rabi* sorghum and soil factors controlling conservation of moisture. *Ph. D. Thesis, M. P. K. V. Rahuri*.
19. O' KEEFE, D.M. and SYLVIA, D. M. (1993): Chronology and mechanism of phosphorus uptake by mycorrhizal sweet potato plants. *New Phytol.* **122**: 651-659.
20. PHILLIPS, J.M. and HAYMAN, D.S.(1970): Improved procedure for clearing roots and staining parasitic and vesicular arbuscular mycorrhizal fungi for rapid assessment of infection. *Trans. Brit. Mycol. Soc.* **55** (1): 158-162.
21. ROHBAKHS, H. (2013) Alleviating Adverse Effects of Water Stress on Growth and Yield of Forage Sorghum by Potassium Application. *Advances in Environmental Biology*, **7**, 40-46.
22. RUIZ-LOZANO, J. M., AZCON, R. and GOMEZ, M. (1995): Effects of arbuscular mycorrhizal *Glomus* species on drought tolerance: physiological and nutritional plant responses. *Appl. Environ. Microbiol.* **61**:456-460.
23. SAED-MOUCHESHI, A., HEIDARI, B., ZAREI, M., EMAM, Y. and PESSARAKLI, M. (2012): Changes in antioxidant enzymes activity and physiological traits of wheat cultivars in response to arbuscular mycorrhizal symbiosis in different water regimes. *Iran Agri. Res.* **31**(2):35-50.
24. SHARIFI, M., GHORBANLI, M., EBRAHIMZADEH, H. (2007): Improved growth of salinity-stressed soybean after inoculation with pre-treated mycorrhizal fungi. *J. of Plant Physiol.* **164**:1144-1151.
25. SHRIHARI, P.C. and SREENIVASA, M.N. (1998) Optimum dose of arbuscular mycorrhizal inoculums for chilli in two soil types. *Karnataka J Agric. Sci.* **11** (3):696-700.
26. SNEDECOR, C.W. and COCHRAN, W.G. (1980): *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press.
27. SRIVASTAVA, S. and SRIVASTAVA, M.(2014): Morphological changes and antioxidant activity of *Stevia rebaudiana* under water stress. *Am. J. of Plant Sci.* **5**:3417-3422.
28. STEVENS, K.J., WALL, C.B. and JANSEN, J.A. (2011): Effects of Arbuscular mycorrhizal fungi on seedling growth and development of two wetland plants, *Bidens frondosa* L., and *Eclipta prostrata* (L.), grown under three levels of water availability. *Mycorrhiza* **21**:279-288.
29. STICKLER, F.C., WEARDEN, S. and PAULI, A.W. (1961): Leaf area determination in grain sorghum. *Agron. J.* **53**:178-188.
30. SYLVIA, D. M. (1994): Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2- microbiological and Biochemical Properties*, 351-378.

### 31. Impact of arbuscular mycorrhizal fungi on yield components and biochemical changes in wheat (*triticum aestivum*)



around the world. Arbuscular mycorrhizal fungi symbiosis contributes to enhance growth and vigor of plants, and can alter plant water relations, particularly during water stress periods<sup>17</sup>. The AM fungi led to enhancement in the growth, nutrition, productivity and improving the yield quality of wheat plants subjected to short-term water-stress at three critical stages of plant growth followed by recovery<sup>1</sup>. Inoculation of plots with both AM fungal isolates increased biomass and grain yields of both cultivars regardless of water regime. The number of heads per plant was generally higher in the AM fungal inoculated plants than in the non inoculated plants. The plants inoculated with *Glomus mosseae* (Gms) had significantly higher head number per plant than the plants inoculated with *Glomus etunicatum* (Gec) and non inoculated plants regardless of water regime<sup>4</sup>. The same researchers also noted that the enhancement in grain and biomass yields due to inoculation with AM fungi was higher for wheat grown under water stress condition than under well water conditions. Maximum increase in growth parameters including plant height and no. of leaves as well as yield parameters in AM inoculated *Lepidium sativum* plant under 25% decreased soil water content<sup>8</sup>.

#### Materials and Methods

The authentic seeds of wheat cultivar variety GW 496 were procured from the Mahatma Phule Agricultural University, Rahuri, Dist. Ahmednagar, (M.S.) for experimental work.

#### Mycorrhizal fungus inoculum

The pure culture of AM fungus, *Glomus mosseae* was procured from the Department of Agricultural Microbiology, University of Agricultural Sciences, Bengaluru, Karnataka, India. Pure culture of AM fungi was multiplied in earthen pots using *Zea mays* in sterilized sand soil five different plants were collected and their length was determined. The dried and matured ear heads were selected randomly

(1:1 v/v) mixture<sup>23</sup>. After 90 days under green house conditions a density of 20-25 spores per gram soil inoculum was attained. The fungal spores, hyphae and colonized root pieces were used as the source of inoculums for further experiment.

#### Preparation of different moisture regimes (FC %)

The pot culture experiment was laid out in a randomized block design with three replications and five treatments of moisture regimes e. g. 100% FC, 80% FC, 60% FC, 40% FC and 20% FC. For making different moisture regimes gravimetric method was followed with some modifications for which garden soil was used after determining its water holding capacity<sup>12</sup>.

#### Experimental design for combinational treatment of AM fungi and water stress

The above prepared FC (100% FC, 80% FC, 60% FC, 40% FC and 20% FC) set and one AM fungi treatment (75g) i.e. (control + 100% FC, 75g + 80% FC, 75g + 60% FC, 75g + 40% FC, 75g + 20% FC) were used for the combinational experiments. A uniform and healthy seeds of wheat cultivar (variety GW 496) was selected, seeds were surface sterilized with 0.1 % HgCl<sub>2</sub>, washed thoroughly 3-4 times in sterilized distilled water and then soaked in distilled water for 12 hours. Hundred well-imbibed seeds were sown in each bucket for water stress and for combinational (AM and water stress) treatment. The said experiment was replicated three times.

#### Analysis of yield parameters

In the present study plant yield was calculated at the anthesis stage during maturity on the basis of yield contributing characters such ear head length, number of seed/ear head, yield/plant and 100 seed weight. The randomly selected ear heads of

and the seeds harvested from each ear head were counted. The weight of seeds per

head and 100 seeds weight was measured from the seeds obtained from ear heads.

#### Statistical analysis

The data obtained from yield parameters were analyzed statistically for mean, standard error (SE), critical difference (CD), and correlation coefficient. Standard statistical methods were followed for estimating correlation coefficients<sup>21</sup>. The CD was calculated at 5% probability and correlation coefficient was calculated at 5% and 1% probability. The correlation between agronomic characters was estimated by using software SPSS 9.0.

### Results and Discussion

#### Effect of water stress treatment on yield contributing parameters

Among all water stress treatment, the treatment 80% FC shows more positive effect in the form of increase in ear head length, no. of seeds/ear head, yield/plant over control. The level of water stress was directly proportional to the reduction in seeds weight. The treatment of 40% FC and 20 % FC shows more negative effect in the form of decrease in ear head length, no. of seeds/ear head, yield/plant and 100 seeds weight. Due to higher concentration of water stress i.e. 20 % FC ear head arises but not filled with grains and therefore unable to estimate the no. of seeds/ear head, yield/plant and seeds weight (Table-1). It is a fact that yield and yield components of the plants are reduced in water stress condition. Wheat grain yield could severely reduce if irrigation is not applied at tillering and anthesis stages<sup>2</sup>. Decrease in yield of different wheat genotypes under drought stress condition<sup>7</sup>. There was reduction in number of wheat root system causing increase in yield, especially under water stress condition<sup>16</sup>. Many researchers have reported that AM fungi are capable of alleviating the hostile effects of drought on plant growth<sup>6,9</sup>. Increase in straw and grain yield per pot and 1000 grain weight of wheat plants inoculated with AM fungi and subjected to different levels of water stress<sup>2</sup>. The

grains / spike at 75 to 25% field capacity levels<sup>15</sup>. Earlier similar observations were recorded considering different yield parameters of wheat like, number of grains / spike<sup>19</sup> and grain weight<sup>14,18</sup>.

#### Effect of AM fungi and water stress treatment on yield contributing parameters

In the present study, the yield parameter like, ear head length, no. of seeds/ear head, yield/plant and 100 seeds weight were greatly affected and reduced at high concentrations (75g+40% FC and 75g+20% FC) combination treatments of mycorrhiza with water stress compare to control. The combination treatment of mycorrhiza with water stress i.e. 75gm+80% FC showed significantly enhancement in all yield contributing traits such as, ear head length(6.74 cm), no. of seeds/ear head (26.60), yield/plant(0.87 g) and seeds weight (3.42 g) as compare with control (Table-2).The maximum values of SE (3.29) and CD (9.13) were obtained for no. of seeds/ear head for combination treatment of AM fungi and water stress, while SE and CD was less for yield/plant i.e. 0.13 and 0.36 respectively (Table-2).

The present investigation reveals that, as water stress increases, there was reduction in all yield contributing traits; but when water stress increases along with combination treatments of mycorrhiza, it showed increase in all these yield contributing traits as compare to only water stress treatments. Such increase in yield and related parameters to the mycelia network of AM fungi which increase absorbing area of the root; convert unavailable phosphorus to available form and translocate it to plants inoculation of AM fungi resulted in significant improvement in yield in two cultivars of wheat<sup>4</sup>. Increase in yield parameters of wheat like, spike length, number of spike-lets number and weight of grains in mycorrhizal wheat plants under water stress as compared to control and also non mycorrhizal plants under water stress<sup>1</sup>. Significant increase in oil yield of



*Lepidium sativum* when inoculated with AM fungi and subjected to water stress conditions<sup>8</sup>.

### Conclusion

The results from this study showed that as water stress increased, there was reduction in all yield contributing traits, but the treatment 80% FC was found best for improvement in yield parameters over 100 % FC (control) and other stress treatments. When water stress increases along with

combination treatments of mycorrhiza, it showed increase in all the yield parameters like, ear head length, no. of seeds/ear head, yield/plant and 100 seeds weight as compare to only water stress treatments. Drought is a major constraint which affects wheat productivity and it can be improved using AM fungi. The current investigation confirms that mycorrhizal symbioses can play a vital role in the improvement of wheat productivity.

TABLE-1: Effect of water stress treatment on yield parameters of wheat.

Field Capacity %	Ear Head length (cm)	No. of Seeds / Ear Head	Yield / Plant (gm)	100 Seeds Weight (gm)
100	5.60	21.40	0.68	3.20
80	6.42	22.60	0.70	3.10
60	5.30	19.00	0.59	3.12
40	4.42	12.20	0.35	2.90
20	1.70	#	#	#
SE	0.81	2.08	0.07	0.06
CD at 5%	2.25	5.78	0.20	0.16

#:- No grain filling

TABLE-2: Effect of AM fungi and water stress treatment on yield parameters of wheat.

AM Soil (g) and Field Capacity %	Ear Head length (cm)	No. of Seeds / Ear Head	Yield / Plant (g)	100 Seeds Weight (g)
Control + 100	5.20	20.20	0.62	3.17
75+80	6.74	26.60	0.87	3.42
75+60	5.73	23.00	0.79	3.26
75+40	4.94	17.80	0.57	3.06
75+20	3.30	7.20	0.15	2.10
SE	0.56	3.29	0.13	0.23
CD at 5%	1.56	9.13	0.36	0.64

### References

1. ABO-GHALIA, H. H. AND KHALAFALLAH, A.A. (2008). Responses of wheat plants associated with Arbuscular mycorrhizal fungi to short-term water stress followed by recovery at three growth stages. *J. Appl. Sci. Res.*, 4(5):570-580.
2. AKRAM, M. (2011). Growth and yield components of wheat under water stress of different growth stages. *Bangladesh J. Agril.*, 36(3):455-468.
3. AL-KARAKI, G.N. AND AL-RADDAD, A. (1997). Effects of arbuscular mycorrhizal fungi and drought stress on growth and nutrient uptake of two wheat genotypes differing in drought resistance. *Mycorrhiza*, 7:83-88.
4. AL-KARAKI, G.N., MCMICHAEL, B. AND ZAK, J. (2004). Field response of wheat to arbuscular mycorrhizal fungi and drought stress. *Mycorrhiza*, 14:263-269.
5. ANJUM, S. A., XIE, X., WANG, L., SALEEM, M. F., MAN, C. AND LEI, W. (2011). Morphological, physiological and biochemical responses of plants to drought stress. *African J. Agric. Res.*, 6:2026-2032.
6. AUGE, R.M. (2001). Water relations, drought and vesic.-arbuscular mycorrhizal symbiosis. *Mycorrhiza*, 11:3-42.
7. DADBAKHSI, A., YAZDANSEPAS, A. AND AHMADIZADEH, M. (2012). Influence of water deficit on yield and some quantitative traits in wheat genotypes. *Cur. Res. J. Bio. Sci.*, 4(1):75-81.

- KHALIL, S.E. AND YOUSEF, R.M.M. (2014). Interaction effects of different soil moisture levels, arbuscular mycorrhizal fungi and three phosphate levels on: i- growth, yield and photosynthetic activity of garden cress (*Lepidium sativum* L.) plant. *Int. Jr. Adv. Res.*, **2** (6):723-737.
- MIRANSARI, M. (2010). Contribution of arbuscular mycorrhizal symbiosis to plant growth under different types of soil stresses. *Review article Plant Biol.*, **12**: 563-569.
- MOLLASADEGHI, V., SHAHRYARI, R., IMANI, A. A. AND KHAYATNEZHAD, M. (2011). Factor analysis of wheat quantitative traits on yield under terminal drought. *Am. Eur. J. Agric. Environ. Sci.*, **10**(2): 157-159.
- MORRIS, M. L., BLAID, A. AND BYERLEE, (1991). Wheat and barley production in rain fed marginal environments of the developing world. Part I of 1990-91 CIMMYT world wheat facts and trends: wheat and barley production in rainfed marginal environment of the developing world. CIMMYT, Mexico, D.F. pp 51.
- NARKHEDE, P. L. (1989). Effect of water stress on dry matter production, nutrient uptake, and protein and carbohydrate metabolic of *rabisorghum* and soil factors controlling conservation of moisture. *Ph. D. Thesis, M. P. K. V. Rahuri*.
- NAWAZ, H., HUSSAIN, N. AND YASMEEN, A. (2015). Growth, yield and antioxidants status of wheat (*Triticum aestivum* L.) cultivars under water deficit conditions. *Pak. J. Agri. Sci.*, **52** (4):953-959.
- PAKNEJAD, F., NASIR, M., MOGHADAM, H.R.T., ZAHIDI, H. AND ALAHMADI, M. J. (2007). Affect of drought stress on chlorophyll fluorescence parameters, chlorophyll contents and grain yield of wheat cultivars. Dept. of Agric. Islamic Azad Uni. Karaj. Branch Iran. *J. of Biol. Sci.*, **7**(6):841-847.
- RAZZAQ, A., QASIM ALL, ABDUL QAYYUM., IMRAN MAHMOOD., MUHAMMAD AHMAD AND M. RASHEED. (2013): Physiological responses and drought resistance index of nine wheat (*Triticum aestivum* L.) Cultivars under different moisture conditions. *Pak. J. Bot.*, **45**:151-155.
- REJALI, F.A., ALIZADEH, M., MALAKUTI, J. AND SALEHRASTIN, N. (2008). Efficiency mycorrhizal relationship on growth, quality and mineral uptake absorption in drought stress on wheat Soil. *Water Sci.*, **21**(2):241-256.
- RUIZ-LOZANO, J. M., AZCON, R. AND GOMEZ, M. (1995). Effects of arbuscular mycorrhizal *Glomus* species on drought tolerance: physiological and nutritional plant responses. *Appl. Environ. Microbiol.*, **61**:456-460.
- SANJARI-PIREIVATLOU, A. AND YAZDANSEPAS, A. (2008). Evaluation of wheat (*Triticum aestivum* L.) genotypes under pre and post-anthesis drought stress conditions. *J. Agri. Sci. Tech.*, **10**:109-121.
- SANJARI-PIREIVATLOU, A., ALIYEV, R. T. AND LALEHLOO, B. S. (2011). Grain filling rate and duration in bread wheat under irrigated and drought stressed conditions. *J. Plant Physiol. Breed.*, **1**(1):69-86.
- SHAO, H. B., CHU, L. Y., JALEEL, C. A., MANIVANNAN, P., PANNEERSELVAM, R. AND SHAO, M. A. (2009). Understanding water deficit stress-induced changes in the basic metabolism of higher plants: biotechnologically and sustainably improving agriculture and the eco-environment in arid regions of the globe. *Crit. Rev. Biotechnol.*, **29**:131-151.
- SNEDECOR, C. W. AND COCHRAN, W. G. (1980). *Statistical Methods*. 7<sup>th</sup> Edition. Iowa State Univ. Press.
- SORIAL, M. E. (2001). Growth, Phosphorus uptake and water relations of wheat infected with an arbuscular mycorrhizal fungus under water stress. *Ann. of Agric. Sci. Moshtohor*, **39**(2):909-931.
- SYLVIA, D. M. (1994). Vesicular-arbuscular mycorrhizal fungi. *Methods of Soil Analysis: Part 2- microbiological and Biochemical Properties*, 351-378.

### 32. A Record of *Parvirostrum retilatatum* Fuhrmann 1908 from the intestine of Partridge *Prancolinus pondicerianus*

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

303

#### A RECORD OF *PARVIROSTRUM RETILATUM* FUHRMANN, 1908, FROM THE INTESTINE, OF PARTRIDGE. *FRANCOLINUS PONDICERIANUS*

S N POKALE

Department of Zoology,  
New Arts, Commerce and Science College,  
Parner- 414 302, Dist. Ahmednagar, Maharashtra, India.  
E mail ID: [snpokale@gmail.com](mailto:snpokale@gmail.com) Cell: 9404976515

#### ABSTRACT

Redescription of *Parvirostrum reticulatum*, Fuhrmann, 1908 (Type species of *Parvirostrum*, Fuhrmann, 1908) from *Lepidecolaptes albolineatus*. And of *Parvirostrum synallaxis* (Mahon, 1957) n. comb. From *Synallaxis rutilans* both from Brazil. The present communication deals with the description of *Parvirostrum reticulatum* from the intestine of a Partridge, *Francolinus pondicerianus* at Mhatar pimprī Tq. Shrigonda, Dist. Ahmednagar, M.S. India. It is characterized by sucker medium size, testes 150-155 (152) in number, cirrus is thin 0.415 mm in length, ovary is large in size ootype is small, uterus is saccular, eggs are medium in size oval in shape.

Figure:05

References:08

Table:00

KEY WORDS: *Parvirostrum reticulatum*, *Lepidecolaptes albolineatus* ootype

#### Introduction

The genus *Parvirostrum* Fuhrmann, 1908 was erected as monotype for *P. reticulatum* Fuhrmann, 1908, described as a parasite of three species of Passeriform birds of the family Dendrocolaptidae, in Brazil. The present communication deals with the description of *Parvirostrum reticulatum* from the intestine of a Partridge, *Francolinus pondicerianus* at Mhatar pimprī Tq. Shrigonda, Dist. Ahmednagar, M.S. India; in the month of July, 1997. All the cestodes were long, whitish, with scolex, numerous immature, mature and gravid proglottids.

#### Material and Method

The cestodes were flattened, preserved in 4% formalin, stained with Harris haematoxyline, passed through various alcoholic grades, cleared in xylol and whole mount slides were prepared, for anatomical studies. The scolex is medium, dome shape, distinctly marked off from the strobila, broad posteriorly, narrow anteriorly, 5-6 depressions on lateral margin and measures 0.165 to 0.335 in length and 0.160 to 0.476 in breadth. The suckers are medium in size, oval in shape, four

in number, arranged in two pair, one pair in each half of the scolex, overlapping on each other and measure 0.126 to 0.141 in length and 0.102 to 0.121 in breadth.

The rostellar hooks are large in size, 16 in number, bi pronged, prongs slightly unequal in length and measure 0.064 to 0.089 in length and 0.001 to 0.014 in breadth.

The neck is medium in length, short, broader than long, almost two and half times broader than long, with slightly concave and convex lateral margins and measure 0.184 to 0.277 in length and 0.481 to 0.490 in breadth. The testes are 150-155 (152) in number, follicular, medium in size, round in shape, encircling ovary, on all sides, from the anterior to the posterior and from one lateral to the other lateral margin of the segments, bounded laterally by the longitudinal excretory canals and measure 0.022 to 0.045 in diameter.

The cirrus pouch is medium in size, oval in shape, anteriorly directed, obliquely placed, almost in the anterior 1 / 4<sup>th</sup> region of the segments, extends far beyond the longitudinal excretory canals, proximally, broad distally

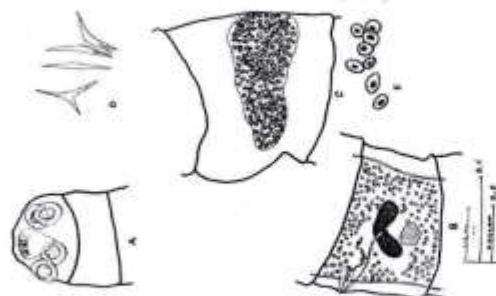
and measures 0.315 in length and 0.090 to 0.011 in breadth. The cirrus is thin, coiled contained within the cirrus pouch and measures 0.465 in length and 0.011 in a breadth. The ovary is large in size, indistinctly bilobed, central in the middle of the segments, with irregular margin, having numerous short, blunt, round acini, mostly in the aporal half of the segments, lobes extend posterolaterally and measures 0.590 to 0.726 in length and 0.136 to 0.215 in breadth. The vagina is a long tube, posterior to the cirrus pouch, starts from the genital pore, runs obliquely for a short distance, crosses the longitudinal excretory canals, slightly curved, crosses the ovary; reaches and opens in to the ootype and measures 0.965 in length and 0.011 in breadth. The ootype is small in size, oval in shape, post ovarian, situated in the postero-ventral region of the ovary, almost in the poral half of the segments, near the poral lobe of / ovary and measures 0.056 in length and 0.034 in breadth. The vitelline gland is large in size, oval in shape, placed in the posterior 1/3<sup>rd</sup> of the segments, 4-5, short, blunt round acini, near the poral lobe of the ovary, postovarian, situated in the posterior region of the segments, in the poral half of the same and measures 0.181 to 0.259 in length and 0.136 to 0.236 in breadth. The genital pores are medium in size, in shape, marginal, irregularly alternate and almost at 1/4<sup>th</sup> from anterior margin of the segments and measure 0.090 in length and 0.11 to 0.022 in breadth. The longitudinal excretory canals are medium in width and measure 0.022 in breadth. The gravid segments are large in size, almost squarish in shape, unequal in length, broader than long, with short-blunt, round acini, at the anterior and posterior and corners of the segment and measure 1.439 to 2.506 in length and 2.145 to 2.315 in breadth. The uterus is saccular, breaks into uterine capsules, each containing a single egg. The eggs are medium in size, oval in shape and measure 0.016 to 0.025 in length and 0.013 to 0.021 in breadth.

### Results and Discussion

The genus *Parvirostrum* was erected by fuhrmann, 1908 from *Picolaptes fuscicapillus*, *Dendronis elegans*, *Dendronis rostripallens*, Brazil, as type species *Parvirostrum reticulatum*.

The present worm resembles it, in many characters, but differs from it, in few characters, which are known as additional characters, as follows:

1. The worm under discussion, differs from *Parvirostrum reticulatus* in the size, shape, number and the position of the testes (medium, round, 150-155(152) and encircling the ovary vs. small, oval, 6 on each lateral side, the segment, arranged in two fields).
2. The present tapeworm, differs from *Dendronis elegans*, in the pattern, size and the position of the ovary (indistinctly bilobed, large, central, mostly poral vs. distinctly bilobed small, just on poral side of the middle line).
3. The present cestode, differs from *Dendronis rostripallens*, the, in the size, structure and position of the vitelline gland (large, with 4-5 short, blunt, round acini, post ovarian, slightly, poral, at 1/3<sup>rd</sup> on the posterior margin of the segments, near the poral lobe of the ovary vs. small, compact, post-ovarian, central, just posterior to the middle of the segments and near the aporal lobe of the ovary).
4. The present cestode differ from *P. symallaxis strobilais* 29 mm long, 50-56 rostellar hooks in two regular rows, irregularly alternate genital pore, 11-17 testes, cirrus sac is 104-129  $\mu$ m long.
5. As the characters are minor, it is redescibebd here as *Parvirostrum reticulatum* fuhrmann, 1908 who has reported his worms, from *Picolaptes fuscicapillus*, *Dendronis elegans*, *Dendronis restripallens* from brazil, whereas the present worms, are being reported from *francolinus pondicerianus* from Mhatar pimpri, Tq. Shrigonda, Dist. Ahmednagar, M.S., India.



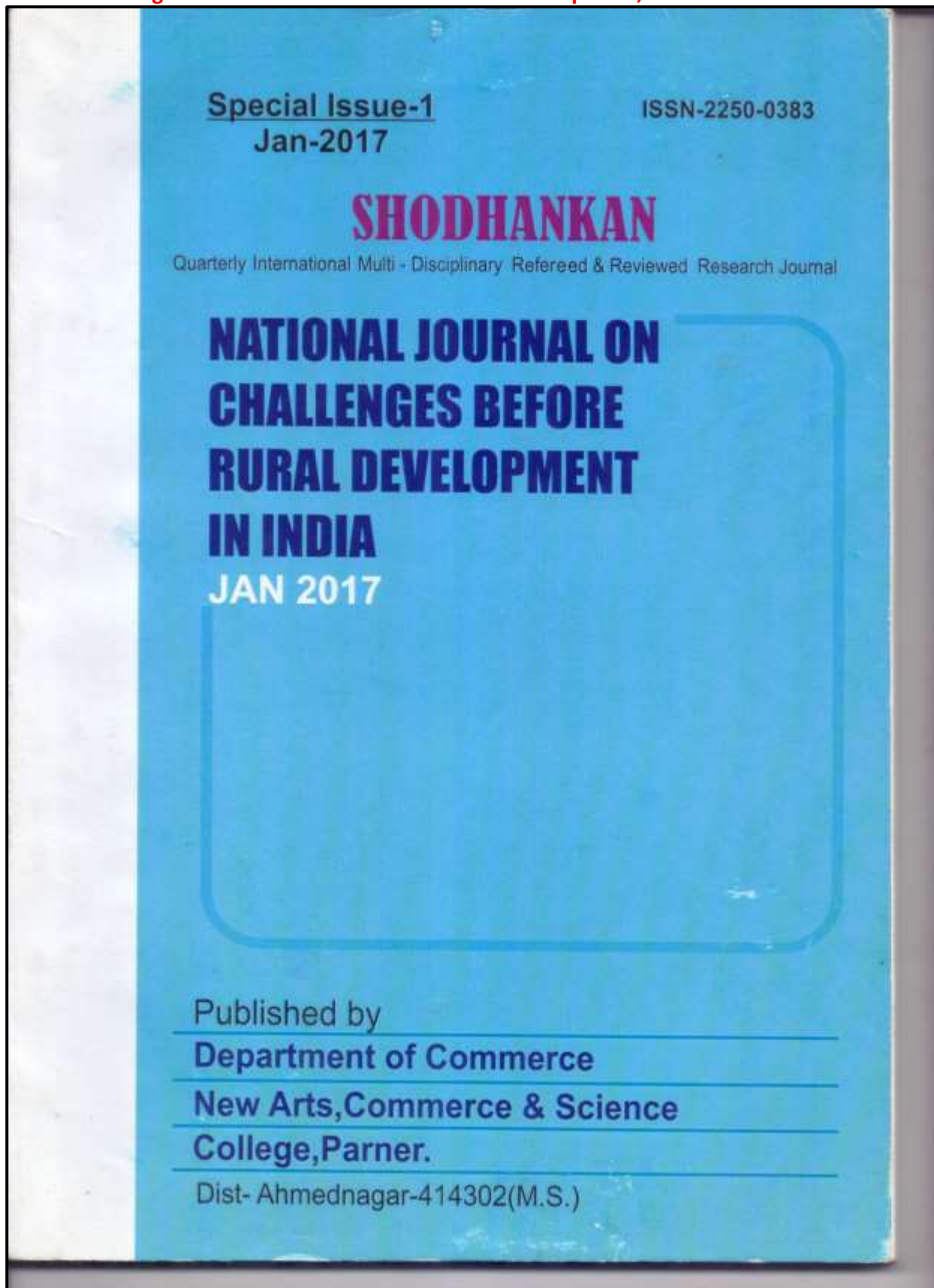
*Parvirostrum reticulatum* Fuhrmann, 1908.

A Scolex  
B Mature segments  
C Gravid segments  
D Hooks  
E Eggs

#### References

1. ALI S, M. (1990). The hand book of Indian birds ,Salim Ali, Bombay Nat. Hist. Soc. 11<sup>th</sup> edition.
2. BOYKO, B.,GEORGIEV. AND CLAUDE, VAUCHER. (2001). Revision of genus *Parvirostrum* Fuhrmann,1908 (Cestoda: Cyciophyllidea: Paruterinidae) Systematic Parasitology **50**:13-29
3. FUHRMANN, O. (1908). Nouveaux Tenias d'Oiseaux. Revue Suisse de zoologie, **16**, 27-73
4. FUHRMANN, O. (1932) Les Tenias des Oiseaux. Memoires de l'Universite de Neuchatel, **8**, 1-381
5. LOPEZ- NEYRA, C.R. (1935) Sobre algunos generos de Dilepidiade .Revista de la Academia de ciencias Exactas,Fisicas Naturales de Madrid, **32**,517-522.
6. MAHON, J., (1957) Deltokeras synallaxis sp.nov. (Dilepididae) from Synalluxis rutilans Temm. Canadian Journal of Zoology, **35**, 441-447.
7. SPASSKII, A.A. AND SPASSKAYA, L. P. (1977) Brief summary of the phylogenetic analysis of two tribes of dilepidid tapeworms:Dileipidini and ,Laterotaeniini In Spasski, A.A., Shumilo, R.P. & Kharsun,A.I. (Eds) Ekto-I endoparazity zhivotnykh Moldavii,Kishinev;Shtiina,pp3-30
8. YAMAGUTI, S. (1959)Systema helminthum. Vol.II The cestodes of vertebrates. New York and London: Interscience Publishers, 860pp

33. Role of Agriculture market structure in rural development,



## Challenges Before Rural Development in India

ISSN NO. 2250-0383  
RNI-MAHMUL02988/19/1/2011-TC**B) Remedial Action Plan with Spiritual Center's initiative -**

- 1) Developing the Role Model of spiritual centre like *Shri Gajanan Maharaj Devsthan, Shegaon, Dist. Buldhana, Maharashtra*, to protect environment by *maintaining cleanliness*.
- 2) Developing the *Bio-gas plant* project for the waste-management & thereby protecting an environment e.g. *Bio-gas plant at Shani-Shinganapur, Dist. Ahmednagar, Maharashtra*.
- 3) Use of *natural materials for heavy consumptions* in "*Prasadalya*" like
  - Paper dishes made from natural materials not harmful to environment.
  - Providing *filtered RO drinking water* to reduce plastic packaged drinking water consumption.

**Ref :-**

Sakal Newspaper - 3<sup>rd</sup> Sept. 2016  
 4<sup>th</sup> Sept. 2016  
 Lokmat Newspaper - 21<sup>st</sup> Aug. 2016

\*\*\*\*\*

**Role of Agriculture Market Structure in Rural Development**

**Dr. Sudhir R. Wagh**  
 Department of Zoology  
[srwagh@rediffmail.com](mailto:srwagh@rediffmail.com)

**Prof. Sunita Sadashiv Thube**  
 Department of B.B.A. – C.A.  
[thube.sunita@gmail.com](mailto:thube.sunita@gmail.com)

New Arts Commerce And Science College, Parner

**Abstract:**

The structure of agriculture refers to the ways that of farms, the farm population, and agribusiness firms are arranged to produce and distribute food and food products to consumers around the world. The Indian market structure consists of rural markets and urban markets.

In India, the organised marketing of agricultural commodities has been supported through a network of regulated markets. The purpose of state regulation of agricultural markets is to protect farmers from the exploitation of intermediaries and traders, and also to ensure better prices and timely payment for their market produce.

**Keywords:**

marketing, rural market, significance of rural markets, growth of rural markets, strategies in rural marketing.

**Introduction:**

The structure of agriculture refers to the ways that of farms, the farm population, and agribusiness firms are arranged to produce and distribute food and food products to consumers around the world. The Indian market structure consists of rural markets and urban markets.

In India, the organised marketing of agricultural commodities has been supported through a network of regulated markets. The purpose of state regulation of agricultural markets is to protect farmers from the exploitation of intermediaries and traders, and also to ensure better prices and timely payment for their produce.

**Challenges Before Rural Development in India**ISSN NO. 2250-0383  
RRI-MAHMUL02988/13/1/2011-TC**Objectives of the Study:**

- To discuss the emerging problems in Rural Marketing.
- To develop an insight into the term, significance, growth, strategies of rural marketing.
- To provide suggestions in order to make the rural marketing a success.

**Rural Market:**

The market is a place where buyers and sellers exchange things. In lay man terms "It is a place where buyers and sellers exchange goods/service for some value in return such as money".

The Market is same everywhere. But, the consumer behaviour is different everywhere. There will be different buyers in each market. This is because of different factors which influence them.. There is a difference in all the marketing Variables. That is why most of the companies approach with different Marketing Mix and Strategies to Rural Market.

**Significance of Rural Markets:**

In India, there is a huge gap between the urban and rural markets. This gap consists of differences in terms of education, culture, standard of living, faith and beliefs, occupation, infrastructure facilities, disposable incomes, and many other factors.

Though the differences, Marketers are taking vital interest in marketing their products and services in rural markets due to the following reasons:

- The urban population consist of different variety of people having different views, culture, beliefs, preferences, social classes, personalities etc., which makes it difficult for marketers to market their products, which will suit the consumers taste, expectations and satisfaction.
- The urban population has information about the products and services hence rarely any product or service is new for them.
- Competition level is very high in urban markets due to its maturity.
- Presence of advertisement clutter in different advertising media.
- The life cycle of the product is short.

**Growth of Rural Markets:**

A number of factors have been recognized as responsible for the growth of rural markets like:

1. A marked increase in the rural income due to farming success.
2. Rural markets are lagging behind of information about new products. This will help the companies to stage their marketing efforts.
3. Inflow of foreign payments and foreign goods into rural areas.
4. A structural change in the ownership patterns and consequent changes in the buying behaviour due to change in the land tenure systems.
5. Large inflow of investment for rural development programmes from government and other sources.

**Problems Related to Rural Marketing:**

- Seasonal incomes because of agricultural occupation which depends on rainfall.
- Undeveloped or lack of infrastructure facilities like communication, transport, electricity, Information Technology, banking etc. Distribution channels are a great challenge in rural markets as they are large and scattered.



## Challenges Before Rural Development in India

ISSN NO. 2250-0383  
RNI-MARSH/LO2988/13/1/2011-TC

- New developed products are not accepted due to traditional way of life style.
- Media is not developed as expected in rural areas and so there is no proper communication possible.

Though problems exist in rural markets about reaching the consumers, this can be overcome by making these markets attractive and developed by an effective marketing strategy.

### Conclusion :

By looking at the challenges and the opportunities, which rural markets give to the marketers and the producers it can be said that a radical change in the views and attitudes of marketers towards the development of rural markets is required. It can be said that, in near future it is going to be very fruitful and promising for those who can understand the changing aspects of rural markets and make use of them to their best advantage. This will help them to make positive changes in the rural consumers thinking and buying behaviour spread over the different villages in rural India.

### References :

1. V.A. Pai Panandiker & P.K.J. Menon, Rural Industrialisation, Oxford & IBH Publishing Co. (P) Ltd., New Delhi, 1986.
2. 7.Rakshit Rajarshi ,M.L.Narasimham,Ashish Gudhe,Kartik Vaddadi (2006) Strategies for rural marketing by an organization
  - <http://www.mbauniverse.com/ruralmarket.php>
  - <http://www.ibef.org/economy/ruralmarket.aspx>
  - <http://www.irjcjournals.org>
  - <http://conference.aimt.edu.in/mba>
  - [www.miteshk.webs.com](http://www.miteshk.webs.com)
  - [www.world-agriculture.com](http://www.world-agriculture.com)

\*\*\*\*\*

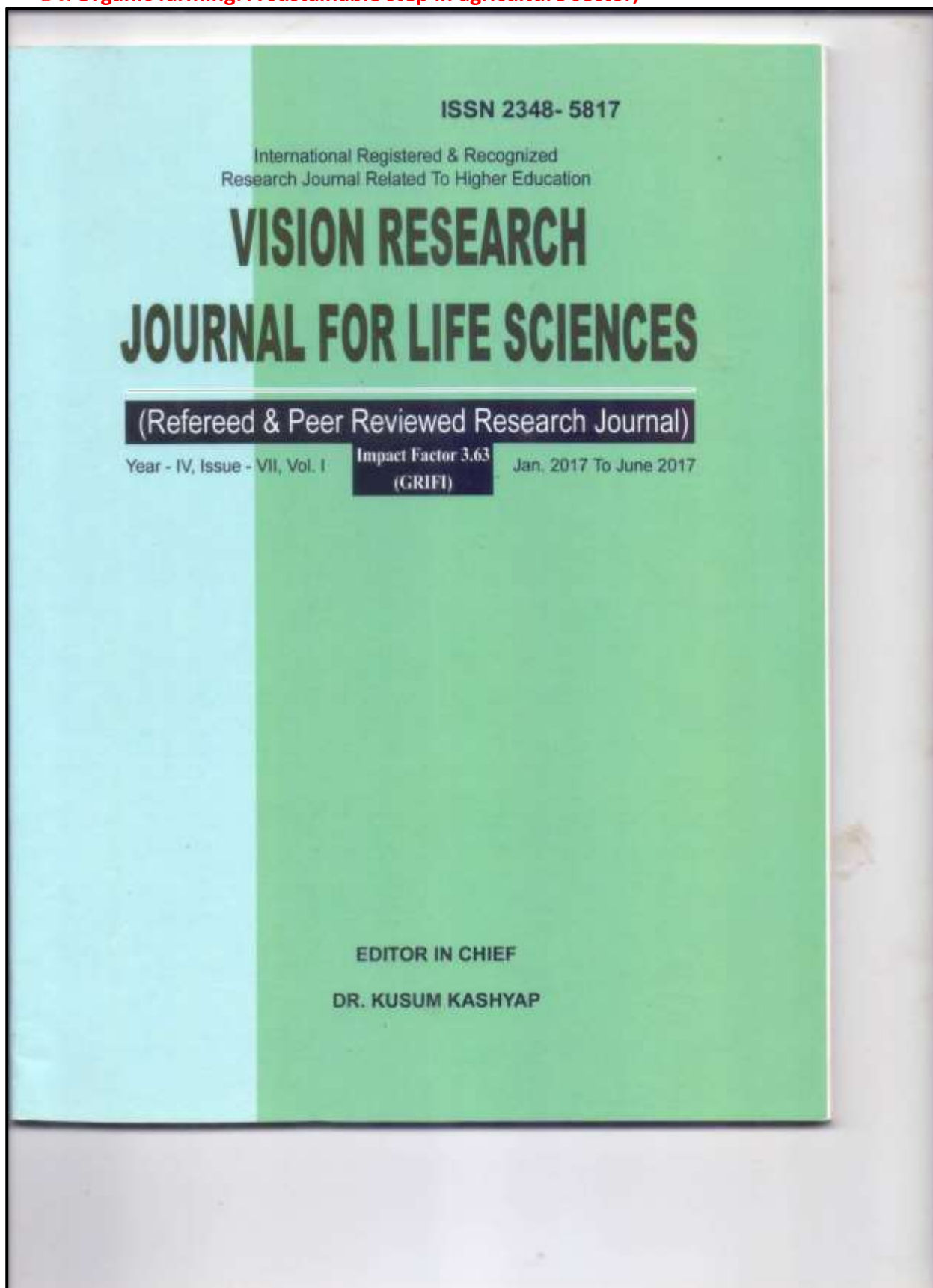
## INTEGRATED RURAL DEVELOPMENT PROGRAM & RURAL DEVELOPMENT

Prof. Lande Vikram Bansi  
Vice Principal, HOD Economics  
New Arts, Commerce & Science College, Shvgaon.

### Introduction

Rural development as an integral part of country's socio-economic development has been recognized as a sine qua non. The goal of rural development is the enrichment of the quality of human life in rural areas accompanied by bridging the rural-urban gap through provision of all amenities. The national policy and programs for a successful rural development task should aim at diversification of economic activities, minimizing the dependence of rural households on agriculture and bringing about a significant increase in the share in both output and employment of allied activities, rural industries, business and service components of the rural economy. If this is not pursued, rural development merely remains as agricultural development and neither solves the problem of rural employment and poverty nor of equitable distribution of resources and income-generating assets. This article reviews broadly Government's initiatives to accelerate the process of rural

**34. Organic farming: A sustainable step in agriculture sector,**





Issue - VII, Vol. I

VRJFLS

IMPACT FACTOR

3.63

ISSN 2348-5817

Jan. 2017 To June 2017

54

10

## ORGANIC FARMING: A SUSTAINABLE STEP IN AGRICULTURE SECTOR

**Dr. S. R. Wagh**

Dept. of Zoology,

New Arts, Commerce and Science College,  
Parner, Dist. Ahmednagar (MS) India*Research Paper - Zoology*

### ABSTRACT

*India is mainly an agricultural country, where agriculture contributes to about 14.6 percent in gross domestic product (GDP) and support over 58 percent of nation's population for livelihood. Organic farming methods are studied in the field of agro ecology. Crop diversity helps environments thrive and protect species from going extinct. Organic farmers integrate cultural, biological, mechanical, physical and chemical tactics to manage weeds without synthetic herbicides. Organic wild collection areas play a major role in India and China.*

### Introduction:

Organic agriculture is a systems approach to agricultural production that is working towards an environmentally and economically sustainable production. The International Federation of Organic Agriculture Movements (IFOAM) defines organic agriculture as "A whole system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs" (Anon, 2002b).

The birthright of all living things is health. This law is true for soil, plant, animal and man.



Issue - VII, Vol. I

VRJFLS

IMPACT FACTOR  
3.63

ISSN 2348-5817

Jan. 2017 To June 2017

35

The health of these four is one connected chain. Any weakness or defect in the health of any earlier link is passed on to the next and succeeding link, until it reaches the last, namely, the man. (Sir Albert Howard, 1945). India is mainly an agricultural country, where agriculture contributes to about 14.6 percent in gross domestic product (GDP) and support over 58 percent of nation's population for livelihood (GOI, 2010). Organic farming emerged as a potential alternative for meeting food demand, maintaining soil fertility and increasing soil carbon pool. However, Indian organic farming industry is almost entirely export oriented, running as contract farming under financial agreement with contracting firms.

**Principles of Organic Farming:**

Organic farming is based on a philosophy and a set of principles that are best encompassed by the IFOAM principles (Anon., 2002b). These are:

- To work compatibly with natural cycles and living systems through the soil, plants and animals in the entire production system.
- To recognise the wider social and ecological impact of the organic production and processing system.
- To maintain and increase long-term fertility and biological activity of soils using locally adapted cultural, biological and mechanical methods as opposed to reliance on inputs.
- To maintain and encourage agricultural and natural biodiversity on the farm and surrounds through the use of sustainable production systems and the protection of plant and wild life habitats.
- To maintain and conserve genetic diversity through attention to on-farm management of genetic resources.

**Methods of Organic Farming:**

Organic farming methods combine scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes. Organic farming methods are studied in the field of agro ecology. While conventional agriculture uses synthetic pesticides and water-soluble synthetically purified fertilizers, organic farmers are restricted by regulations to



Issue - VII, Vol. I

VRJFLS

IMPACT FACTOR

3.63

ISSN 2348-5817

Jan. 2017 To June 2017

56

using natural pesticides and fertilizers.

**Crop Diversity:**

Crop diversity is a distinctive characteristic of organic farming. Conventional farming focuses on mass production of one crop in one location, a practice called monoculture. The science of agro ecology has revealed the benefits of poly culture (multiple crops in the same space), which is often employed in organic farming. Planting a variety of vegetable crops supports a wider range of beneficial insects, soil microorganisms and other factors that add up to overall farm health. Crop diversity helps environments thrive and protect species from going extinct.

**Soil Management:**

Organic farming relies heavily on the natural breakdown of organic matter, using techniques like green manure and composting, to replace nutrients taken from the soil by previous crops. This biological process, driven by microorganisms such as mycorrhiza, allows the natural production of nutrients in the soil throughout the growing season and has been referred to as feeding the soil to feed the plant. Organic farming uses a variety of methods to improve soil fertility, including crop rotation, cover cropping, reduced tillage, and application of compost. By reducing tillage, soil is not inverted and exposed to air; less carbon is lost to the atmosphere resulting in more soil organic carbon. This has an added benefit of carbon sequestration which can reduce greenhouse gases and aid in reversing climate change.

**Weed Management:**

Organic weed management promotes weed suppression, rather than weed elimination, by enhancing crop competition and phytotoxic effects on weeds. Organic farmers integrate cultural, biological, mechanical, physical and chemical tactics to manage weeds without synthetic herbicides. Mechanical and physical weed control practices used on organic farms can be broadly grouped as: Tillage - Turning the soil between crops to incorporate crop residues and soil amendments; remove existing weed growth and prepare a seedbed for planting; turning soil after seeding to kill weeds; Mowing and cutting - Removing top growth of weeds and Mulching - Blocking weed emergence with organic materials, plastic films, or landscape fabric.



Issue - VII, Vol. I

VRJFLS

IMPACT FACTOR

3.63

ISSN 2348-5817

Jan. 2017 To June 2017

57

**Vermi composting:**

Vermicompost is the product or process of composting using various worms, usually red wigglers, white worms and other earthworms to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials and vermicast. Vermicast also called worm castings, worm humus or worm manure, is the end-product of the breakdown of organic matter by an earthworm. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than do organic materials before vermicomposting.

**Animal Wastes:**

Animal manure is often a mixture of animal feces and bedding straw. Animal fertilizer is organic fertilizer which made of cattle and poultry wastes fermentation. Cattle waste can be from mammals such as cows, goats, bulls etc. Poultry waste can be from ducks, birds, chicken etc. Ingredients of both cattle and poultry wastes are different; they depend on type of animal, age, animal condition, animal foods and storing waste process before application. Generally, ingredients of poultry waste are higher than mammals waste, because their solid and liquid waste blends together. The most useful one is chicken waste compare to other poultry.

**Fish Manure:**

Fish forms powerful manure, but it cannot be used too fresh, though the quantity should be limited. They are usually mixed with sand or soil. It is easy to explain the operation of fish as manure. The skin is principally gelatin, which from its slight state of cohesion, is readily soluble in water; fat or oil is always found in fishes, either under the skin or in some of the viscera and their fibrous matter contains all the essential elements of vegetable substances. In fact, the whole body consists of those substances which constitute the food of plants, prone to decompose and rapidly changing into those compounds which are most easily absorbed and assimilated by plants.

**Sheep and Goat Manure:**

The droppings of sheep and goats contain higher nutrients than farmyard manure and compost. On an average, the manure contains 3 % N, 1 % P<sub>2</sub>O<sub>5</sub> and 2 % K<sub>2</sub>O. It is applied to the field in two ways. The sweeping of sheep or goat sheds are placed in pits



Issue - VII, Vol. I

VRJFLS

IMPACT FACTOR

3.63

ISSN 2348-5817

Jan. 2017 To June 2017

58

for decomposition and it is applied later to the field. The nutrients present in the urine are wasted in this method. The second method is sheep penning, wherein sheep and goats are kept overnight in the field and urine and fecal matter added to the soil is incorporated to a shallow depth by working blade harrow or cultivator or cultivator.

**Poultry Manure:**

The excreta of birds ferment very quickly. If left exposed, 50 % of its nitrogen is lost within 30 days. Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 % N; 2.63 % P<sub>2</sub>O<sub>5</sub> and 1.4 % K<sub>2</sub>O.

**Controlling Other Organisms:**

Chloroxylon is used for Pest Management in Organic Rice Cultivation in Chhattisgarh, India. Organisms aside from weeds that cause problems on organic farms include arthropods (e.g., insects, mites), nematodes, fungi and bacteria. Organic practices include encouraging predatory beneficial insects to control pests by serving them nursery plants and/or an alternative habitat; encouraging beneficial microorganisms; rotating crops to different locations from year to year to interrupt pest reproduction cycles; using stale seed beds to germinate and destroy weeds before planting; using sanitation to remove pest habitat; Using insect traps to monitor and control insect populations.

**Organic Farming in Asia:**

The total organic area in Asia is nearly 2.9 million hectares. This constitutes 9 % of the world's organic agricultural land. 230000 producers were reported. The leading countries are China (1.6 million hectares) and India (1 million hectares). The highest shares of organic land of all agricultural land are in Timor Leste (7 %). Organic wild collection areas play a major role in India and China. Production of final processed products is growing, although a majority of production is still fresh produce and field crops with low value-added processing, such as dry or processed raw ingredients. Modern organic agriculture in China began in the 1990s, focusing primarily on exporting to international markets. Historically, China has 4,000 years of traditional sustainable farming methods. The modern Chinese organic system was heavily influenced by the standards, concepts, organization and accreditation developed in Western countries. China has the



Issue - VII, Vol. 1

**VRJFLS**IMPACT FACTOR  
3.63

ISSN 2348-5817

Jan. 2017 To June 2017

39

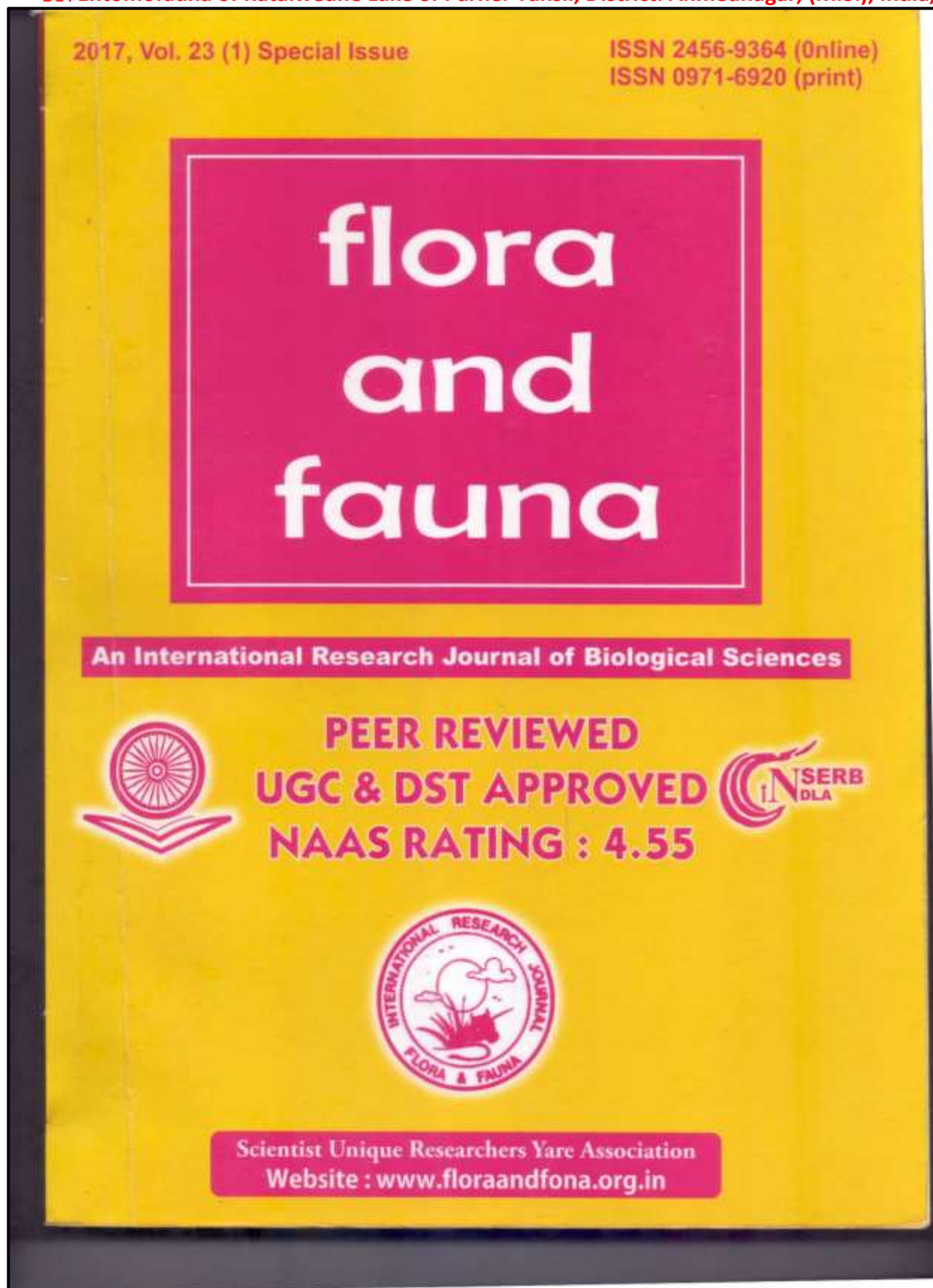
4th largest area for organic agricultural land in the world at 1.9 million hectares. In 2009, Chinese organic products were traded to more than 20 different countries. In wealthier urban areas like Hong Kong, where demand for organic food is increasing, consumers are concerned about the fact that China uses 30% of world's nitrogen fertilizer on 10% of world's arable land along with being the largest user of pesticides and fertilizer in the world. The capital city of Beijing is the largest domestic organic market, accounting for approximately 1/3 of total domestic market value. Large urban metropolises like Shanghai, Guangzhou, Nanjing and Shenzhen are also major domestic markets. Domestic organic food are found mainly in supermarkets, specialized stores and home delivery systems, which have gained popularity in recent years.

### References

1. Anderson, Randy L., "A Rotation Design To Reduce Weed Density In Organic Farming," *Renewable Agriculture And Food Systems* 25 (2010): 189-195.
2. Anon. (2002b).IFOAM Norms. IFOAM Basic Standards For Organic Production And Processing. IFOAM. Germany.
3. Delate, K. And C. Cambardella, "Agroecosystem Performance During Transition To Certified Organic Grain Production," *Agronomy Journal* 96 (2004): 1288-1298.
4. Jitendra Pandey And Ashima Singh, Opportunities And Constraints In Organic Farming: An Indian Perspective *Journal Of Scientific Research Banaras Hindu University, Varanasi* Vol. 56, 2012: 47-72 ISSN: 0447-9483.



35. Entomofauna of Katalwedhe Lake of Parner Tahsil, District. Ahmednagar, (M.S.), India,



**ENTOMOFAUNA OF KATALWEDHE LAKE OF PARNER TAHASIL, DISTRICT AHMEDNAGAR, (M.S.), INDIA**WAGH S. R.<sup>\*1</sup>

<sup>\*1</sup>Department of Zoology,  
New Arts, Commerce and Science College, Parner,  
Tal. Parner, Dist. Ahmednagar, Pin. 414 302, Maharashtra, India.  
E-Mail ID: srwagh@rediffmail.com  
Contact No. +91-9403190432

**ABSTRACT**

The work reveals complex assemblage of aquatic insects from Katalwedhe Lake, Taluka-Parner, District. Ahmednagar. The study yielded presence of 24 species belonging to 20 genera distributed within 16 families and 6 orders. The dominant order is Odonata representing 8 species followed by Hemiptera 7, Diptera 5, Coleoptera 3, Ephemeroptera 1 and Trichoptera 1.

Figure:00

References:37

Table:01

**KEY WORDS:** Katalwedhe Lake, Entomofauna, Diversity.**Introduction**

Insects are most successful group in the Kingdom Animalia which represents 73% of all fauna known to science (Alfred & Ramakrishna, 2004). The studies on the insects and their close relatives has received a great attention as they cause damage to the natural stands, agricultural crops, plantations, stored products. On the other hand, insects also provides valuable services to man and ecosystem also, they are pollination, honey, lac, act as biocontrol agent, nutrient recycling and others. This indicates insects have twofold importance that is beneficial and harmful. As we know that insects are found in all types of habitats that is forests, agriculture, decaying organic matter, freshwater aquatic bodies, soil and others.

Aquatic insects forms a complex assemblage of diverse organisms inhabits variety of aquatic environments. Aquatic insects are main elements of aquatic food web as they breakdown and process organic matter supply for food for other invertebrates and vertebrates. The Aquatic insects represent the orders Ephemeroptera, Odonata, Plecoptera, Trichoptera, Megaloptera, Coleoptera, Hemiptera and Diptera. Several workers have thrown a light on the different aspects of aquatic insects. Cummins (1973) provided the detailed information on the trophic relations of aquatic insects. Anbalagan and Dinakaran (2006) observed the seasonal variation of diversity and habitat preferences of aquatic

insects along the longitudinal gradient of the Gadana river basin, South West Ghats India.

Biological diversity includes multiple facets of the variability of nature, ranging from genes to species and from ecosystem to biomes (Gaston and Spicer, 1998). Most of the studies on the biological diversity have been focused on the population dynamics, species and assemblage (Angermeier and Schlosser, 1995).

Indian geographic region forms a complex set of diverse habitats which provides shelter to huge number of organisms. The pioneering work on the Indian aquatic insects includes Lefroy, 1909; Fraser, 1933-36; Beeson, 1941. Prasad and Varshney (1995) published a comprehensive checklist of Odonata of Bihar. Subramaniam (2005) provided a detailed information on the dragon flies and damsel flies of peninsular India in the form of field guide. This study includes natural history of dragon and damsel flies, studying odonates, field key to adult dragon and damsel flies and key to the larval dragon and damsel flies. Subramaniam (2009) published a revised checklist of Odonata of India which includes 463 species of Odonata. May flies belong to the order Ephemeroptera. These are amphibiotic insects and they are good bio-indicators of water quality. Srivastva (2000) studied on the Ephemeroptera of Renuka Wetland and reported 6 species. The total number of described Ephemeroptera from India comprises 94 species distributed in the

**ACKNOWLEDGEMENTS:** The author is grateful to the authorities of New Arts, Commerce and Science College, Parner, Dist. Ahmednagar and the Principal, New Arts, Commerce and Science College, Parner.

36 genera and belongs to the 12 different families.

Biswas (2000) reported 20 species of aquatic beetles from the Renuka Wetland belonging to 16 genera distributed within 6 families. The aquatic Coleoptera of world includes more than 5000 species. Of these, 1000 species were recorded from the Indian subcontinent. The earlier study on the aquatic beetles Himachal Pradesh includes a comprehensive information (Zaitsev, 1910; D'Orchymont, 1928). Vazirani (1977; 1984) provided the significant information on the Gyrinidae and Dytiscidae of Himachal Pradesh. The Indian subcontinent represents 150 species of aquatic hemiptera (Distant, 1902, 1906, 1910). Likewise several studies have been carried out in the different parts of India on aquatic hemiptera (Paiva, 1919; Hafiz and Mathai, 1938; Hutchinson, 1940; Pradhan, 1950; Brooks, 1951; Thirumalai, 1986; Bal & Basu, 1992, 1994a, 1994b). No comprehensive information is available on the aquatic insects of the Katalwedhe reservoir, therefore the present research work is undertaken.

#### Materials and Methods

Materials used during the insect studies are aquatic net, forceps, vials (15 ml) containing 70% alcohol and 4% formalin as preserving media, plastic containers for temporary storage and transportation. The insects were collected randomly from the reservoir at monthly interval for two years (April, 2014 to March, 2016). The insects were collected according to the methods suggested by Alfred and Ramakrishna (2004). The preservation includes both dry preservation method and wet preservation method. The identification of the species was made with the help of available literature of Fauna of British India Series on the insects. The collected material was identified with help of available literature (Fraser, 1933-36p; Dudgeon, 1999; Subramanian, 2005.)

#### STUDY AREA:

Katalwedhe reservoir is situated near village Katalwedhe in Parner Taluka, Dist-Ahmednagar (M.S.). The reservoir was built in 1972 for the drinking water and irrigation purposes. The construction of the reservoir completed in three years (1971-1973). Annual rainfall at this reservoir is about 3.50 cm.

#### Results and Discussion

The study revealed presence of 24 species belonging to 20 genera and 16 families distributed within six different orders viz. Ephemeroptera, Odonata, Trichoptera, Coleoptera, Hemiptera and Diptera. Among these 24 species order Odonata is dominant order represents 8 species viz. *Ischnura aurora*, *Pseudaeschna decorum* Rambur, *Anax* sp., *Orthetrum sabina* Drury, *Orthetrum taeniolatum* Schneider, *Pantella flavescens* Fabricius, *Trithemis* sp. and *Trithemis* sp. These 8 species belongs to 3 different families viz. Coenagrionidae, Aeshnidae and Libellulidae.

The order Hemiptera includes 7 species viz. *Nepa* sp., *Belostoma indica*, *Ranatra* sp., *Notonecta* sp., *Notonecta* sp., *Gerris* sp. and *Gerris* sp. belonging to the 4 families. These families are Nepidae, Belostomatidae, Notonectidae and Gerridae. The Coleoptera shows 3 species viz. *Dineutus indicus*, *Cybister* sp. and *Hydrophilus* sp. belonging to 3 families that are Gyrinidae, Dytiscidae and Hydrophilidae. The Order Diptera represents 4 species belonging to 3 families viz. Tipulidae, Culicidae and Chironomidae. Ephemeroptera includes 1 family and 1 species from Katalwedhe reservoir. The order Trichoptera represents 1 species and 1 family that is Hydropsychidae. The genus is *Hydropsyche*. The Ephemeroptera, Coleoptera, Hemiptera and Odonata represent bio-indicators of water quality and potential bio-control agents. The checklist of aquatic insects of the present study region is present in the table 1. Bal and Basu (2000) reported 10 species of aquatic Hemiptera from the Renuka Wetland. Bal and Basu (2002) reported 14 species of water bugs belonging to 12 genera and 09 families from the Kabar Wetland. During the present study seasonal changes in the water was observed in Katalwedhe lake. This affects the abundance of species. Ramakrishna (2002) reported that seasonal changes fluctuate the physico-chemical conditions of the waterbody, affects the abundance and period of emergence of different groups of aquatic animals. With this view, Ramakrishna (2002) studied the Odonata of Kabar lake and reported 6 species and added that the abundance of larval Odonata was mainly due the growth of macrophytic vegetation. This vegetation forms

an association with macrobenthic forms, micro-crustaceans, molluscs, insects and insect larvae offer better niche for several fish species and their immature stages which form the food of this group.

The balanced wetland ecosystem represents both stream species and standing water species. Kumar and Sharma (2003) reported 43 species of dragonflies and damselflies including 14 species of Zygoptera and 29 species of Anisoptera from the Asan Wetland. Biswas (2002) reported 17 species of aquatic Coleoptera belonging to 10 genera and three families. The Dipteran insects inhabit wide range terrestrial, semiaquatic and aquatic niches. They feed on the decaying organic matter and some vectors which transmit pathogens of diseases like malaria, elephantiasis, sleeping sickness, yellow fever, kala-azar and other diseases of (livestock Pauri and Mukherjee, 2000). Brunetti (1917) made a significant contribution on the Diptera of Simla. Similarly several efforts have been

made to find out the Dipteran assemblage from different parts of the Country Senior-White *et al.*, (1940), Brunetti (1912, 1920, 1923), Emden, 1965). Pauri and Mukherjee (2000) studied on the Diptera of Renuka Wetland and reported 14 species under 14 genera of 9 families. This includes *Consonia irrorata*, *Plectia dispersa*, *Oplodontha rubrithorax*, *Adoxomyia heminopla*, *Tabanus striatus*, *Episyrphus balteatus*, *Phytomyia crassa*, *Sepedon plumbella*, *Musca domestica*, *Orthelliatimorensis*, *Gymnodia tonitru*, *Stomoxys calcitrans* and *Chrysomya megacephala* and *Parasarcophaga albiceps*. During the present study, *Culex* and *Aedes* were recorded from the small pot like holes and back water of the Katalwedhelake. The *Chironomus* species was also recorded from the present study area. In the vicinity of the lake, in the wet decaying organic matter larvae of *Musca domestica* and *Calliphora erythrocephala* were recorded. But these were not included as true aquatic insects in the list.

ORDER	FAMILY	SPECIES
I. Ephemeroptera	1. Ephemeridae	i. <i>Ephemera</i> sp.
II. Odonata	2. Coenogronidae	ii. <i>Ischnura aurora</i>
		iii. <i>Pseudoagrion decorum</i> Rambur
	3. Aeshnidae	iv. <i>Anax</i> sp.
	4. Libellulidae	v. <i>Orithetrum Sabina</i> Drury
vi. <i>Orithetrum taeniolatum</i> Schneider		
vii. <i>Pantella flavescens</i> Fabricius		
viii. <i>Trithemis</i> sp.		
ix. <i>Trithemis</i> sp.		
III. Trichoptera	5. Hydropsychidae	x. <i>Hydropsyche</i> sp.
IV. Hemiptera	6. Nepidae	xi. <i>Nepa</i> sp.
	7. Belostomatidae	xii. <i>Belostoma indica</i>
		xiii. <i>Ranatra</i> sp.
	8. Notonectidae	xiv. <i>Notonecta</i> sp.
		xv. <i>Notonecta</i> sp.
9. Gerridae	xvi. <i>Gerris</i> sp.	
V. Coleoptera	10. Gyrinidae	xviii. <i>Dineutus indicus</i>
	11. Dytiscidae	xix. <i>Cybister</i> sp.
	12. Hydrophilidae	xx. <i>Hydrophilus</i> sp.
VI. Diptera	13. Culicidae	xxi. <i>Culex</i> sp.
		xxii. <i>Aedes</i> sp.
	14. Tipulidae	xxiii. <i>Tipula</i> sp.
	15. Chironomidae	xxiv. <i>Chironomus</i> sp.

## References

1. ALFRED J.R.B. AND RAMAKRISHNA (2004). Collection, Preservation and Identification of animals. Zoological Survey of India Publications.
2. ANBALAGAN, S. AND DINAKARAN (2006). Seasonal variation of diversity and habitat preferences of aquatic insects along the longitudinal gradient of the Gadana river basin, South West Ghats (India). *Acta Zoologica Bulgarica*, **58**: 253-264.
3. BAL, A. AND BASU, R. C. (1994b). Insecta: Hemiptera:Belostomatidae, Nepidae, Notonectidae and Pleidae: 535-558. In: State Fauna Series 3, Fauna of West Bengal, Pt. 5. *Zoological Survey of India*, Calcutta.
4. BAL, A. AND BASU, R.C. (1992). Water-bugs of economic importance. *Proc. Zool. Soc. Calcutta* **45**(Suppl.A): 321-329.
5. BAL, A. AND BASU, R.C. (1994a). Insecta: Hemiptera: Mesoveliidae, Hydrometridae, Veliidae and Gerridae: 511-534. In:State Fauna Series 3, Fauna of West Bengal, Pt.5 *Zoological Survey of India*, Calcutta.
6. BEESON, C. F. C. (1941). The Ecology and Control of the Forest insects India the neighboring Countries (1961 reprint), New Delhi: Govt. of India.
7. BISWAS, S. (2000). Aquatic Coleoptera. *Zoological Survey of India, Wetland Ecosystem Series 2: Fauna of Renuka Wetland*: 97-103.
8. BISWAS, S. (2002). Insecta: Coleoptera. *Wetland Ecosystem Series 4, Fauna of Kabar Lake*: 69-75. *Zoological Survey of India*, Calcutta.
9. BROOKS, G. T. (1951). A revision of the genus *Anisops* (Notonectidae: Hemiptera): *Kans. Univ. Sci. Bull.*, **34** (8): 301-519.
10. BRUNETTI, E. (1917). Diptera of Simla district, *Rec. Indian Mus.*, **13**: 59-101.
11. BRUNETTI, E. (1920). The fauna of British India including Ceylon and Burma. Diptera, Nematocera (excluding Chironomidae and Culicidae), xxviii+581 pp. Taylor and Francis Ltd. London.
12. BRUNETTI, E. (1923). The fauna of British India including Ceylon and Burma. Diptera Vol. III. Pipuniulidae, Syrphidae, Conopidae, Oestridae, xi+ 424 pp. Taylor & Francis Ltd., London.
13. CUMMINS. K.W. (1973). Trophic relations of aquatic insects. *Ann.Rev. Entomol.*, **18**: 183-206.
14. D' ORCHYMONT, A. (1928). Catalogue of Indian Insects, part 4, 146pp. Govt. of India Publication
15. DISTANT, W. L. (1902). The fauna of British India including Ceylon and Burma, Rhynchota 2, 503 pp. Taylor & Francis, London.
16. DISTANT, W. L. (1910). The fauna of British India including Ceylon and Burma, Rhynchota 5, 362 pp. Taylor & Francis, London.
17. DISTANT, W.L. (1906). The fauna of British India including Ceylon and Burma, Rhynchota 3, 503 pp. Taylor & Francis, London.
18. DUDGEON, D. (1999). *Tropical Asian Streams-Zoobenthos, Ecology and Conservation*, Hong Kong University Press, Hongkong, 828pp.
19. EMDEN, F.I. VAN. (1965). The fauna of British India and adjacent countries. Vol. VII, Part I Muscidae, xvi +647 pp. Manager of Publications, Govt. of India, Delhi.
20. FRASER, (1933-36). The fauna of British India including Ceylon and Burma, Odonata, Vol.I-III. Taylor & Francis Ltd., London.
21. GASTON, K.G. AND SPICER, J.I. (1998). *Biodiversity: An introduction*. Blackwell Science, Oxford.
22. HAFIZ, H. A. AND MATHAI, G. (1938). On collection of aquatic Rhynchota from the Rajmahal Hills, Santhal Parhanas, Bihar. *Rec. Indian Mus.*, **40**: 207- 210.
23. HUTCHINSON, G. E. (1940). A revision of the corixiadae of India and Adjacent regions. *Trans. Connect. Acad. Arts.Sci.*, **33**:339-476.
24. KUMAR, A. AND SHARMA, G. (2003). Insecta: Odonata. Fauna of Asan Wetland: *Wetland Ecosystem Series 5*: 11-13. *Zoological Survey of India*, Calcutta.

25. LEFROY, H.M. (1909). Indian Insect Life, Today's and Tomorrow's Printers and Publishers, New Delhi.
26. PAIVA, C. (1919). Aquatic and semi aquatic Rhynchota from the Satara and Poona Districts. *Rec. Indian Mus.*, 16: 152-156.
27. PAURI, P. AND MUKHERJEE, M. (2000). Diptera. Wetland Ecosystem Series 2: Fauna of Renuka Wetland: 135-140. Zoological Survey of India, Calcutta.
28. PRADHAN, K.S. (1950). A collection of aquatic Rhynchota from Rihand Dam site, Mirzapur district (U. P.), with description of new water strider (Insecta: Hemiptera: Gerridae). *Rec. Indian Mus.*, 48 (2): 1-5.
29. PRASAD, M. AND VARSHNEY, R. K. (1988). The Odonata of Bihar India. *Rec. Zool. Surv. India, Occ. Paper No. 110*: 1-45.
30. RAMAKRISHNA (2002). Insecta: Odonata. Wetland Ecosystem Series 4, Fauna of Kabar Lake: 65-67. Zoological Survey of India, Calcutta.
31. SENIOR-WHITE, R.A., AUBERTIN, D. AND SMART, J. (1940). The fauna of British India including remainder of the Oriental region. Diptera. Vol. VI. Family Calliphoridae, xii+288 pp. Taylor and Francis Ltd., London.
32. SRIVASTAVA, V.D. (2000). Ephemeroptera. Zoological Survey of India, Wetland Ecosystem Series 2: Fauna of Renuka Wetland: 41-43.
33. SUBRAMANIAM, K. A. (2005). Dragonflies and Damselflies of Peninsular India: A field guide, Project Life Scape, ZSI, Kolkata. 1: 1-118.
34. SUBRAMANIAM, K. A. (2009). A Checklist of Odonata (Insecta) of India, Western Regional Centre, Zoological Survey of India, Pune, pp.1-36.
35. THIRUMALAI, G. (1986). On Gerridae and Notonectidae (Heteroptera: Hemiptera: Insecta) from the Silent Valley, Kerala. *Rec. Zool. Surv. India*, 84 (1-4): 9-33.
36. VAZIRANI, T.G. (1977). Catalogue of oriental Dytiscidae. *Rec. Zool. Surv. India, Occ. Paper, No 6*: 1-111.
37. VAZIRANI, T.G. (1984). Fauna Coleoptera: family Gyrinidae and family Haliphidae. Fauna of India, xi + 140pp. Zoological Survey of India, Calcutta.
38. ZAITEV, P. (1910). Dryopidae, Cyathoceridae, Georyssidae, Heteroceridae. *Coleopterum Catalogus, Pars 17*: 1-68.

**36. Synthesis and Characterization of A Visible Light Photo catalyst**

CTBC's  
**INTERNATIONAL  
RESEARCH  
JOURNAL**



Proceedings of  
International Conference  
on

**GO GREEN**



Volume 3 / Issue 3 (Special Issue)  
January 2017

Website : [www.ctboracollege.edu.in](http://www.ctboracollege.edu.in)

Email : [ctborainfo68@gmail.com](mailto:ctborainfo68@gmail.com)

**INTERNATIONAL CONFERENCE**

ON

**GO GREEN**

January 12-13, 2017

**SOUVENIR AND ABSTRACTS**

Organized by:



S.S. P Mandal's

**Chandmal Tarachand Bora College,  
Shirur, District-Pune, Pin -412210 (MS), India****Sponsored By**

B.C.U.D

Savitribai Phule Pune University, Pune 411 007.

**Editor**

Dr. K. C. Mohite

**Editorial Team**Dr. B. R. Khot  
Dr. S. V. PatilDr. V. V. Awati  
Prof. K. D. Badave



**CONTRIBUTED PAPERS**

## Index

Sr. No.	Title of Paper	Authors	Page No.
1	PERFORMANCE AND EMISSION CHARACTERISTICS OF VCR ENGINE USING COCONUT BIODIESEL AS A FUEL	Mahesh V. Srivastava, Abhishek Yadav, Ajeet Kumar, S. K. Shukla and J V Tirkey	1
2	EDUCATION AND SKILL DEVELOPMENT IN GREEN ENERGY	Usha Bajpai	11
3	STATUS OF BIOETHANOL PRODUCTION FROM RICE STRAW IN INDIA	Renu Singh	21
4	CROPPING PATTERN AND CROP RANKING	Ningaraju, S. Arun Das	35
5	ADVANCES IN RENEWABLE ENERGY TECHNOLOGY: AN OVERVIEW	K. C. Mohite, S. D. Gunjal	40
6	TEMPERATURE DEPENDENT OPTICAL AND PHOTOVOLTAIC PROPERTIES OF NANOCRYSTALLINE TiO <sub>2</sub> FILMS FOR DYE SENSITIZED SOLAR CELL	M.T.Sarode, Y. B. Kholam, S. R. Jadkar, B. B. Kale, K. C. Mohite	48
7	DOPED ZINC OXIDE CATALYSED SYNTHESIS OF SUBSTITUTED BENZIMIDAZOLES BY GREENER ROUTE AND THEIR ANTIMICROBIAL ACTIVITY	Malhari Nagtilak, Sandip Labade, Sandeep Sontakke	58
8	BIOMASS A GREEN ENERGY SOURCE	A. B. Bhise	65
9	SYNTHESIS AND CHARACTERIZATION OF A VISIBLE LIGHT PHOTOCATALYST	Dilip R. Thube, Hojin Ryub	67
10	POROUS NANONOODLES STRUCTURED MOBIINS <sub>5</sub> THIN FILM AS ELECTRODE FOR PHOTOELECTROCHEMICAL SOLAR CELLS	N.B. Pawar, S. D. Kharade, K. V. Khot, P. N. Bhosale	79
11	DEVELOPMENT AND ANALYSIS OF BRICKS MADE FROM WASTE PLASTIC BAGS: PLASTIC BRICK	Rutticka Madhukar Kedare, Varsha Ashutosh Joshi	85
12	SIMULATION AND DEVELOPMENT OF ENERGY EFFICIENT LIGHTING CONTROL SYSTEM FOR CORRIDORS OF A GREEN BUILDING	Jayashri. A Bangali Arvind D. Shaligram	91
13	GREEN BUILDING USING INTERNET OF THINGS TO CREATE SUSTAINABLE ENVIRONMENT	Deepa Ramane, Reena Shinde	96
14	PERFORMANCE EVALUATION OF DIESEL ENGINE USING ENRICHED REVIEW BIOGAS	H. S. Salave, A. D. Desai	101

International Conference on Go Green

## SYNTHESIS AND CHARACTERIZATION OF A VISIBLE LIGHT PHOTOCATALYST

Dilip R. Thube<sup>a\*</sup>, Hojin Ryu<sup>b</sup>

<sup>a</sup>Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, Ahmednagar (MS), 414 302, India.

<sup>b</sup>Energy Materials Research Center, Korea Research Institute of Chemical Technology, P.O. Box 107, Yuseong, Daejeon, 305-600, South Korea

### ABSTRACT

The phosphor supported TiO<sub>2</sub> nanoparticles were synthesized by sol-gel method. They were characterized using powder X-ray diffraction (-XRD), diffused reflectance UV-Visible spectroscopy, fourier transform infrared, scanning electron microscopy and transmission electron microscopy techniques. The powder-XRD pattern of as-prepared and sintered phosphor supported TiO<sub>2</sub> reveals that the crystal structure does not transformed from anatase to rutile phase till 600 °C. The FT-IR spectra showed a shift in the peak positions to higher wavenumbers for Ti-O vibrations which implies that the TiO<sub>2</sub> nanoparticles are covalently bonded to the phosphor support. TEM micrographs of the as-prepared materials revealed dispersion of TiO<sub>2</sub> nanoparticles with different sizes (8-20 nm) on the surface of phosphor. This phosphor-TiO<sub>2</sub> nanocomposite will have potential applications in other photovoltaic devices as well.

**Keywords:** Titanium dioxide; Phosphor supported TiO<sub>2</sub>; Sol-gel method; Visible light photocatalyst

### INTRODUCTION

Photocatalysis has attracted extensive attention for decades due to its potential applications in energy and environmental clean up [1-3]. Photocatalytic degradation in solar light is a promising way for the removal of toxic organic and inorganic contaminants from water and waste water [4-7]. Among various photocatalysts, most attention has been given to efficient and environmentally benign TiO<sub>2</sub> photocatalyst due to its high photocatalytic activity, strong oxidizing power, resistance to corrosion, photostability, chemical inertness, low cost and non-toxicity [8-10]. In addition, TiO<sub>2</sub> based self cleaning surfaces also exhibit antimicrobial activity useful in the home and hospital [11]. However, because of its large band gap (3.20 eV for anatase phase), it could be only activated by ultraviolet (UV) light. The solar light has only a small fraction (3-4 %) of UV light as compared to visible light (45%) [11-12]. Hence to make efficient use of the solar light, many attempts such as transition metal ion deposition [13] and anion doping [14-26] have been made to sensitize TiO<sub>2</sub> to absorb in the visible region. However, doped materials suffer from thermal instability and increase of carrier-recombination centers [27]. There are many reports on the modification of TiO<sub>2</sub> nanoparticles with transition metal oxides and other oxides such as SiO<sub>2</sub>, SnO<sub>2</sub>, In<sub>2</sub>O<sub>3</sub>, (Sr, La)TiO<sub>3,6</sub> and SrTiO<sub>3</sub> [28-31] to enhance the visible light sensitivity. Existing bulk semiconducting materials possess low surface area, absorb less light energy and exhibit fast electron-hole recombination affecting the photocatalytic activity. In order to overcome these drawbacks, research has been focused towards the synthesis of

\*Corresponding authors:drthube@rediffmail.com (Dilip R. Thube)

### International Conference on Go Green

nanomaterials which possess enhanced properties and activity [32]. Nanocrystalline materials exhibit unique properties such as quantum size effect, high surface area, short interface migration distance and visible light activity, which are of great importance for enhancing photocatalytic activity. The particle size of a catalyst has a direct consequence on surface area. When particle size is smaller, the number of active surface sites increases and consequently the surface charge carrier transfer rate also increases in photocatalysis [33-34]. The sol-gel process is the versatile technique for the preparation of nanocrystalline  $\text{TiO}_2$  through which the physico-chemical and electrochemical properties of  $\text{TiO}_2$  can be modified to improve its efficiency [1, 34-35].

Recently, Zheng et al. have reported light-storing photocatalyst [36] by combining light-storing phosphor and  $\text{TiO}_2$ . This photocatalyst can absorb and store the light from the source and supply it for the  $\text{TiO}_2$  photocatalyst when the light source is cut off. Hence, this kind of catalyst can function all day long when it is used in outdoor environment and save energy for indoor use. This encouraged us to explore the modification of  $\text{TiO}_2$  nanoparticles with optically sensitive phosphor material. Thus in this work, we present the synthesis of phosphor (calcium aluminate;  $\text{CaAl}_2\text{O}_4$ ;  $\text{Eu}^{2+}$ ,  $\text{Nd}^{3+}$ ) supported  $\text{TiO}_2$  nanoparticles using sol-gel method. The resultant products are characterized thoroughly using powder X-ray diffraction (XRD), diffused reflectance UV-Visible spectroscopy (DRS UV-Vis), fourier transform infrared (FT-IR), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) techniques. Their structure, thermal stability and morphological properties are discussed in the following sections.

### EXPERIMENTAL

#### *Synthesis of phosphor supported $\text{TiO}_2$ nanoparticles*

The phosphor ( $\text{CaAl}_2\text{O}_4$ ;  $\text{Eu}^{2+}$ ,  $\text{Nd}^{3+}$ ) supported  $\text{TiO}_2$  nanoparticles were synthesized using sol-gel procedure as follows: the phosphor ( $\text{CaAl}_2\text{O}_4$ ;  $\text{Eu}^{2+}$ ,  $\text{Nd}^{3+}$ , 1.2 – 4.8 g) was dispersed into ethanol (115 g, Merck, 99.7%), DI water (3.5 g) and a catalytic quantity of glacial acetic acid (0.035 g) with constant stirring for 30 min. TIP, (Aldrich, 97%), 0.08 to 0.24 M was added drop-wise over a period of approximately 10 min, under constant stirring. The white precipitate of  $\text{TiO}_2$  formed immediately was stirred at 50 °C for 5 min and then dried in oven at 70-80 °C for 48 h. It was then calcined at 400 and 600 °C and characterized using XRD, DRS UV-Vis, FT-IR, SEM and TEM techniques. The as-prepared catalysts were abbreviated as PST1-a, PST1-b and PST1-c for phosphor supported  $\text{TiO}_2$ , with  $\text{TiO}_2$  to phosphor molar ratio 1:1 and titanium precursor (TIP) concentration varied from 0.08, 0.16 and 0.24 M, respectively. The samples PST2-a, PST2-b and PST2-c, where  $\text{TiO}_2$  to phosphor molar ratio is 1:2 and titanium precursor (TIP) concentration varied from 0.08, 0.16 and 0.24 M, respectively. In samples PST3-a, PST3-b and PST3-c, the  $\text{TiO}_2$  to phosphor molar ratio is 1:4 and titanium precursor (TIP) concentration varied from 0.08, 0.16 and 0.24 M, respectively.

### CHARACTERIZATION

The  $\text{TiO}_2$  materials produced were analyzed and characterized with powder-XRD, DRS UV-Vis, FT-IR, SEM and TEM. The XRD spectra were recorded on a RIGAKU D/MAX 2200V, Japan with  $\text{Cu K}\alpha$  radiation ( $\lambda=1.54059 \text{ \AA}$ ) and a graphite monochromator operated at 40 kV and 40 mA. The diffractograms were recorded in the  $2\theta$  range 10-80° in steps of  $0.02^\circ \text{ s}^{-1}$ . The primary crystallite size of the obtained powders was estimated using the Scherrer equation (1) [37-38],

International Conference on Go Green

$$Dc = \frac{K\lambda}{B\cos\theta}$$

equation (1) where  $Dc$  is the average crystallite size;  $K$  ( $=0.89$ ) is the Scherrer constant;  $\lambda$  ( $=1.54059 \text{ \AA}$ ) is the X-ray wavelength;  $B$  is the full-width at half-maximum (FWHM) and  $\theta$  is the diffraction angle. The identification of the different crystalline phases was accomplished using the JCPDS database.

**Table 1**

Average crystallite sizes (nm) derived from anatase peak (1 0 1) of phosphor supported  $TiO_2$  calcined at  $400 \text{ }^\circ\text{C}$  using XRD.

Material	Average crystalline size in nm		
	a	b	c
Phosphor Supported $TiO_2$			
PST1	14.28	16.46	16.91
PST2	19.07	21.76	19.54
PST3	16.13	17.46	17.34

The average crystallite size of materials was determined by XRD using Scherrer equation.

PST - Phosphor supported  $TiO_2$ .

1, 2 and 3 - Molar ratio of  $TiO_2$ : phosphor 1:1, 1:2 and 1:3, respectively.

a, b and c – TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

**Table 2** The two-theta ( $2\theta$ ) values of selected peaks for free and phosphor supported  $TiO_2$  using XRD.

Peak	Two-theta ( $2\theta$ ) values for									
	Free $TiO_2$	PST1			PST2			PST3		
		a	b	c	a	b	c	a	b	c
(1 0 1)	25.31 9	25.30 0	25.34 0	25.30 0	25.34 0	25.32 0	25.34 0	25.38 0	25.37 9	25.24 1
(0 0 4)	37.88 0	37.74 0	37.99 9	37.79 8	37.72 6	37.87 9	37.89 9	37.82 1	37.68 2	37.67 0
(2 0 0)	48.06 1	48.04 0	48.16 0	48.09 9	48.12 0	48.06 0	48.00 0	47.93 7	48.08 0	47.88 1

PST - Phosphor supported  $TiO_2$ .

1, 2 and 3 - Molar ratio of  $TiO_2$ : phosphor 1:1, 1:2 and 1:3, respectively.

a, b and c – TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

**Table 3**

DRS UV-visible absorption maxima (in nm) for free  $TiO_2$  and phosphor supported  $TiO_2$  nanoparticles from.

Material	Absorption band in nm	Band-gap energy in eV
$TiO_2$	396	3.13
PST1-a	397	3.12
PST1-b	397	3.12
PST1-c	402	3.09
PST2-a	397	3.12
PST2-b	400	3.10
PST2-c	405	3.06
PST3-a	408	3.04
PST3-b	412	3.01
PST3-c	420	2.95

### International Conference on Go Green

PST - Phosphor supported  $\text{TiO}_2$ .

1, 2 and 3 - Molar ratio of  $\text{TiO}_2$ : phosphor 1:1, 1:2 and 1:3, respectively.

a, b and c - TIP concentration 0.08 M, 0.16 M and 0.24 M, respectively.

Band-gap energy is calculated using equation,  $E_{bg}$  (in eV) =  $1240/\lambda$ (in nm)

FT-IR spectra were recorded with a BRUKER EQUINOX55 FT-IR spectrometer in the range of  $4000\text{--}200\text{ cm}^{-1}$  on powders dispersed in KBr pellets. DRS UV-Visible spectra were recorded using UV-visible spectrophotometer (Shimadzu 2401 PC), with  $\text{BaSO}_4$  as a reference. The spectra were recorded at room temperature in air, in the range of 250 to 800 nm. SEM images were recorded using Philips XL30S FEG at 10 kV. Samples were deposited as dry powders on carbon tape on aluminium microscopy stubs and sputtered with platinum. TEM images of the materials were recorded with FEI TECNAI  $G^2$  T-20S microscope. A drop of sample suspension, which had been previously dispersed in ethanol by ultrasonication, was placed on a Cu microgrid coated with carbon film. The particle sizes were investigated by high-resolution transmission electron microscopy (HRTEM), using an accelerating voltage of 200 kV.

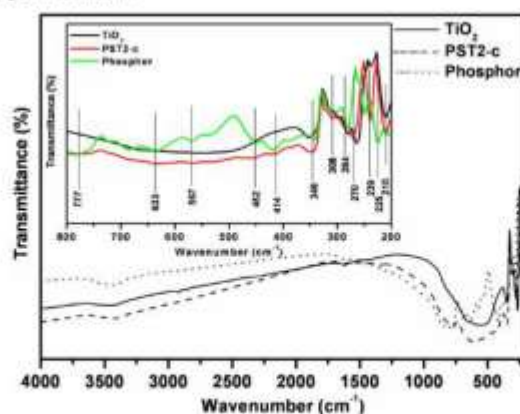


Figure 3.

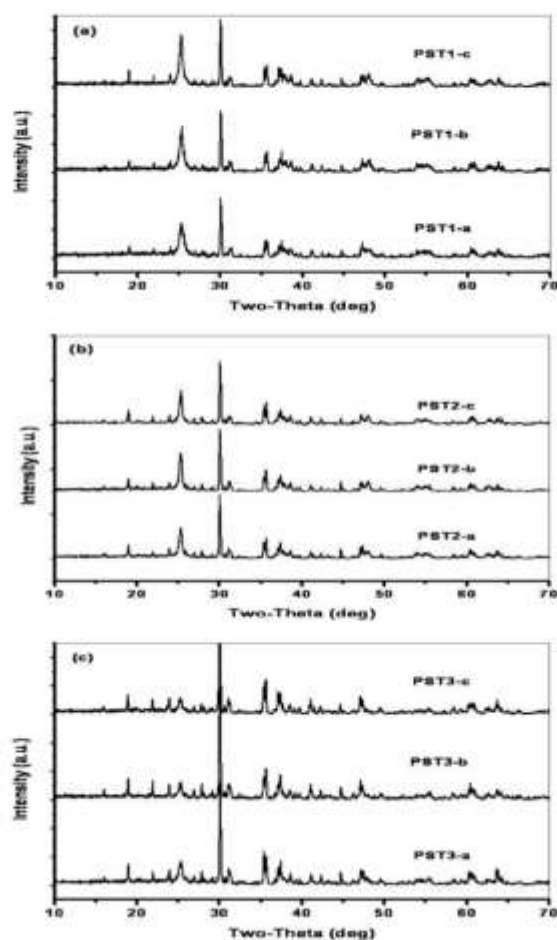
FT-IR spectra of Phosphor, free  $\text{TiO}_2$  and Phosphor supported  $\text{TiO}_2$  (PST2-c) catalysts. Inset showing enlarged view in the range from  $200$  to  $800\text{ cm}^{-1}$ .

## Results and Discussion

### Powder X-ray Diffractometry

The XRD patterns of phosphor supported  $\text{TiO}_2$  samples PST1, PST2, and PST3, are presented in Figs. 1(a), (b) and (c), respectively. Fig. 1(a) illustrates the XRD patterns of PST1 wherein the content of  $\text{TiO}_2$  is increased from PST1-a to PST1-c. There is gradual increase in the intensity of patterns for all the major peaks ((1 0 1), (0 0 4) and (2 0 0)) of anatase with the increase in the  $\text{TiO}_2$  contents. It is quite understood that due to high concentration of precursor the growth of the  $\text{TiO}_2$  is faster and hence there is slight increase in the intensity of XRD peaks with concentration of titanium precursor. Additionally, it also increases the crystallinity of the  $\text{TiO}_2$  leads to show sharp and intense peaks in XRD. The particle size derived by Scherrer equation is given in Table 1. There is increase in

## International Conference on Go Green

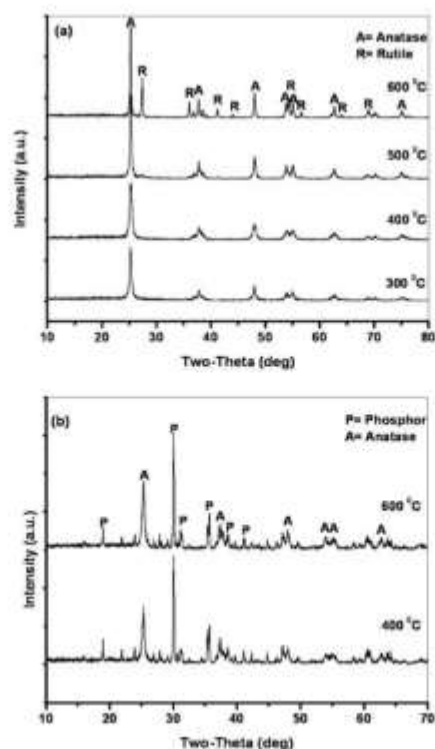


the particle size with the increase in the TiO<sub>2</sub> content as discussed above. It is also verified from the TEM pictures as discussed below. Though, the TiO<sub>2</sub> particles are covalently bound to phosphor surface, no change in the morphology of the patterns is observed. It is an interesting observation, which confirms adsorption of particles on the surface of phosphor after they are grown, rather than adsorbing titanium precursor, Ti(OC<sub>2</sub>H<sub>5</sub>)<sub>4</sub>, in the beginning itself. It is a quite general phenomenon as hydrophobic alkyl surrounding of titanium will be repelled and adsorbed on the polar surface of phosphor. So the hydrolysis and growth of TiO<sub>2</sub> nanocrystallites occur independently and finally transport to the phosphor surface as they have high surface energy.

The XRD patterns of PST2 shown in Fig. 1(b) also illustrate nearly similar features. The particle size of PST2-a, PST2-b and PST2-c are also presented in the same table and compared. There is slight increase in size for PST2-a, PST2-b and PST2-c as compared to PST1-a, PST1-b and PST1-c respectively. This observation suggests the influence of phosphor support on the equilibria of hydrolysis of titanium(iv)isopropoxide and nucleation of TiO<sub>2</sub> nanocrystallites. The XRD patterns of PST3-a to PST3-c, shown in Fig. 1(c) illustrates the patterns of both phosphor and TiO<sub>2</sub>, but the intensity of TiO<sub>2</sub> patterns shows a

### International Conference on Go Green

significant decrease compared to Fig. 1(a) and Fig. 1(b). It is a clear indication for decoration of phosphor support with much more finely divided  $\text{TiO}_2$  nanocrystallites. This observation once again supports the influence of phosphor support on the hydrolysis of titanium (iv) isopropoxide and the growth of  $\text{TiO}_2$  nanocrystallites. Since our main interest is to develop a methodology for the development of phosphor supported  $\text{TiO}_2$  photocatalyst, fine dispersion of  $\text{TiO}_2$  on phosphor support is important for enhanced photocatalytic activity. In this context, the methodology with the composition corresponding to the synthesis of PST3 samples appears to be better than others. The small particle size for PST3 catalysts than PST2 shown in Table 1 also confirms fine dispersion of  $\text{TiO}_2$  on phosphor support.



**Figure 2.** XRD patterns of (a)  $\text{TiO}_2$  and (b) Phosphor supported  $\text{TiO}_2$  at different temperatures.

as studied between 300 and 600 °C using XRD technique. The conversion of anatase to rutile is partly evident at 500 °C and more so at 600 °C (Fig. 2(a)). The influence of phosphor on the thermal stability of  $\text{TiO}_2$  is illustrated in Fig. 2(b). At 600 °C, no evidence is observed in support of conversion of anatase into rutile, hence phosphor is confirmed to confer thermal stability to  $\text{TiO}_2$  nanocrystallites. An important point to mention is unless the  $\text{TiO}_2$  particles are covalently bound to phosphor surface they cannot derive stability hence there might be covalent binding between phosphor and  $\text{TiO}_2$  to provide such property. The



### International Conference on Go Green

shift in  $2\theta$  values of XRD patterns presented in the Table 2 also proves the bonding interaction between  $\text{TiO}_2$  and phosphor. In addition, a point to note is there might not be free  $\text{TiO}_2$  nanocrystallites, as there is no evidence for rutile peaks. So it could be suggested that the phosphor support might provide significant binding force to attract and hold the  $\text{TiO}_2$  nanocrystallites either directly or through pre-adsorbed  $\text{TiO}_2$  crystallites. Hence, the phosphor support is discerned to inhibit the densification and crystal growth by providing dissimilar boundaries. Similar results for the thermal stability of anatase were also reported in the literature [39-42].

In order to establish the nature of interaction between  $\text{TiO}_2$  and phosphor support, additional support materials such as  $\gamma$ -alumina and MgO were chosen. The former can provide Lewis acid interaction and the later, Lewis basic interaction with  $\text{TiO}_2$ . These supports were separately mixed with  $\text{TiO}_2$ , calcined at 600 °C and subjected to XRD analysis. The XRD results indicated absence of anatase to rutile conversion, hence the  $\text{TiO}_2$  particles can be adsorbed on any supports which can act either as Lewis acid or as Lewis base. When the support acts as a Lewis acid,  $\text{TiO}_2$  oxidic sites can act as Lewis base. On the other hand if the support acts as a Lewis base titanium can act as Lewis acid site during the binding. Actually in alumina Lewis acidic aluminium sites are more important to bind than its Lewis basic oxidic sites.

#### FT-IR Spectroscopy

FT-IR spectra of phosphor,  $\text{TiO}_2$  and phosphor supported  $\text{TiO}_2$  (PST2-c) are compared in Fig. 3. The characteristic stretching vibrations of the materials lie between 200-1000  $\text{cm}^{-1}$ [43-48]. A careful examination of the group vibrations clearly shows shifts in peak positions for phosphor supported  $\text{TiO}_2$  compared to both, free phosphor and  $\text{TiO}_2$ . Hence it also becomes an important supporting evidence for the bonding interaction between the phosphor and  $\text{TiO}_2$ . The vibrations of phosphor are shifted to lower values after supporting  $\text{TiO}_2$ . Hence, the interaction between phosphor and support should transport  $\pi$ -electronic cloud from  $\text{TiO}_2$  to phosphor. In other words, the phosphor can drain electronic cloud from  $\text{TiO}_2$  by acting as Lewis acid. Since only oxidic  $\pi$ -electronic cloud of  $\text{TiO}_2$  is to be involved for such interactions, the sigma ( $\sigma$ ) bonding in  $\text{TiO}_2$  is to be strengthened. It is exemplified by the increase in the energy of  $\text{TiO}_2$  vibrations in phosphor supported  $\text{TiO}_2$  compared to free  $\text{TiO}_2$ . Actually for bonding between phosphor and  $\text{TiO}_2$ , phosphor acts as the Lewis acid, but for bonding between  $\text{TiO}_2$  crystallites this order could occur in both ways.

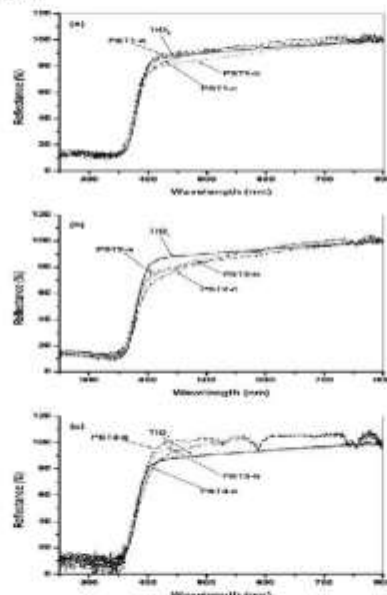
Based on the shift of the IR peak position to higher wavenumbers and decrease in the d-spacing as evidenced from XRD studies, it could be confirmed that the  $\text{TiO}_2$  nanoparticles are not free but covalently bound to the phosphor support. Therefore, there must be transfer of  $\pi$ -electron clouds particularly from the terminal oxidic sites of  $\text{TiO}_2$  nanoparticles to the phosphor support. This might be true as the support carries Lewis acidic sites such as  $\text{Al}^{3+}$  and rare earth ions as discussed above. The transfer of  $\pi$ -electronic cloud from the terminal oxidic sites would result in the suppression of backdonation of the some of the titanium sites through antibonding molecular orbitals, as a consequence there might be strengthening of the Ti-O sigma bonds in the entire nano- $\text{TiO}_2$  particles. This type of interaction might also be the cause for controlling size and higher level dispersion of  $\text{TiO}_2$  nanoparticles as evidenced from TEM studies.

#### Diffuse Reflectance Spectroscopy

The DRS UV-visible spectral analysis of  $\text{TiO}_2$  and phosphor supported  $\text{TiO}_2$  catalysts was carried out between 250 and 800 nm covering the ultraviolet and visible

### International Conference on Go Green

regions. The spectra for PST1, PST2 and PST3 catalysts are presented in Fig. 4(a), (b) and (c) respectively. In each figure phosphor content remains the same while the TiO<sub>2</sub> content increases, but the phosphor content increases from Fig. 4 (a) to (c). In each figure shift in the onset of absorbance towards longer wavelength with increase in TiO<sub>2</sub> content is clearly evident. The absorbance maximum for as-prepared free TiO<sub>2</sub> corresponds to 396 nm. The absorbance maximum and the band-gap energy derived for all the samples are presented in Table 3. The shift in absorbance towards longer wavelength in each figure indirectly proves increase in the particle size of TiO<sub>2</sub> nanocrystallites as discussed in XRD analysis, this observation is therefore conforming to quantum size effects as reported in the literature [49-52]. With increase in phosphor content the expected decrease in TiO<sub>2</sub> size is not observed in this study. In other words, from PST1 to PST3, the numbers of phosphor particles are increased but the TiO<sub>2</sub> size does not show the expected decrease by dilution effect of phosphor. From PST1 to PST2 the particle size increases therefore in PST1 the number of phosphor particle's content might not be sufficient to attract and adsorb all Ti precursors on their surface to form TiO<sub>2</sub> crystallites, where as in PST2 the phosphor particle's content is suggested to be optimum level to adsorb Ti precursors in greater amount on their surface thus aiding formation of large TiO<sub>2</sub> crystallites. Hence with PST2 supported catalyst, there might be minimum free TiO<sub>2</sub> particles compared to PST1 supported TiO<sub>2</sub> catalyst. If it is true then further increase in the phosphor content might show obvious decrease in the size of TiO<sub>2</sub> crystallites. In line with our view, the size of TiO<sub>2</sub> crystallites with PST3 systems is less than that of PST2 system. The presence of more free TiO<sub>2</sub> particles in PST1 and less in PST2 and PST3 is also partly evident from TEM analysis as discussed below. The excessive phosphor content is suppressing the formation of free TiO<sub>2</sub>. Dense aggregates of TiO<sub>2</sub> crystallites on the surface of phosphor in PST2 also support our view of minimizing formation of free TiO<sub>2</sub> particles. In comparison, the TEM pictures of PST1 and PST3 do not have such dense aggregation.



**Figure 4.** UV-Visible diffuse reflectance spectra for free and phosphor supported TiO<sub>2</sub> catalysts: (a) PST1, (b) PST2 and (c) PST3.

### International Conference on Go Green

The DRS UV-visible absorbance spectra of phosphor ( $\text{CaAl}_2\text{O}_4: \text{Eu}^{2+}, \text{Nd}^{3+}$ ) show characteristic absorbance maximum at 425 nm. It is also matching with the one already reported in the literature [53]. The above said absorbance is closely matching with  $\text{TiO}_2$ . This study therefore fulfils the requirement of nearly same absorbance maxima for both, phosphor support and  $\text{TiO}_2$  for visible light photodegradation even in the absence of sunlight. An added advantage of the supported catalyst is absorbance of light can occur either on  $\text{TiO}_2$  or phosphor. The light absorption on  $\text{TiO}_2$  can end up with either photodegradation or photoexcitation of phosphor, whereas the excitation of phosphor is to subsequently excite  $\text{TiO}_2$ . In any way there is enhanced light absorption cross section for phosphor supported material and so there might be consequent enhancement of photocatalysis activity. Hence phosphor supported  $\text{TiO}_2$  is expected to have better photocatalytic performance than  $\text{TiO}_2$  itself.

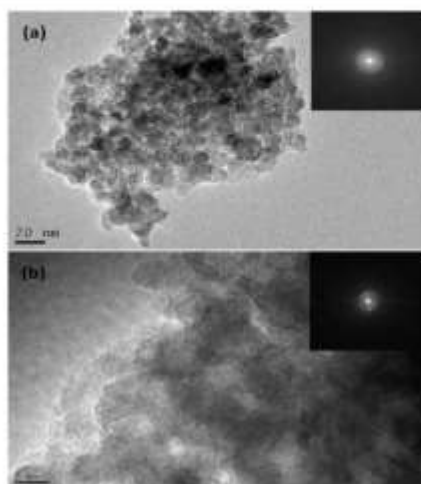
Generally band-gap of semiconducting materials is increased with decrease in particle size [49-52]. Contrary to the quantum size effects, the band-gap is observed to be less although the particle dimensions are in nanosize. Hence it is understood that each particle in this system is not an independent isolated one. Hence they are to be aggregated not by Van der Waal's forces but through covalent bond interactions. So when a particle interacts three dimensionally with other particles through covalent bond, new filled energy levels are to be added in the band-gap. This process leads to minimization of band-gap, thus making the absorption band to occur in the visible region, so aggregation of nanoparticles by bonding results in band-gap reduction and shifting the absorption band towards the lower energy region. In other words, quantum size effects can be applied to a system of nanoparticles which are isolated or are aggregated through Van der Waal's forces and not for the particles aggregated through actual bond formation. In such aggregates newer molecular orbitals are formed which can go around the entire molecular aggregates without confining to individual particles.

### SEM and TEM Studies

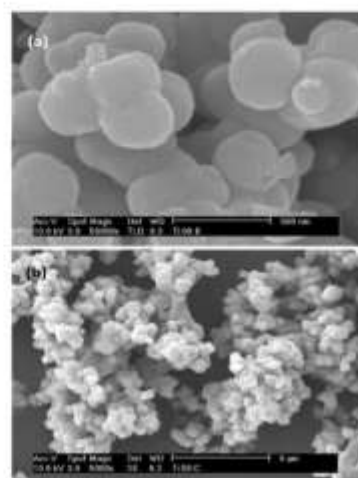
TEM study is a powerful tool to study the structural transformation and morphology of the material. The morphology of synthesized nanoparticles was studied using HRTEM images and selected area electron diffraction (SAED). Each composition was investigated by HRTEM for their microstructure and crystallinity. Fig.5 (a) and (b) shows the representative TEM and HRTEM images along with the corresponding SAED patterns of phosphor supported  $\text{TiO}_2$  (PST1-a and PST3-a) catalysts. Fig. 6 (a) and (b) shows the representative SEM image of phosphor supported  $\text{TiO}_2$  nanoparticles (PST2-b and PST2-c).

A TEM picture of phosphor supported  $\text{TiO}_2$  nanoparticles clearly reveals the crystalline nature of the material. The well defined rings and bright spots in SAED pattern shows good crystallinity. SEM and TEM pictures confirmed that the  $\text{TiO}_2$  particles are spherical in shape with an average grain size of 8-20 nm. There is very fine dispersion of  $\text{TiO}_2$  crystallites on the surface of

## International Conference on Go Green



**Figure 5.** (a) TEM image of PST1-a and (b) HRTEM image of PST3-a with an inset of corresponding SAED pattern.



**Figure 6.** SEM images of Phosphor supported TiO<sub>2</sub>, (a) PST2-b and (b) PST2-c

phosphor as compared to free TiO<sub>2</sub>. Fig. 5 and Fig. 6 illustrate aggregates of TiO<sub>2</sub> crystallites on the surface of phosphor. The morphology of the as-prepared TiO<sub>2</sub> nanoparticles remains same while the particle size is decreased to 8–20 nm. The covalent interactions that co-exist between TiO<sub>2</sub> nanoparticles and support as discussed earlier might be the cause for higher level dispersion. As and when the TiO<sub>2</sub> nanoparticles attains a particular size they will be picked up by covalent bonding by phosphor materials so further growth has been suppressed. Such a size controlling donor-acceptor mechanism is clearly evidenced in this study.

Although TiO<sub>2</sub> particles are of nanosize but they appear to have the different sizes i.e. lack of uniform particle size. It is attributed to the difference in the Lewis acid strength of different sites on the surface of phosphor material.

### CONCLUSION

The preparation of phosphor supported titanium dioxide catalysts by sol-gel method and their characterization is investigated in this study. From this study it is concluded that the size of TiO<sub>2</sub> nanocrystallites during synthesis can be controlled by adding a support like phosphor. The influence arises by the Lewis acid-base interaction between support and TiO<sub>2</sub>. To enhance the photocatalytic activity, TiO<sub>2</sub> should be highly crystalline and in nano-dimensions. Hence, the synthesis of TiO<sub>2</sub> in the presence of support is suggested to be a better route than the others for making nanocrystalline TiO<sub>2</sub>. The thermal stability of TiO<sub>2</sub> crystallites is favorably enhanced by the support. Therefore for synthesizing thermally stable anatase form, addition of support during synthesis appears to be a good alternative route. As the TiO<sub>2</sub> crystallites, when supported on phosphor, absorbs light in the visible region, they can be a better photocatalysts in visible light applications than free nano-TiO<sub>2</sub> crystallites. Here the phosphor support appears to be more important than others as it helps retaining absorbed light for photocatalysis rather than wasting it. In addition, absorption of light by

### International Conference on Go Green

both, phosphor and phosphor supported TiO<sub>2</sub> in nearly the same wavelength, is important as the light absorption cross section can very much be increased. Again, the support can also provide enhancement in photocatalysis rate by providing large surface area for adsorbing the reactant and bringing it close to TiO<sub>2</sub> particles. We will confirm this property by carrying out photocatalytic degradation of methylene blue in the following work.

### ACKNOWLEDGEMENT

One of the authors (D. R. Thube) is grateful to Korea Federation of Science and Technology KOPST, South-Korea, for the fellowship under Brain Pool Program. Dr. M. Palanichamy, Anna University, Chennai, India is gratefully acknowledged for useful discussions on the results obtained in this studies.

### REFERENCES

- 1) X. Chen, S.S. Mao, Chem. Rev. 107 (2007) 2891.
- 2) T.L. Thompson, J.T. Yates, Jr, Chem. Rev. 106 (2006) 4428.
- 3) O. Legrini, E. Oliveros, A. Braun, Chem. Rev. 93 (1993) 671.
- 4) D.F. Ollis, C.S. Turchi, Environ. Prog. 9 (1990) 229.
- 5) D.W. Bahnemann, in: E. Pelizzetti, M. Schiavello (Eds.), Photochemical Conversion and Storage of Solar Energy, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1991, pp. 251–276.
- 6) M.R. Hoffmann, S.T. Martin, W. Choi, D.W. Bahnemann, Chem. Rev. 95 (1995) 69.
- 7) Mills, S.L. Hunte, J. Photochem. Photobiol. A 108 (1997) 1.
- 8) Fujishima, K. Honda, Nature 238 (1972) 37.
- 9) M.A. Fox, M.T. Dulay, Chem. Rev. 93 (1993) 341.
- 10) M.V. Shankar, S. Anandan, N. Venkatachalam, B. Arbindoo, V. Murugesan, J. Chem. Technol. Biotechnol. 79 (2004) 1279.
- 11) X. Quan, Q. Zhao, H. Tan, X. Sang, F. Wang, Y. Dai, Mater. Chem. Phys. 114 (2009) 90.
- 12) Burda, Y. Lou, X. Chen, A.C.S. Samia, J. Stout, J.L. Gole, Nano. Lett. 3 (2003) 1049.
- 13) S. Sakthivel, H. Kisch, Angew. Chem. Int. Ed. 42 (2003) 4908.
- 14) H. Irie, Y. Watanabe, K. Hashimoto, Chem. Lett. 32 (2003) 772.
- 15) T. Umebayashi, T. Yamaki, S. Tanaka, K. Assai, Chem. Lett. 32 (2003) 330.
- 16) T. Ohno, T. Mitsui, M. Matsumura, Chem. Lett. 32 (2003) 364.
- 17) J.C. Yu, J.G. Yu, W.K. Ho, Z.T. Jiang, L.Z. Zhang, Chem. Mater. 14 (2002) 3808.
- 18) T. Lindgren, J.M. Mwabora, E. Avendano, J. Jonsson, A. Hoel, C.-G. Granqvist, S.-E. Lindquist, J. Phys. Chem. B 107 (2003) 5709.
- 19) T. Ihara, M. Miyoshi, Y. Iriyama, O. Matsumoto, S. Sugihara, Appl. Catal. B 42 (2003) 403.
- 20) Lettmann, K. Hildenbrand, H. Kisch, W. Macyk, W.F. Maier, Appl. Catal. B 32 (2001) 215.
- 21) W. Zhao, W. Ma, C. Chen, J. Zhao, Z. Shuai, J. Am. Chem. Soc. 126 (2004) 4782.
- 22) H. Irie, S. Washizuka, N. Yoshino, K. Hashimoto, Chem. Commun. (2003) 1298.
- 23) H. Irie, Y. Watanabe, K. Hashimoto, J. Phys. Chem. B 107 (2003) 5483.

**International Conference on Go Green**

- 24) J.L. Gole, J.D. Stout, C. Burda, Y. Lou, X. Chen, J. Phys. Chem. B 108 (2004) 1230.
- 25) L. Lin, W. Lin, Y.X. Zhu, B.Y. Zhao, Y.C. Xie, Chem. Lett. 34 (2005) 284.
- 26) L. Lin, R.Y. Zheng, J. L. Xie, Y.X. Jhu, Y.C. Xie, App. Catal. B Environ. 76 (2007) 196.
- 27) Shchukin, S. Poznyak, A. Kulak, P. Pichat, J. Photochem. Photobiol. A: Chem. 162 (2004) 423.
- 28) Asahi, T. Morikawa, T. Ohwaki, K. Aoki, Y. Taga, Science 293 (2001) 269 and references therein
- 29) S. Otsuka-Yao- Matsuo, M. Ueda, J. Photochem. Photobiol. A: Chem. 168 (2004) 1.
- 30) P. Cheng, W. Li, T. Zhou, Y. Jin, M. Gu, J. Photochem. Photobiol. A: Chem. 168 (2004) 97.
- 31) F.X. Ye, T. Tsumura, K. Nakata, A. Ohmoric, Mater. Sci. Eng. B 148 (2008) 154.
- 32) H. Wang, Y. Wu, B.Q Xu, Appl. Catal. B Environ. 59 (2005) 139.
- 33) R.S. Sonawane, B. B. Kale, M.K. Dongare, Mater. Chem. Phys. 85 (2004) 52.
- 34) N. Venkatchalam, M. palanichamy, V. Murugesan, Mater. Chem. Phys. 104 (2007) 454.
- 35) J. N. Hart, L. Bourgeois, R. Cervini, Y. B. Cheng, G. P. Simon, L. Spiccia, J Sol-Gel Sci. Tech. 42 (2007)107.
- 36) J. Zhang, F. Pan, W. Hao, Qi Ge, T. Wang, Appl. Phys. Letts. 85 (2004) 5778.
- 37) P. Scherrer, Gottinger, Nachrichte 2 (1918) 98.
- 38) B. D. Cullity Elements of X-Ray Diffraction, 3<sup>rd</sup> Edn. Addison-Wesley, Reading, MA, pp. 102, 284 (1978).
- 39) K. Datye, G. Riegel, J.R. Bolton, M. Haung, M.R. Prairie, J. Solid State Chem. 115 (1995) 236.
- 40) Y.H. Zhang, H.X. Zhang, Y.X. Xu, Y.G. Wang, J. Solid State Chem. 177 (2004) 3490.
- 41) S. Hishita, I. Mutoh, K. Koumoto, H. Yanagida, Ceram. Int. 9 (1983) 61.
- 42) J. Nair, P. Nair, F. Mizukami, Y. Oosawa, T. Okuba, Mater. Res. Bull. 34 (1999) 1275.
- 43) N. Venkatchalam, M. Palanichamy, V. Murugesan, J. Mol. Catal. A: Chem. 273 (2007)177.
- 44) W. Bauer, G. Tomandl, Ceram. Int. 20 (1994) 189.
- 45) M. Ocana, V. Fornes, C.J. Serna, Ceram. Int. 18 (1992) 99.
- 46) Zhao, C. Chen, Y. Wang, H. Ji, W. Ma, L. Zang, J. Zhao, J. Phys. Chem, C 112 (2008) 5993.
- 47) S. Sivakumar, P. Krishna, P. Mukundan, K.G.K Warriar, Mater. Lett. 57 (2002) 330.
- 48) J.Zhu, J. Yang, Z.-F. Bian, J. Ren, Y.-M. Liu, Y. Cao, H.-X. Li, H.-Y. He, K.-N. Fan, Appl. Catal., B 76 (2007) 82.
- 49) Z. Li, B. Hou, Y. Xu, D. Wu, Y. Sun, J. Colloid. Interface. Sci. 288 (2005) 149.
- 50) Z. Wang, L. Mao, J. Lin, J. Photochem. Photobiol. A: Chem. 177 (2006) 261.
- 51) D.S. Kim, S.J. Han, S.Y. Kwak, J. Colloid. Interface. Sci. 316 (2007) 85.
- 52) M. Anpo, T. Shima, S. Kodama, Y. Kubokawa, J. Phys. Chem. 91 (1987) 4305.
- 53) C. Chang, J. Xu, L. Jiang, D. Mao, W. Ying, Mater. Chem. Phys. 98 (2006) 509.



**The Editor**  
CTBC's **International Research Journal**

**c/o The Principal,**  
Chandmal Tarachand Bora College, Shirur, Dist. Pune  
Pin - 412210 (M.S.) India  
Contact : 02138 - 222301, 224170 Fax : 02138 - 224170  
Website : [www.ctboracollege.edu.in](http://www.ctboracollege.edu.in)  
Email : [ctborainfo68@gmail.com](mailto:ctborainfo68@gmail.com)

## 37. Synthesis of some fluorinated aurones and chromones

Indian Journal of Heterocyclic Chemistry  
Vol. 27 - Number 04 (Oct-Dec 2017) 373-376

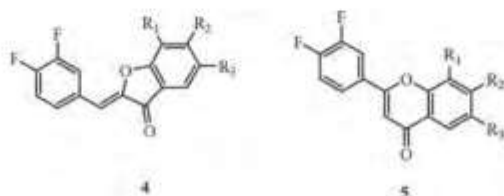
ISSN (Print) : 0971-1627  
ISSN (Online) : 2456-4311

## Synthesis of Some Fluorinated Aurones and Chromones

Sarita G. Kundlikar, Pratibha V. Randhavane, Hemantkumar N. Akolkar, and Bhausaheb K. Karale\*

Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar, Maharashtra, India

**ABSTRACT** 3,4-Difluorobenzaldehyde **1** when reacted with substituted 2-hydroxyacetophenone **2** gave corresponding chalcone **3**, which when treated with mercuric acetate in dry pyridine gave compound **4** and with dimethyl sulfoxide/ $I_2$  gave compound **5**. The structures of all the synthesized compounds were confirmed by spectroscopic techniques.



**KEYWORDS** Fluorine, Aurone, Chromone.

## INTRODUCTION

Incorporation of fluorine in drug discovery has become an essential tool because fluorine influences a variety of dramatic effects on the molecule's properties such as better bioavailability, longer biological half-life,<sup>[1]</sup> and hydrogen bonding<sup>[2]</sup> making them more selective and increasing their efficacy. Various biological activities associated with fluorine-containing molecules are anticancer,<sup>[3]</sup> antibacterial,<sup>[4]</sup> antifungal,<sup>[5]</sup> and phosphodiesterase inhibitors.<sup>[6]</sup>

Chalcones are the intermediates for the preparation of different compounds. They consist of open-chain flavonoids in which the two aromatic rings are joined by a three-carbon  $\alpha,\beta$ -unsaturated carbonyl system, associated with various biological activities such as cytotoxic,<sup>[7]</sup> antibacterial,<sup>[8]</sup> HIF-1 inhibitor,<sup>[9]</sup> anti-tubulin,<sup>[10]</sup> human P-glycoprotein,<sup>[11]</sup> and anticancer.<sup>[12]</sup>

Aurones are a family of natural compounds particularly found in the coloring of fruits and flowers. Aurones are synthesized in plants by oxidation, cyclization,

and rearrangement of chalcones by an enzyme called aureusidin synthase.<sup>[13]</sup> Aurones exhibits broad spectrum of biological activities as anticancer,<sup>[14]</sup> antimalarial,<sup>[15]</sup> antimicrobial,<sup>[16]</sup> tyrosine phosphatase 1B inhibitors,<sup>[17]</sup> and antiproliferative.<sup>[18]</sup>

Chromones are the oxygen-containing heterocyclic compounds with benzo-annulated  $\gamma$ -pyrone ring, with the parent compound being chromone (4*H*-chromene-4-one, 4*H*-1-benzopyran-4-one). Chromone derivatives have a wide range of biological activities such as antiproliferative,<sup>[19]</sup> insecticidal,<sup>[20]</sup> antifungal,<sup>[21]</sup>  $\beta$  amyloid imaging agent,<sup>[22]</sup> antitumor, and antibacterial.<sup>[23]</sup>

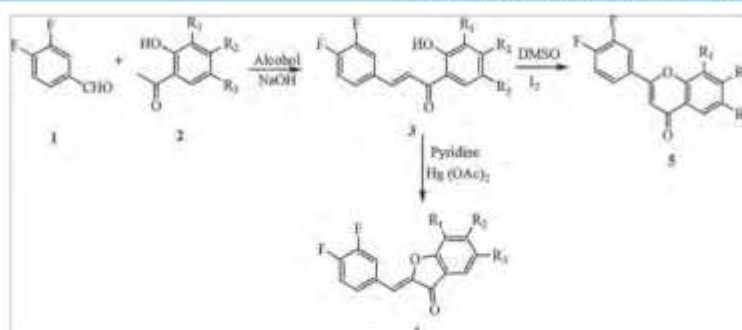
Biological activities associated with aurones and chromones, and we intend to synthesize fluorinated chromones and aurones.

## RESULTS AND DISCUSSION

2-Hydroxyacetophenones **2** were synthesized by Fries rearrangement. Equimolar quantities of 3,4-difluorobenzaldehyde

\*Corresponding author: Email: bkkarale@yahoo.com





Scheme 1

Table 1: Characterization data of synthesized compounds

Compound	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	m. p.(°C)	Yield (%)
3a	H	CH <sub>3</sub>	Cl	138	72
3b	Cl	H	Cl	154	70
3c	H	H	Cl	140	74
3d	H	H	Br	152	58
3e	H	H	CH <sub>3</sub>	110	68
4a	H	CH <sub>3</sub>	Cl	150	66
4b	Cl	H	Cl	180	62
4c	H	H	Cl	160	68
4d	H	H	Br	176	54
4e	H	H	CH <sub>3</sub>	166	60
5a	H	CH <sub>3</sub>	Cl	218	74
5b	Cl	H	Cl	214	70
5c	H	H	Cl	228	66
5d	H	H	Br	210	58
5e	H	H	CH <sub>3</sub>	180	62

**1** and substituted 2-hydroxyacetophenone **2** were dissolved in ethanol. The pH of the solution was made basic by adding 40% aqueous NaOH solution. The reaction mixture was stirred at room temperature for 24 h. The reaction mixture poured over crushed ice and neutralized with diluted acetic acid. The yellow solid thus obtained was filtered and crystallized from alcohol to afford chalcone **3**. Chalcone **3** which when refluxed with mercuric acetate in dry pyridine for 4–5 h gave aurone **4** and when heated with dimethyl sulfoxide (DMSO)/I<sub>2</sub> at 140°C for 2 h gave chromone **5**. The formation of all the synthesized compounds was confirmed by thin-layer chromatography (TLC), m. p., infrared (IR), <sup>1</sup>H-nuclear magnetic resonance (NMR), and mass spectral data. The compound **3b** gave characteristic C=O stretching frequency at 1635 cm<sup>-1</sup> due to conjugation of the double bond, and also in <sup>1</sup>H NMR spectroscopy, *trans* coupling is observed which confirms the formation of chalcone. In case of aurone **4b**, C=O stretching frequency at 1712 cm<sup>-1</sup> is increased due to ring size and also disappearance of singlet of -OH proton confirms cyclization of chalcone to aurone. In case of **5b**, C=O stretching frequency at 1658 cm<sup>-1</sup> is specifically due

to chromone ring and disappearance of singlet of -OH proton confirms cyclization of chalcone to chromone.

## EXPERIMENTAL SECTION

Melting points were recorded in open capillaries in liquid paraffin bath and are uncorrected. Mass spectra were recorded on Waters acquity TQD mass spectrometer. IR spectra were recorded on Shimadzu IR Affinity-1S spectrophotometer. <sup>1</sup>H NMR spectra were recorded on Bruker Avance II 400 MHz NMR spectrometer in DMSO-*d*<sub>6</sub> as a solvent and TMS as an internal standard. Peak values are shown in δ (ppm). The skeleton of the experimental procedure as per **Scheme 1** is explained as follows and characterization data of synthesized compounds is summarized in **Table 1**.

### (*E*)-3-(3,4-Difluorophenyl)-1-(2-hydroxyphenyl)prop-2-en-1-ones, 3a-e

Equimolar quantity of compound **1** (0.002 mol) and substituted 2-hydroxyacetophenone **2** (0.002 mol) was dissolved in 25 ml ethanol. 40% NaOH was added to the above solution. The reaction mixture was stirred at room temperature for 24 h. After completion of reaction, the reaction mixture was then poured over crushed ice and neutralized with diluted acetic acid. The yellow solid thus obtained was filtered and crystallized from alcohol to afford compound **3**.

- **3a**: IR: 3068 (O-H), 2992 (=CH), 1634 (C=O), 1554 (C=C) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.35 (s, 3H, CH<sub>3</sub>), 7.15 (t, 1H, Ar-H), 7.60 (d, 1H, =CH), 7.72 (s, 1H, Ar-H), 7.84-8.02 (m, 3H, Ar-H and =CH), 8.40 (s, 1H, Ar-H), 13.50 (s, 1H, OH); MS: *m/z*: (M+1), 307.
- **3b**: IR: 3072 (O-H), 2995 (=CH), 1635 (C=O), 1556 (C=C) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 7.17 (t, 1H, Ar-H), 7.62 (d, 1H, =CH), 7.78 (d, 1H, Ar-H), 7.86-8.04 (m, 3H, Ar-H and =CH), 8.45 (d, 1H, Ar-H), 13.52 (s, 1H, OH); MS: *m/z*: (M-1), 326.
- **3c**: IR: 3074 (O-H), 2994 (=CH), 1637 (C=O), 1552 (C=C) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 7.16 (t, 1H, Ar-H), 7.52 (m, 1H, Ar-H), 7.60 (d, 1H, =CH), 7.74 (d, 1H,

Sarita G. Kundlikar *et al.*

Ar-H), 7.84-8.02 (m, 3H, Ar-H and =CH), 8.42 (d, 1H, Ar-H), 13.50 (s, 1H, OH); MS:  $m/z$  (M+1), 293.

- **3d**: IR: 3075 (O-H), 2993 (=CH), 1635 (C=O), 1553 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.12 (t, 1H, Ar-H), 7.50 (m, 1H, Ar-H), 7.57 (d, 1H, =CH), 7.71 (d, 1H, Ar-H), 7.81-8.05 (m, 3H, Ar-H and =CH), 8.44 (d, 1H, Ar-H), 13.49 (s, 1H, OH); MS:  $m/z$  (M+1), 336.
- **3e**: IR: 3070 (O-H), 2992 (=CH), 1633 (C=O), 1550 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.30 (s, 3H, CH<sub>3</sub>), 7.11 (t, 1H, Ar-H), 7.51 (m, 1H, Ar-H), 7.63 (d, 1H, =CH), 7.72 (d, 1H, Ar-H), 7.82-8.04 (m, 3H, Ar-H and =CH), 8.40 (d, 1H, Ar-H), 13.48 (s, 1H, OH); MS:  $m/z$  (M+1), 273.

**(Z)-2-(3,4-Difluorobenzylidene)benzofuran-3(2H)-ones, 4a-e**

Compound **3** (0.001 mol) was dissolved in 10 ml dry pyridine, and mercuric acetate (0.001 mol) was added to it. The reaction mixture was refluxed for 4-5 h. After completion of reaction (as indicated by TLC), the reaction mixture was cooled to room temperature and poured over crushed ice and acidified with concentrated HCl. The solid product thus obtained was filtered and crystallized from acetic acid to afford compounds **4**.

- **4a**: IR: 2916 (=CH), 1710 (C=O), 1607 (C=C), 1275 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.40 (s, 3H, CH<sub>3</sub>), 7.03 (s, 1H, =CH), 7.23 (t, 1H, Ar-H), 7.75-7.95 (m, 4H, Ar-H); MS:  $m/z$  (M+1), 305.
- **4b**: IR: 2918 (=CH), 1712 (C=O), 1608 (C=C), 1276 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.05 (s, 1H, =CH), 7.25 (t, 1H, Ar-H), 7.77-7.97 (m, 4H, Ar-H); MS:  $m/z$  (M+1), 327.
- **4c**: IR: 2917 (=CH), 1711 (C=O), 1606 (C=C), 1274 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.03 (s, 1H, =CH), 7.24 (t, 1H, Ar-H), 7.74-7.96 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 293.
- **4d**: IR: 2915 (=CH), 1710 (C=O), 1607 (C=C), 1273 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.04 (s, 1H, =CH), 7.23 (t, 1H, Ar-H), 7.75-7.95 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 336.
- **4e**: IR: 2916 (=CH), 1713 (C=O), 1606 (C=C), 1274 (C-O-C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.35 (s, 3H, CH<sub>3</sub>), 7.03 (s, 1H, =CH), 7.22 (t, 1H, Ar-H), 7.77-7.97 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 273.

**2-(3,4-Difluorophenyl)-4H-chromen-4-ones, 5a-e**

Compound **3** (0.001 mol) was dissolved in 15 ml DMSO. To this reaction, mixture catalytic amount of iodine was added and heated at 140°C for 2 h and left overnight. The reaction mixture was then poured into crushed ice, and the solid thus obtained was filtered and washed with sodium thiosulfate followed by water and crystallized from alcohol to afford compound **5**.

- **5a**: IR: 2916 (=CH), 1655 (C=O), 1598 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.36 (s, 3H, CH<sub>3</sub>), 7.21 (s, 1H,

chromone), 7.62 (m, 1H, Ar-H), 7.92-8.15 (m, 4H, Ar-H); MS:  $m/z$  (M+1), 307.

- **5b**: IR: 2918 (=CH), 1658 (C=O), 1594 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.23 (s, 1H, chromone), 7.64 (m, 1H, Ar-H), 7.94-8.15 (m, 4H, Ar-H); MS:  $m/z$  (M+1), 327.
- **5c**: IR: 2917 (=CH), 1654 (C=O), 1596 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.20 (s, 1H, chromone), 7.62 (m, 1H, Ar-H), 7.84-8.13 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 293.
- **5d**: IR: 2914 (=CH), 1657 (C=O), 1597 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.25 (s, 1H, chromone), 7.60 (m, 1H, Ar-H), 7.82-8.11 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 334.
- **5e**: IR: 2915 (=CH), 1655 (C=O), 1595 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.33 (s, 3H, CH<sub>3</sub>), 7.20 (s, 1H, chromone), 7.60 (m, 1H, Ar-H), 7.83-8.10 (m, 5H, Ar-H); MS:  $m/z$  (M+1), 273.

**ACKNOWLEDGMENT**

Sarita G. Kundlikar is thankful to UGC, New Delhi, for financial support as JRF and to the Director, SAIF, Panjab University, Chandigarh, for providing spectral information.

**REFERENCES**

- [1] Mabe, S., Eller, J., Champsey, W.S. Structure-activity relationships for three macrolide antibiotics in *Haemophilus influenzae*, *Curr. Microbiol.*, **2004**, *49*, 248-254.
- [2] Plusker, G.L., Perry, C.M., Goa, K.L. Efavirenz: A pharmacoeconomic review of its use in HIV infection, *Pharmacoeconomics*, **2001**, *19*, 421-436.
- [3] Bridges, A.J. Chemical inhibitors of protein kinases, *Chem. Rev.*, **2001**, *101*, 2541-2572.
- [4] Antony, S.J., Diaz-Vasquez, E., Stratton, C. Clinical experience with linezolid in the treatment of resistant gram-positive infections, *J. Natl. Med. Assoc.*, **2001**, *93*, 386-391.
- [5] Cui, D., Li, Z., Song, G., Qian, X. Synthesis and biological activities of *N*-(1,2,4-triazole-4-yl)-*N'*-(fluorine-containing-phenyl)carbamide derivatives, *J. Fluorine Chem.*, **2002**, *115*, 79-82.
- [6] Ismail, F.M.D. Important fluorinated drugs in experimental and clinical use, *J. Fluorine Chem.*, **2002**, *118*, 27-33.
- [7] Reddy, M.V.B., Su, C.R., Chiou, W.F., Liu, Y.N., Chen, R.Y.H., Bastow, K.F., Lee, K.H., Wuu, T.S. Design, synthesis, and biological evaluation of Mannich bases of heterocyclic chalcone analogs as cytotoxic agents, *Bioorg. Med. Chem.*, **2008**, *16*, 7358-7370.
- [8] Chen, Z.H., Zheng, C.J., Sun, L.P., Piao, H.R. Synthesis of new chalcone derivatives containing a rhodamine-3-acetic acid moiety with potential anti-bacterial activity, *Eur. J. Med. Chem.*, **2010**, *45*, 5739-5743.
- [9] Wang, L., Chen, G., Lu, X., Wang, S., Han, S., Li, Y., Ping, G., Jiang, X., Li, H., Yang, J., Wu, C.



- Novel chalcone derivatives as hypoxia-inducible factor (HIF)-1 inhibitor: Synthesis, anti-invasive and anti-angiogenic properties, *Eur. J. Med. Chem.*, **2015**, *89*, 88–97.
- [10] Sharma, S., Kaur, C., Budhiraja, A., Nepali, K., Gupta, M.K., Saxena, A.K., Bedi, P.M.S. Chalcone based azacarholine analogues as novel antitubulin agents: Design, synthesis, biological evaluation and molecular modelling studies, *Eur. J. Med. Chem.*, **2014**, *85*, 648–660.
- [11] Parveen, Z., Brunhofer, G., Jabeen, L., Erker, T., Chiba, P., Ecker, G.F. Synthesis, biological evaluation and 3D-QSAR studies of new chalcone derivatives as inhibitors of human P-glycoprotein, *Bioorg. Med. Chem.*, **2014**, *22*, 2311–2319.
- [12] Kamal, A., Prabhakar, S., Ramaiah, M.J., Reddy, P.V., Reddy, C.R., Mallareddy, A., Shankaraiiah, N., Reddy, T.L.N., Pushpavalli, S.N.C., Pal-Bhadra, M. Synthesis and anticancer activity of chalcone-pyrrolizobenzodiazepine conjugates linked via 1,2,3-triazole ring side-armed with alkane spacers, *Eur. J. Med. Chem.*, **2011**, *46*, 3820–3831.
- [13] Nakayama, T. Enzymology of aurone biosynthesis, *J. Biosci. Bioeng.*, **2002**, *94*, 487–491.
- [14] Lawrence, N.J., Rennison, D., McGowan, A.T., Hadeld, J.A. The total synthesis of an aurone isolated from *Uvaria hamiltonii*: Aurones and flavones as anticancer agents, *Bioorg. Med. Chem. Lett.*, **2003**, *13*, 3759–3763.
- [15] Kayser, O., Kiderlen, A.F., Brun, R. *In vitro* activity of aurones against *Plasmodium falciparum* strains K1 and NF54, *Planta Med.*, **2001**, *67*, 718–721.
- [16] Bandgar, B.P., Patil, S.A., Korbadi, B.L., Biradar, S.C., Nile, S.N., Khobragade, C.N. Synthesis and biological evaluation of a novel series of 2,2-bisaminomethylated aurone analogues as anti-inflammatory and antimicrobial agents, *Eur. J. Med. Chem.*, **2010**, *45*, 3223–3227.
- [17] Li, W., Li, S., Higai, K., Sasaki, T., Asada, Y., Ohshima, Y., Koike, K. Evaluation of licorice flavonoids as protein tyrosine phosphatase 1B inhibitors, *Bioorg. Med. Chem. Lett.*, **2013**, *23*, 5836–5839.
- [18] Huang, W., Chen, Q., Yang, W.C., Yang, G.F. Efficient synthesis and antiproliferative activity of novel thioether-substituted flavonoids, *Eur. J. Med. Chem.*, **2013**, *66*, 161–170.
- [19] Shaw, A.Y., Chung, C.Y., Liu, H.H., Lu, P.J., Chen, H.L., Yang, C.N., Li, H.Y. Synthesis of 2-styrylchromones as a novel class of antiproliferative agents targeting carcinoma cells, *Eur. J. Med. Chem.*, **2009**, *44*, 2552–2562.
- [20] Zhao, P.L., Li, J., Yang, G.F. Synthesis and insecticidal activity of chromanone and chromone analogues of diacylhydrazines, *Bioorg. Med. Chem.*, **2007**, *15*, 1888–1895.
- [21] Prakash, O., Kumar, R., Prakash, V. Synthesis and antifungal activity of some new 3-hydroxy-2-(1-phenyl-3-aryl-4-pyrazolyl) chromones, *Eur. J. Med. Chem.*, **2008**, *43*, 435–440.
- [22] Ono, M., Maya, Y., Haratake, M., Nakayama, M. Synthesis and characterization of styrylchromone derivatives as  $\beta$ -amyloid imaging agents, *Bioorg. Med. Chem.*, **2007**, *15*, 444–450.
- [23] Modranka, J.N., Nawrot, E., Graczyk, J. *In vivo* antitumor, *in vitro* antibacterial activity and alkylating properties of phosphorohydrazine derivatives of coumarin and chromone, *Eur. J. Med. Chem.*, **2006**, *41*, 1301–1309.

Received: 18 May 2017; Accepted: 20 Nov 2017

## 38. Synthesis of some multihalogenated pyrazolyl benzofurans and benzoxazoles

Indian Journal of Heterocyclic Chemistry  
Vol. 27 - Number 04 (Oct-Dec 2017) 477-481

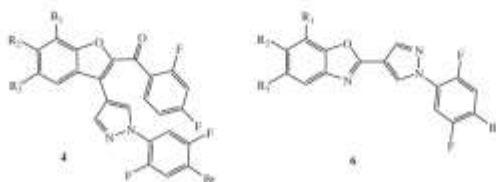
ISSN (Print) : 0971-1627  
ISSN (Online) : 2456-4311

### Synthesis of Some Multihalogenated Pyrazolyl Benzofurans and Benzoxazoles

Sarita G. Kundlikar, Pratibha V. Randhavane, Hemantkumar N. Akolkar and Bhausaheb K. Karale\*

Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar, Maharashtra, India

**ABSTRACT** 1-(4-Bromo-2,5-difluorophenyl)hydrazine **1**, when reacted with substituted 3-formylchromone **2** in alkaline medium, gave methanone **3**. Compound **3** was treated with 2-chloro-1-(2,4-difluorophenyl)ethanone in DMF/K<sub>2</sub>CO<sub>3</sub> to yield benzofuran **4** and when treated with hydroxylamine hydrochloride in alcohol gave oxime **5**. Compound **5** which on refluxing with POCl<sub>3</sub> cyclized to form benzoxazole **6**. The structures of all the synthesized compounds were confirmed with the help of spectral techniques.



**KEY WORDS** Fluorine, Benzofuran, Benzoxazole, Pyrazoles, Chromones.

#### INTRODUCTION

Fluorinated molecules have higher bioavailability than nonfluorinated molecules. They also have a knock-on effect on the stability and reactivity of other functional groups in the compound. Some of the fluorine-containing molecules exhibit DNA photocleavers<sup>[1]</sup> and insecticidal<sup>[2]</sup> activities.

3-Formylchromone is a versatile intermediate for synthesis of different heterocycles depending on which type of nucleophile used. Some of the methanone derivatives synthesized from 3-formylchromone exhibits cytotoxic as well as antiviral<sup>[3]</sup> activity. Pyrazole derivatives are known to possess a wide spectrum of biological activities such as antiviral,<sup>[4]</sup> anti-angiogenesis,<sup>[5]</sup> and selective CB<sub>2</sub> receptor ligands.<sup>[6]</sup>

Benzofuran and its derivatives constitute a major group of naturally-occurring compounds that are of particular interest due to their biological activity and role in plant defense systems. These are associated with broad spectrum

of biological activities such as selective adenosine A<sub>2A</sub> receptor antagonists,<sup>[7]</sup> nerve growth factor,<sup>[8]</sup> cytotoxic,<sup>[9]</sup> insecticidal,<sup>[10]</sup> antimitotic,<sup>[11]</sup> and antifungal<sup>[12]</sup>.

Oximes are the chemical compounds belonging to imine class and are the derivatives of carbonyl group. Various biological activities associated with oxime derivatives are anti-inflammatory<sup>[13]</sup>, antitumor,<sup>[14]</sup> and antimicrobial.<sup>[15]</sup>

Benzoxazole is benzo-fused oxazole compound having 1,3-azole in which oxygen atom has position 1 and nitrogen atom at the position 3. Recent observations showed that benzoxazole derivatives have remarkable biological activities such as anti-inflammatory,<sup>[16]</sup> antitumor,<sup>[17]</sup> antimicrobial,<sup>[18]</sup> antiviral,<sup>[19]</sup> herbicidal,<sup>[20]</sup> anticancer,<sup>[21]</sup> and elastase inhibitors.<sup>[22]</sup>

Biological activities associated with benzofuran and benzoxazole moieties prompted us to synthesize series of these compounds.

\*Corresponding author: Email: bkkarale@yahoo.com

Published & Hosted by

Journal Homepage: [www.connectjournals.com/ijhc](http://www.connectjournals.com/ijhc)

©2017 Connect Journals

CONNECT Journals™  
[www.connectjournals.com](http://www.connectjournals.com)

## RESULTS AND DISCUSSION

The starting material substituted 3-formylchromone was synthesized using method developed by Nohara *et al.* 1-(4-Bromo-2,5-difluorophenyl)hydrazine **1** was refluxed with substituted 3-formylchromone **2** in alkaline medium undergo ring opening to afford methanone **3** which when treated with 2-chloro-1-(2,4-difluorophenyl)ethanone in DMF/ $K_2CO_3$  at 80–90°C for 6–7 h with constant stirring cyclized to yield benzofuran **4** and when stirred with hydroxylamine hydrochloride in alcohol for 3–4 h gave oxime **5**. Compound **5** refluxed with  $POCl_3$  cyclized to form benzoxazole **6**. The structures of all the synthesized compounds were confirmed with the help of thin-layer chromatography (TLC), m.p. and spectral data which are mentioned in the experimental section. The compound **3e** gave characteristic C=O stretching frequency at 1633/cm and also in  $^1H$  nuclear magnetic resonance (NMR) spectroscopy singlet at  $\delta$  10.97 for one OH and two singlets at  $\delta$  8.26 and 8.75 for two pyrazolyl proton confirming formation of pyrazolyl methanone. In case of benzofuran **4c** C=O stretching frequency at 1647/cm and also disappearance of singlet at  $\delta$  10.97 -OH proton confirms cyclization of methanone to benzofuran. In  $^1H$  NMR of **5e**, appearance of four singlets, two for pyrazolyl proton at  $\delta$  7.82, 8.63 and two for OH proton at  $\delta$  9.77, 11.62 confirms

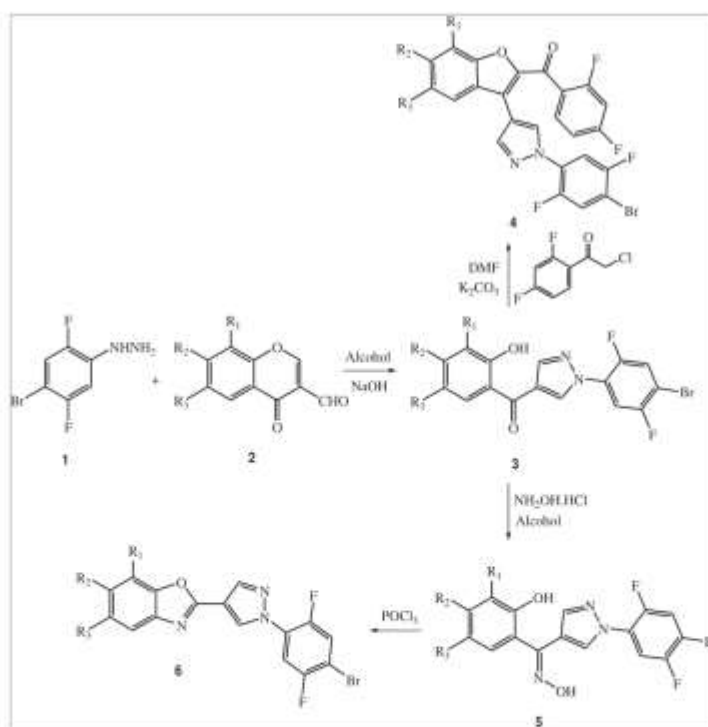
formation of an oxime. In compound **6c** disappearance of two OH proton singlets at  $\delta$  9.77 and  $\delta$  11.62 in  $^1H$  NMR formation of compound. The detailed scheme is presented in **Scheme 1**.

## EXPERIMENTAL SECTION

Melting points were recorded in open capillaries in liquid paraffin bath and are uncorrected. Mass spectra (MS) were recorded on waters Acquity TQD mass spectrometer. Infrared (IR) spectra were recorded on Shimadzu IR Affinity-15 spectrophotometer.  $^1H$  NMR spectra were recorded on Bruker Advance II 400 MHz NMR spectrometer in dimethyl sulfoxide ( $DMSO-d_6$ ) as a solvent and TMS as an internal standard. Peak values are shown in  $\delta$  (ppm). Physical data of synthesized compounds are summarized in **Table 1**.

## [1-(4-Bromo-2,5-difluorophenyl)-1H-pyrazol-4-yl] (2-hydroxyphenyl)methanones (3a-e)

3-Formylchromone **2** (0.014 mol) was dissolved in 15 ml alcohol with phenylhydrazine **1** (0.014 mol). The reaction mixture was heated under reflux for 30 min to get corresponding hydrazone. To the same reaction mixture 1 g NaOH was added and heating was continued for 4 h. After



Scheme 1

Sarita G. Kundlikar *et al.*

completion of reaction (as indicated by TLC), the contents were cooled to room temperature and poured into crushed ice and neutralized with dilute acetic acid. The solid thus obtained was separated by filtration, dried, and crystallized from acetic acid to afford compound **3** [Table 1].

**3a**: IR: 3172 (-OH), 1638 (C=O), 1596 (C=C), 1170 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.18 (d, 1H, Ar-H), 7.56 (d, 1H, Ar-H), 7.88–7.99 (m, 2H, Ar-H), 8.28 (s, 1H, pyrazole), 8.77 (s, 1H, pyrazole), 10.99 (s, 1H, OH); MS:  $m/z$  (M+1), 447.

**3b**: IR: 3170 (-OH), 1630 (C=O), 1594 (C=C), 1171 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  6.93 (d, 1H, Ar-H), 7.32 (q, 1H, Ar-H), 7.54 (d, 1H, Ar-H), 7.92–7.99 (m, 2H, Ar-H), 8.27 (s, 1H, pyrazole), 8.79 (s, 1H, pyrazole), 10.98 (s, 1H, OH); MS:  $m/z$  (M+1), 457.

**3c**: IR: 3169 (-OH), 1633 (C=O), 1595 (C=C), 1172 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.30 (s, 3H, CH<sub>3</sub>), 6.91 (d, 1H, Ar-H), 7.30 (q, 1H, Ar-H), 7.52 (d, 1H, Ar-H), 7.90–7.98 (m, 2H, Ar-H), 8.26 (s, 1H, pyrazole), 8.75 (s, 1H, pyrazole), 10.97 (s, 1H, OH); MS:  $m/z$  (M+1), 393.

**3d**: IR: 3171 (-OH), 1635 (C=O), 1594 (C=C), 1173 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.35 (s, 3H, CH<sub>3</sub>), 6.94 (s, 1H, Ar-H), 7.62 (s, 1H, Ar-H), 7.92–7.98 (m, 2H, Ar-H), 8.29 (s, 1H, pyrazole), 8.77 (s, 1H, pyrazole), 10.96 (s, 1H, OH); MS:  $m/z$  (M+1), 427.

**3e**: IR: 3172 (-OH), 1633 (C=O), 1592 (C=C), 1170 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  6.93 (d, 1H, Ar-H), 7.32 (q, 1H, Ar-H), 7.54 (d, 1H, Ar-H), 7.91–7.97 (m, 2H, Ar-H), 8.27 (s, 1H, pyrazole), 8.72 (s, 1H, pyrazole), 10.98 (s, 1H, OH); MS:  $m/z$  (M+1), 413.

Table 1: Characterization data of synthesized compounds

Compound	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	M.P. (°C)	Yield (%)
3a	Cl	H	Cl	140	76
3b	H	H	Br	162	70
3c	H	H	CH <sub>3</sub>	164	78
3d	H	CH <sub>3</sub>	Cl	150	72
3e	H	H	Cl	148	68
4a	Cl	H	Cl	252	70
4b	H	H	Br	210	67
4c	H	H	CH <sub>3</sub>	208	72
4d	H	CH <sub>3</sub>	Cl	250	66
4e	H	H	Cl	230	69
5a	Cl	H	Cl	180	64
5b	H	H	Br	190	62
5c	H	H	CH <sub>3</sub>	172	61
5d	H	CH <sub>3</sub>	Cl	120	60
5e	H	H	Cl	220	58
6a	Cl	H	Cl	210	44
6b	H	H	Br	204	43
6c	H	H	CH <sub>3</sub>	206	45
6d	H	CH <sub>3</sub>	Cl	172	48
6e	H	H	Cl	208	42

**{3-[1-(4-Bromo-2,5-difluorophenyl)-1H-pyrazol-4-yl]-1-benzofuran-2-yl](2,4-difluorophenyl) methanones, (4a-e)**

Equimolar mixture of compound **3** (0.001 mol) and 2-chloro-1-(2,4-difluorophenyl)ethanone (0.001 mol) was dissolved in minimum quantity of dry DMF. To this reaction mixture (0.003 mol) anhydrous K<sub>2</sub>CO<sub>3</sub> was added and then heated in between 80°C and 90°C in oil bath for 6–7 h with constant stirring. Progress of the reaction was monitored with the help of TLC. After completion of reaction, the contents were poured over crushed ice and neutralized with dilute acetic acid. The solid thus obtained was filtered, dried, and crystallized from ethanol to afford **4** [Table 1].

**4a**: IR: 2919 (=CH), 1650 (C=O), 1596 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.17–7.98 (m, 7H, Ar-H), 8.48 (s, 1H, pyrazole), 8.95 (s, 1H, pyrazole); MS:  $m/z$  (M+1), 583.

**4b**: IR: 2920 (=CH), 1648 (C=O), 1596 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.15–7.99 (m, 8H, Ar-H), 8.47 (s, 1H, pyrazole), 8.92 (s, 1H, pyrazole); MS:  $m/z$  (M+1), 593.

**4c**: IR: 2918 (=CH), 1647 (C=O), 1598 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.50 (s, 3H, CH<sub>3</sub>), 7.16–7.95 (m, 8H, Ar-H), 8.45 (s, 1H, pyrazole), 8.93 (s, 1H, pyrazole); MS:  $m/z$  (M+1), 529.

**4d**: IR: 2917 (=CH), 1649 (C=O), 1597 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  2.60 (s, 3H, CH<sub>3</sub>), 7.15–7.98 (m, 7H, Ar-H), 8.50 (s, 1H, pyrazole), 8.97 (s, 1H, pyrazole); MS:  $m/z$  (M+1), 563.

**4e**: IR: 2915 (=CH), 1646 (C=O), 1596 (C=C)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.14–7.97 (m, 8H, Ar-H), 8.44 (s, 1H, pyrazole), 8.92 (s, 1H, pyrazole); MS:  $m/z$  (M+1), 549.

**(E)-[1-(4-Bromo-2,5-difluorophenyl)-1H-pyrazol-4-yl]([2-hydroxyphenyl)methanone oximes, (5a-e)**

Compound **3** (0.055 mol) was dissolved in 20 ml of ethanol in 250 ml beaker. To this 10 ml of 20% KOH was added with constant stirring at 4°C and then hydroxylamine hydrochloride (1.1 mol) was added in portion wise. Further stirring was continued for 3–4 h at room temperature. After completion of reaction (monitored by TLC), reaction mixture was poured into crushed ice and acidified with dilute acetic acid. The product obtained was separated by filtration and crystallized from ethanol to afford compound **5** [Table 1].

**5a**: IR: 3138 (-OH), 3079 (-OH), 2924 (=CH), 1617 (C=N), 1562 (C=C), 1174 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  7.14 (d, 1H, Ar-H), 7.25 (d, 1H, Ar-H), 7.45 (m, 1H, Ar-H), 7.73 (m, 1H, Ar-H), 7.84 (s, 1H, pyrazole), 8.65 (s, 1H, pyrazole), 9.80 (s, 1H, OH), 11.65 (s, 1H, OH); MS:  $m/z$  (M+1), 462.

**5b**: IR: 3134 (-OH), 3077 (-OH), 2923 (=CH), 1615 (C=N), 1563 (C=C), 1172 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):  $\delta$  6.86 (d, 1H, Ar-H), 7.09 (d, 1H, Ar-H), 7.18 (m, 1H, Ar-H), 7.42 (m, 1H, Ar-H), 7.68 (m, 1H, Ar-H), 7.85 (s, 1H, pyrazole), 8.64 (s, 1H, pyrazole), 9.75 (s, 1H, OH), 11.60 (s, 1H, OH); MS:  $m/z$  (M+1), 472.

**5c**: IR: 3136 (-OH), 3078 (-OH), 2920 (=CH), 1614 (C=N), 1560 (C=C), 1176 (Ar-F)  $\text{cm}^{-1}$ ;  $^1\text{H NMR}$  (DMSO- $d_6$ ):



$\delta$  2.25 (s, 3H, CH<sub>3</sub>), 6.83 (d, 1H, Ar-H), 7.04 (d, 1H, Ar-H), 7.15 (m, 1H, Ar-H), 7.40 (m, 1H, Ar-H), 7.69 (m, 1H, Ar-H), 7.82 (s, 1H, pyrazole), 8.63 (s, 1H, pyrazole), 9.77 (s, 1H, OH), 11.62 (s, 1H, OH); MS: *m/z* (M+1), 408.

5d: IR: 3138 (-OH), 3076 (-OH), 2924 (=CH), 1612 (C=N), 1562 (C=C), 1177 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.30 (s, 3H, CH<sub>3</sub>), 6.80 (s, 1H, Ar-H), 7.18 (s, 1H, Ar-H), 7.42 (m, 1H, Ar-H), 7.64 (m, 1H, Ar-H), 7.84 (s, 1H, pyrazole), 8.66 (s, 1H, pyrazole), 9.78 (s, 1H, OH), 11.67 (s, 1H, OH); MS: *m/z* (M+1), 442.

5e: IR: 3137 (-OH), 3074 (-OH), 2922 (=CH), 1611 (C=N), 1563 (C=C), 1175 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  6.81 (d, 1H, Ar-H), 7.06 (d, 1H, Ar-H), 7.18 (m, 1H, Ar-H), 7.44 (m, 1H, Ar-H), 7.71 (m, 1H, Ar-H), 7.84 (s, 1H, pyrazole), 8.64 (s, 1H, pyrazole), 9.78 (s, 1H, OH), 11.64 (s, 1H, OH); MS: *m/z* (M+1), 428.

### 2-[1-(4-Bromo-2,5-difluorophenyl)-1H-pyrazol-4-yl]-1,3-benzoxazoles, (6a-c)

Compound **5** (0.001 mol) was dissolved in 10 ml of POCl<sub>3</sub> in 50 ml round bottom flask and the contents were heated under reflux for 3 hr. After completion of reaction, the contents were cooled to room temperature and poured into crushed ice and neutralized by adding sodium acetate. The solid thus obtained was separated by filtration and crystallized from ethanol to afford compound **6**.

6a: IR: 2916 (=CH), 1597 (C=C), 1245 (C-O-C), 1166 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  7.19 (d, 1H, Ar-H), 7.20 (d, 1H, Ar-H), 7.56 (m, 1H, Ar-H), 7.77 (m, 1H, Ar-H), 8.42 (s, 1H, pyrazole), 8.87 (s, 1H, pyrazole); MS: *m/z* (M+1), 444.

6b: IR: 2919 (=CH), 1596 (C=C), 1246 (C-O-C), 1167 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  7.15 (d, 1H, Ar-H), 7.25 (m, 1H, Ar-H), 7.46-7.55 (m, 2H, Ar-H), 7.77 (m, 1H, Ar-H), 8.43 (s, 1H, pyrazole), 8.88 (s, 1H, pyrazole); MS: *m/z* (M+1), 454.

6c: IR: 2918 (=CH), 1598 (C=C), 1247 (C-O-C), 1168 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.47 (s, 3H, CH<sub>3</sub>), 7.17 (d, 1H, Ar-H), 7.23 (m, 1H, Ar-H), 7.44-7.52 (m, 2H, Ar-H), 7.75 (m, 1H, Ar-H), 8.40 (s, 1H, pyrazole), 8.86 (s, 1H, pyrazole); MS: *m/z* (M+1), 490.

6d: IR: 2920 (=CH), 1597 (C=C), 1249 (C-O-C), 1165 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  2.44 (s, 3H, CH<sub>3</sub>), 7.07 (s, 1H, Ar-H), 7.39-7.50 (m, 2H, Ar-H), 7.76 (m, 1H, Ar-H), 8.42 (s, 1H, pyrazole), 8.85 (s, 1H, pyrazole); MS: *m/z* (M+1), 424.

6e: IR: 2916 (=CH), 1594 (C=C), 1246 (C-O-C), 1167 (Ar-F) cm<sup>-1</sup>; <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>):  $\delta$  7.15 (d, 1H, Ar-H), 7.25 (m, 1H, Ar-H), 7.49-7.58 (m, 2H, Ar-H), 7.77 (m, 1H, Ar-H), 8.43 (s, 1H, pyrazole), 8.85 (s, 1H, pyrazole); MS: *m/z* (M+1), 410.

### ACKNOWLEDGMENT

Authors are thankful to UGC New Delhi for financial support and also thankful to the Director, SAIF, Punjab University, Chandigarh for spectral analysis.

### REFERENCES

- [1] Yao, W., Qian, X. Synthesis of fluorine-containing oxazolaphthalimide hydroperoxides as DNA photocleavers, *J. Fluorine Chem.*, **2000**, *106*, 69–72.
- [2] Mori, T., Ujihara, K., Matsumoto, O., Yanagi, K., Matsuo, N. Synthetic studies of fluorine-containing compounds for household insecticides, *J. Fluorine Chem.*, **2007**, *128*, 1174–1181.
- [3] Galal, S.A., Abd-El-All, A.S., Abdallah, M.M., El-Diwani, H. Synthesis of potent antitumor and antiviral benzofuran derivatives, *Bioorg. Med. Chem. Lett.*, **2009**, *19*, 2420–2428.
- [4] Hashem, A.I., Youssef, A.S.A., Kandeel, K.A., Abou-Elmagd, W.S.I. Conversion of some 2(3H)-furanones bearing a pyrazolyl group into other heterocyclic systems with a study of their antiviral activity, *Eur. J. Med. Chem.*, **2007**, *42*, 934–939.
- [5] Abadi, A.H., Eissa, A.A.H., Hassan, G.S. Synthesis of novel 1,3,4-trisubstituted pyrazole derivatives and their evaluation as antitumor and antiangiogenic agents, *Chem. Pharm. Bull.*, **2003**, *51*, 838–844.
- [6] Gembus, V., Fumand, C., Millet, R., Mansouri, R., Chavatte, P., Levacher, V., Briere, J.F. Scaffold hopping strategy toward original pyrazolines as selective CB<sub>1</sub> receptor ligands, *Eur. J. Med. Chem.*, **2012**, *58*, 396–404.
- [7] Saku, O., Saki, M., Kurokawa, M., Ikeda, K., Uchida, S., Takizawa, T., Uesaka, N. Synthetic studies on selective adenosine A<sub>2A</sub> receptor antagonists. Part II: Synthesis and structure-activity relationships of novel benzofuran derivatives, *Bioorg. Med. Chem. Lett.*, **2010**, *20*, 3768–3771.
- [8] Liu, Y., Kubo, M., Fukuyama, Y. Nerve growth factor-potentiating benzofuran derivatives from the medicinal fungus *Phellinus ribis*, *J. Nat. Prod.*, **2012**, *75*, 2152–2157.
- [9] Banskota, A.H., Tezuka, Y., Midorikawa, K., Matsushige, K., Kadota, S. Two novel cytotoxic benzofuran derivatives from Brazilian propolis, *J. Nat. Prod.*, **2000**, *63*, 1277–1279.
- [10] Huang, Z., Cui, Q., Xiong, L., Wang, Z., Wang, K., Zhao, Q., Bi, F., Wang, Q. Synthesis and insecticidal activities and SAR studies of novel benzoheterocyclic diacylhydrazine derivatives, *J. Agric. Food Chem.*, **2009**, *57*, 2447–2456.
- [11] Morita, H., Tsuchiya, T., Kishibe, K., Noya, S., Shiro, M., Hirasawa, Y. Antimitotic activity of lobaric acid and a new benzofuran, sakisacaulon a from *Stereocaulon sasakii*, *Bioorg. Med. Chem. Lett.*, **2009**, *19*, 3679–3681.
- [12] Aslam, S.N., Stevenson, P.C., Phythian, S.J., Veitch, N.C., Hall, D.R. Synthesis of ciccerfuran, an antifungal benzofuran, and some related analogues, *Tetrahedron*, **2006**, *62*, 4214–4226.
- [13] Hegab, M.I., Yousef, N.M., Nour, H.F., Ellithey, M., Arbid, M.S. Synthesis and pharmacological activities of some condensed 4-chloro-2,2-dialkyl chromene-3-carbaldehyde derivatives, *Acta Pharm.*, **2008**, *58*, 15–27.

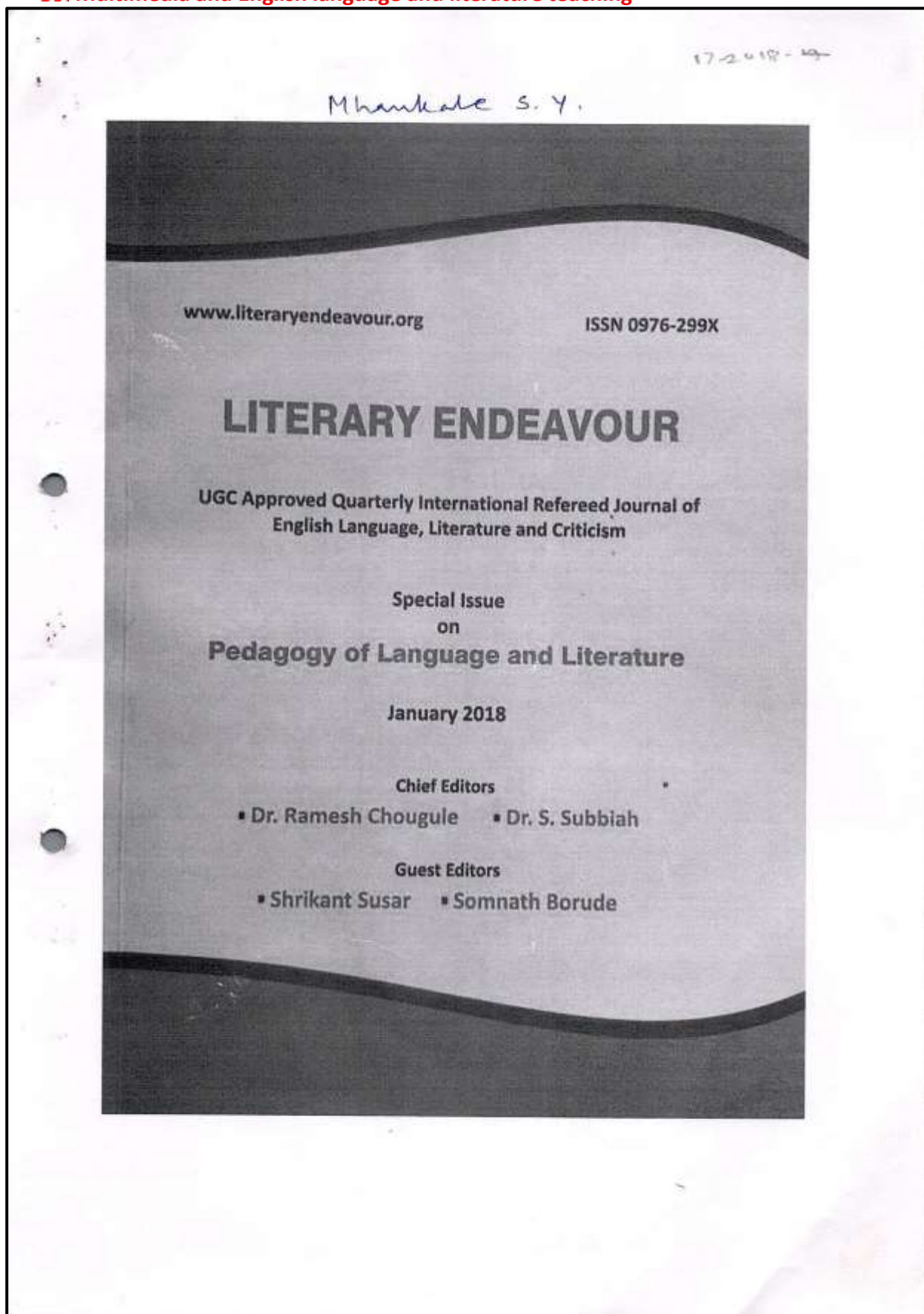
Sarita G. Kundlikar *et al.*

- [14] Park, H.J., Lee, K., Park, S.J., Ahn, B., Lee, J.C., Cho, H.Y., Lee, K.I. Identification of antitumor activity of pyrazole oxime ethers, *Bioorg. Med. Chem. Lett.*, **2005**, *15*, 3307–3312.
- [15] Lokhande, R.S., Patil, V.R., Shevde, P.P., Lele, S.M. Imine oximes: Synthesis, characterization, thermal and biological studies, *Int. J. Chem. Sci.*, **2010**, *8*, 88–96.
- [16] Singh, S.P., Verma, N.K., Rai, P.K., Tripathi, A.K. Synthesis and pharmacological screening of some novel benzoxazole derivatives, *Der Pharm. Lett.*, **2014**, *6*(6), 283–288.
- [17] Xiang, P., Zhou, T., Wang, L., Sun, C.Y., Hu, J., Zhao, Y.L., Yang, L. Novel benzothiazole, benzimidazole and benzoxazole derivatives as potential antitumor agents: Synthesis and preliminary *in vitro* biological evaluation, *Molecules*, **2012**, *17*, 873–883.
- [18] Anusha, P., Rao, J.V. Synthesis and biological evaluation of benzoxazole derivatives as new antimicrobial agents, *Int. J. Pharm. Biosci.*, **2014**, *4*(4), 83.
- [19] Neyts, J., De Clercq, E., Singha, R., Chang, Y.H., Das, A.R., Chakraborty, S.K., Hong, S.C., Tsay, S.C., Hsu, M.H., Hwu, J.R. Structure-activity relationship of new anti-hepatitis c virus agents: Heterobicyclic-coumarin conjugates, *J. Med. Chem.*, **2009**, *52*, 1486–1490.
- [20] Zhou, Y., Xue, N., Wang, G., Miao, W., Qu, J. Syntheses and herbicidal activity of pyrazolyl benzoxazole derivatives, *J. Heterocycl. Chem.*, **2010**, *47*, 15–21.
- [21] Mckee, M.L., Kerwin, S.M. Synthesis, metal ion binding, and biological evaluation of new anticancer 2-(2'-hydroxyphenyl)benzoxazole analogs of UK-1, *Bioorg. Med. Chem.*, **2008**, *6*, 1775–1783.
- [22] Mulchande, J., Oliveria, R., Carrasca, M., Gouveia L., Guedes, R.S., Iley, J., Moreira, R. 4-Oxo- $\beta$ -lactams (azetidine-2,4-diones) are potent and selective inhibitors of human leukocyte elastase, *J. Med. Chem.*, **2010**, *53*, 241–253.

Received: 21 May 2017; Accepted: 02 Jan 2018.





**39. Multimedia and English language and literature teaching**

## INDEX

S.No.	Title & Author	Page No.
1	Pedagogy : Teaching of English at Present <b>Shrikant R. Susar</b>	1 - 4
2	Visualizing the 'Phantom Category' : Teaching of Diaspora Studies to Undergraduate Classes <b>Pandurang Barkale</b>	5 - 12
3	Approaches and Methods in Language Teaching <b>Dr. Kalyan D. Sonawane</b>	13 - 16
4	Introducing Soft Skills : A Makeover of Conventional Teaching Methods <b>Suryakant S. Gadkari</b>	17 - 22
5	Shakespeare's Impact on Modern English <b>Dr. Ravi P. Savanekar</b>	23 - 27
6	Comparative Analysis of Teaching Vocabulary and Grammar to Marathi and English Medium Students <b>Parameshwar B. Vikhe</b>	28 - 34
7	Youtube : A Supplementary Resource in Teaching English Drama <b>Dr. Suporna Mitra</b>	35 - 38
8	Being Productive : Novels and Film Adaptations in the ESL/EFL Classroom <b>Jitha Gopinath</b>	39 - 43
9	Linguistic Enactment of Co-operative principle and Politeness principle in the Story 'The Greedy Old Woman and Lime Tree' <b>Kailas Pote &amp; Sunil Adhav</b>	44 - 46
10	An Effective Usage of Critical Pedagogy in Education <b>Kamalakar B. Gaikwad</b>	47 - 50
11	Psychoanalysis and Pedagogy : Psychological Analysis Between Character and Author with Special Reference to <i>The Bell Jar</i> by Sylvia Plath <b>Somnath N. Borude</b>	51 - 56
12	Elements of Sanskrit and Persian Words in English Language with Special Reference to India and Iran <b>Kirtikumar R. Pimpliskar</b>	57 - 61
13	Effective Methods of Teaching and Learning English Vocabulary <b>Kishor V. Kure</b>	62 - 67
14	Impact of a Digital Language Laboratory to Teaching and Learning Oral Aural English Language Skills <b>Nandkumar D. Bhandari</b>	68 - 70
15	Why Students in Rural Degree College are Still Incapable to Acquire Desired Proficiency in English? : A Pedagogical Perspective <b>Pawanjay N. Sudewad</b>	71 - 74

16	Waiting to be Heard : A Critical Study of the Marginalized Voices in Amish Tripathi's <i>The Immortals of Meluha</i> <b>Prashant P. Dharmadhikari</b>	75 - 79
17	Code-Switching and Code-Mixing in Indian English : A Review <b>Rakesh S. Mali</b>	80 - 86
18	Using Multimedia to Develop Listening and Speaking Skills <b>Sachin Gadekar, Jaymati K.</b>	87 - 92
19	Multimedia and English Language and Literature Teaching <b>Sunil Y. Mhankale</b>	93 - 95
20	Critical Approaches to Literature Teaching <b>Sudhir K. Joshi</b>	96 - 99
21	Information and Communication Technology in English Language Learning : The Role of Language Laboratory <b>Varsha S. Aher</b>	100 - 103
22	Use of Multimedia in English Language Teaching <b>Vijay A. Khade</b>	104 - 107
23	Use of Language Lab in Teaching English <b>Vina S. Kulkarni</b>	108 - 111
24	Pedagogy in Language and Literature : The Use of Language Laboratory as an Effective Tool <b>Anil Chindhe</b>	112 - 115
25	Use of Language Laboratory as an Effective Tool <b>Varsha A. Darkunde</b>	116 - 120
26	Re-defining Eligibility of the Teachers and Re-Structuring the Teacher Education in Maharashtra <b>Dr. R. T. Bedre</b>	121 - 125
27	Importance of Language Lab in Teaching Learning English <b>Nitin S. Bhalke</b>	126 - 130
28	Approaches and Methods in Language Teaching <b>Dayaneshwar Bhosale</b>	131 - 135
29	The Use of Film Adaptation in Teaching of English Novel with reference to R.K. Narayan's <i>The Guide</i> <b>Sangita Dhimate</b>	136 - 139
30	A Lexical Analysis of Khushwant Singh's Short Story 'Man, How the Government of India Run!' <b>Prasad R. Dagwale</b>	140 - 142

Literary Endeavour (ISSN 0976-2998): Special Issue on Pedagogy of Language & Literature (January 2018)

### MULTIMEDIA AND ENGLISH LANGUAGE AND LITERATURE TEACHING

Sunil Y. Mhankale, Asst. Prof. Department of English,  
New Arts, Commerce and Science College, Parner

#### Abstract:

*This paper aims at analyzing the use of multimedia to English language teaching and brings out the problems faced by both teachers and learners of English. The rapid development of science and technology such as multimedia technology has offered a better tool to explore the new teaching method. In fact, multimedia technology has played an important role in English language teaching, especially, in the non-native speaking of English situations. It also aims to make non-native speakers of English as language teachers aware of the strategies to use it in an effective manner. Multimedia teaching method has been used in college English teaching wider and wider. It has contributed a lot to higher teaching quality. Chalk and Talk teaching method is not enough to teach English effectively. We should change our teaching ideas and recognize its impersonal attribute as one kind of teaching method. Thus we can utilize modern education technology reasonably to fulfill the target of college English teaching.*

**Keywords:** *English language teaching, multimedia technology*

"Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally. Multimedia can be recorded and played, displayed, interacted with or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. Multimedia devices are electronic media devices used to store and experience multimedia content. Multimedia is distinguished from mixed media in fine art; for example, by including audio it has a broader scope. In the early years of multimedia the term "rich media" was synonymous with interactive multimedia, and "hypermedia" was a application of multimedia. The term *multimedia* was coined by singer and artist Bob Goldstein (later 'Bobb Goldsteinn') to promote the July 1966 opening of his "Light Works at L'Oursin" show at Southampton, Long Island. Goldstein was perhaps aware of an

Literary Endeavour (ISSN 0970-2998): Special Issue on Technology in Language & Literature (January 2011)

American artist named Dick Higgins, who had two years previously discussed a new approach to art-making he called "intermedia" (<http://slideplayer.com/slide/9357345/>)

The main purpose of using multimedia in language teaching is to promote student motivation and learning interest in the English language. In the non-native English speaking context, this can be a practical way to get them involved in the language learning. In India and elsewhere in the non-native speaking countries, English is used as a second or third language and for some people the first language. With the spread and development of English around the world, it has become an important means of communication among the people of different cultures and languages. At present, the role and status of English in India is higher than ever as it is a medium of instruction and curriculum in educational institutions. As a number of English learners are growing up, different teaching methods have been experimented to see the effectiveness of English language and literature teaching. The use of multimedia in the form of films, radio, TV and tape recording has been there for a long time. "Multimedia has turned into one essential aspect of society that helps students to understand the bigger picture of the world and not just stay confined to what schools and teachers teach them within their classrooms" (12). Of course, the multimedia has proved to be successful in replacing the traditional language teaching. The modern language teachers have new challenges and duties given by the new era. The tradition of English teaching has been drastically changed with the remarkable development of newer technologies such as multimedia technology. Technology provides so many options as it makes teaching interesting and productive because it has capability to attract the language learners.

As the popularity of English is expanding day by day and worldwide, the teachers of English feel the need of change in their language teaching methods. There are teachers who use the "leading edge of technological and scientific development" (Young and Bush 2), but the majority of teachers still teach in the traditional manner. However, this paper does not claim that none of these traditional manners are bad or damaging the students. In principle, they are proving to be useful even today. There are many opportunities for students to gain confidence in learning English who learn the language for more than just fun. For them, to keep pace with English language teaching and gain more confidence, they have to stride into the world of multimedia technology. Here, multimedia technology refers to computer-based interactive applications that use both the hardware and software, allowing people to share their ideas and information. It is a combination of text, graphics, animation, video and sound.

*Literary Endeavour* (ISSN 0976-299x), Special Issue on Pedagogy of Language & Literature (January 2018)

With the rapid growth of science and technology, the use of multimedia technology in language teaching has created a favorable context for reforming and exploring English language teaching models in the new age. This trend features the use of audio, visual, and animation effects in the English language teaching classrooms. Multimedia technology plays a positive role in improving activities and initiatives of students and teaching effect in the classrooms. Elaborating on the scope of technology, "Educational institutions all across the globe have already started implementing technology in education, and India also needs to understand that there's no way to stop the evolution of technology; and rather than working on ways to separate technology from education, we rather need ways to combine them" (12). Thus, technological innovations should go hand in hand with the growth of English and change the way in which we communicate. In fact, the growth of the Internet has facilitated the growth of the English language. In this sense, computers are no longer the exclusive domains of a few individuals, but rather they are available to many. As the English language teaching models change rapidly, there has been a significant growth of literature regarding the use of technology in English language teaching. These literatures unequivocally accept technology as the most essential part in teaching. Such a tendency has emphasized on an essential role of technology in pedagogy in which technology has been dominant over the teachers. As a result, if we ignore technological developments, the teachers will never be able to catch up with the new trend, irrespective of our discipline or branch.

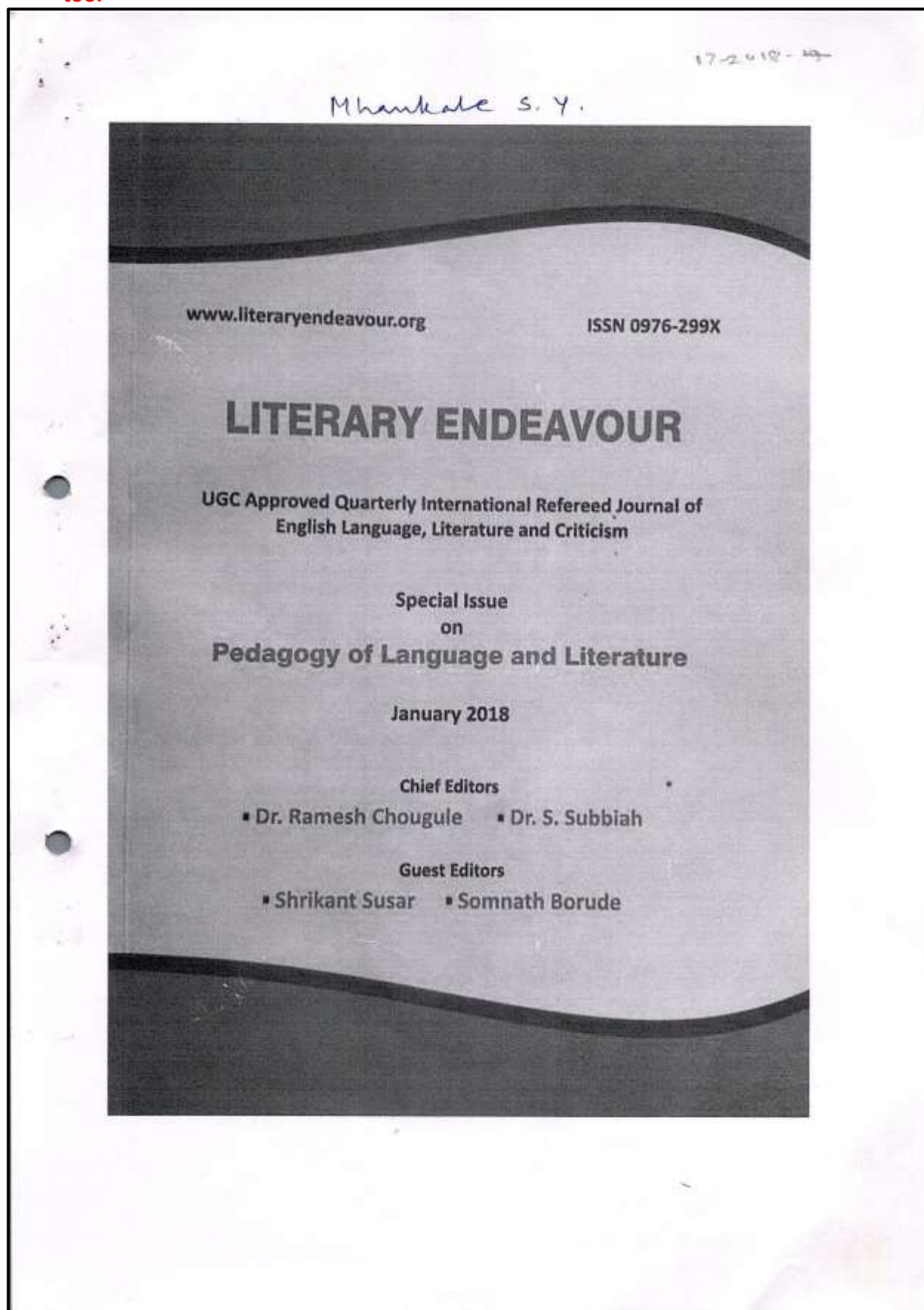
To sum up, the main purpose of using multimedia in language teaching is to promote students' motivation and learning interest in the English language. This can be a practical way to get them involved in the language learning. To achieve this goal, the language teachers should create a favourable environment for English language teaching, which should be based on the availability of information and teaching materials.

#### References:

1. England, Liz. *Technology Applications in English Language Teaching in Egyptian Universities: A Developing Relationship*. CALICO Journal 24.2 (2007): 381-406. Print.
2. Graddol, David. *Future of English: A Guide to Forecasting the Popularity of the English Language in the 21st Century*. London: British Council, 1997. Print.
3. Kennedy, Sean and Don Soifer. *Technology-Driven Innovations for Teaching English Learners*. VA: Lexington Institute, 2013. Print.
4. Rana, Prajesh SJB. *Education and the Use of Technology*. Republica 1e Week. 23 August 2013: 12. Print.
5. August 2013: 12. Print.

2018-4-27 17:42

40. **Pedagogy in Language and Literature: The use of Language laboratory as an effective tool**



## INDEX

S.No.	Title & Author	Page No.
1	Pedagogy : Teaching of English at Present <b>Shrikant R. Susar</b>	1 - 4
2	Visualizing the 'Phantom Category' : Teaching of Diaspora Studies to Undergraduate Classes <b>Pandurang Barkale</b>	5 - 12
3	Approaches and Methods in Language Teaching <b>Dr. Kalyan D. Sonawane</b>	13 - 16
4	Introducing Soft Skills : A Makeover of Conventional Teaching Methods <b>Suryakant S. Gadkari</b>	17 - 22
5	Shakespeare's Impact on Modern English <b>Dr. Rama P. Savanekar</b>	23 - 27
6	Comparative Analysis of Teaching Vocabulary and Grammar to Marathi and English Medium Students <b>Parameshwar B. Vikhe</b>	28 - 34
7	Youtube : A Supplementary Resource in Teaching English Drama <b>Dr. Suparna Mitra</b>	35 - 38
8	Being Productive : Novels and Film Adaptations in the ESL/EFL Classroom <b>Jitha Gopinath</b>	39 - 43
9	Linguistic Enactment of Co-operative principle and Politeness principle in the Story 'The Greedy Old Woman and Lime Tree' <b>Kailas Pote &amp; Sunil Adhav</b>	44 - 46
10	An Effective Usage of Critical Pedagogy in Education <b>Kamalakar B. Gaikwad</b>	47 - 50
11	Psychoanalysis and Pedagogy : Psychological Analysis Between Character and Author with Special Reference to <i>The Bell Jar</i> by Sylvia Plath <b>Somnath N. Borude</b>	51 - 56
12	Elements of Sanskrit and Persian Words in English Language with Special Reference to India and Iran <b>Kirtikumar R. Pimpliskar</b>	57 - 61
13	Effective Methods of Teaching and Learning English Vocabulary <b>Kishor V. Kure</b>	62 - 67
14	Impact of a Digital Language Laboratory to Teaching and Learning Oral Aural English: Language Skills <b>Nandkumar D. Bhandari</b>	68 - 70
15	Why Students in Rural Degree College are Still Incapable to Acquire Desired Proficiency in English? : A Pedagogical Perspective <b>Pawanjay N. Sudewad</b>	71 - 74



16	Waiting to be Heard : A Critical Study of the Marginalized Voices in Amish Tripathi's <i>The Immortals of Meluha</i> <b>Prashant P. Dharmadhikari</b>	75 - 79
17	Code-Switching and Code-Mixing in Indian English : A Review <b>Rakesh S. Mali</b>	80 - 86
18	Using Multimedia to Develop Listening and Speaking Skills <b>Sachin Gadekar, Jayanti K.</b>	87 - 92
19	Multimedia and English Language and Literature Teaching <b>Sunil Y. Mhankale</b>	93 - 95
20	Critical Approaches to Literature Teaching <b>Sudhir K. Joshi</b>	96 - 99
21	Information and Communication Technology in English Language Learning : The Role of Language Laboratory <b>Varsha S. Aher</b>	100 - 103
22	Use of Multimedia in English Language Teaching <b>Vijay A. Khade</b>	104 - 107
23	Use of Language Lab in Teaching English <b>Vina S. Kulkarni</b>	108 - 111
24	Pedagogy in Language and Literature : The Use of Language Laboratory as an Effective Tool <b>Anil Chindhe</b>	112 - 115
25	Use of Language Laboratory as an Effective Tool <b>Varsha A. Darkunde</b>	116 - 120
26	Re-defining Eligibility of the Teachers and Re-Structuring the Teacher Education in Maharashtra <b>Dr. R. T. Bedre</b>	121 - 125
27	Importance of Language Lab in Teaching Learning English <b>Nitin S. Bhalke</b>	126 - 130
28	Approaches and Methods in Language Teaching <b>Dayaneshwar Bhosale</b>	131 - 135
29	The Use of Film Adaptation in Teaching of English Novel with reference to R.K. Narayan's <i>The Guide</i> <b>Sangita Dhimate</b>	136 - 139
30	A Lexical Analysis of Khushwant Singh's Short Story 'Man, How the Government of India Run!' <b>Prasad R. Dagwale</b>	140 - 142

Literary Endeavour (ISSN 0976-299x): Special Issue on Pedagogy of Language & Literature (January 2018)

**PEDAGOGY IN LANGUAGE AND LITERATURE: THE USE OF LANGUAGE  
LABORATORY AS AN EFFECTIVE TOOL**

Anil Chindhe, Assistant Prof., Dept. of English, New Arts, commerce and Science College,  
Parner

**Abstract:**

*English is a global language. It is spoken by most of the country of the world. It is the third language for Indian people, so it is difficult for Indian to learn English easily. They can learn it by using different kind of medium or tool in which language laboratory is one of the powerful medium. It is also helpful for the students of schools or College to learn English as a second language..*

*We can, however, describe what language is, language is a medium of communication. Communication implies carrying of message or receiving of message. Students from various cultures and background feel difficult to learn English. We need some to lean English language. The language lab is a technological break for imparting skills in English. The language lab offers an exclusive result oriented and efficient to enrich the English language learning process. . English language lab is the break through the traditional method of language learning, the digital language lab motivates student's learning attitude, providing an interactive learning environment. Foreign language learning lends itself naturally to the use of media. The language lab is the solution and need of the hour to learn the English language. The quality of the language proficiency will be more when they learn it from the multimedia, digital and computerized Language Lab. By high merit of its unique equipment and its unambiguous pedagogy, it stands alone. The computer now fulfils all the need of language educators and gives life to language for many learners.*

**Keywords:** *Language lab, Communication, Environment, Multimedia, Computerised.*

We can, however, describe what language is, language is a medium of communication. Communication implies carrying of message or receiving of message. The importance of English is not because of its more users but what it is used for. In the present century English has gained a position. It is commonly used in many fields. English language makes the people to know what is happening around the world.

Literary Endeavour (ISSN 0976-299x): Special Issue on Pedagogy of Language & Literature (January 2018)

**Dampen the idea:** The Lab regulates the language through the different thoughts created in the mind of the students.

**Effective learning:** The lab provides to learn the foreign language practice in a focused setting that eliminates the feelings of self-consciousness.

**Focus Veracity:** By using text, audio and video can easily be integrated with actuality in everyday situations.

**Guide the group:** It is easy to guide the groups by monitoring each student independently without disturbing the others students.

**Have the self-evaluation:** the students can do a periodical self-evaluation to measure the progress as well as evaluate his/her language with that of the expert.

**Janitor for learners:** It care takes the learners to become skilled at the language that they are learning.

**Kaput the fear:** The automated learning environment removes one's fear and creates a happy learning situation. **Learn the need:** The lab fulfills the need of the learner that is learning the language skills in an effective way.

**Record:** The students have the ability to record their own voices along with the master stimulus. Each student can be working interactively on different segments within the same program or be working with completely different program material.

Today's educational climate is increasingly diverse. Art has long been seen as a visual language. The language lab plays a key role to learn the foreign language in a happy atmosphere and in a successful way. Both the teacher and the students' inputs are very important in this kind of learning activity. The efforts of the both make the above points victorious. The computers are just an aid and not a solution. The well planned contents and practice help the learners learn the language very quickly. Though the language lab is believed as self-learning accessible, we need an expert to handle the classes. Multicultural countries like India, students are taking taut try to learn the English language and its proficiency. So we need a solution that facilitates the second language learning in a trouble-free way.

**SUBALTERN ISSUES IN 'THE HUNGRY TIDE' BY AMITAV GHOSH****ANIL KALE**Associate Professor and Head,  
New Arts, Commerce and Science College, Parner

**Abstract:-** *The word 'subaltern' is a German word which refers to something that is of secondary importance. It is used in various disciplines such as history, sociology, psychology anthropology and literature. Antonio Gramsci, Ranjit Guha, Amitav Ghosh and Gayatri Chakravorty Spivak have dealt with subaltern issues in their works. The Subaltern literature reflects various themes such as oppression, marginalization, Gender discrimination, subjugation of lower and working classes, disregarded women, neglected sections of society. Post-colonial literature dwells on the political and cultural autonomy of the people who were subdued in colonial period. This paper is an attempt to show how Amitav Ghosh in his novel The Hungry Tides shows the sufferings of marginalized people.*

**Keywords:** *refugees, dispossessed, marginalized, subaltern*

**Introduction:**

Amitav Ghosh is a postcolonial writer. He proves his anthropological power in writing to produce a historical novel, *The Hungry Tide*. This novel shows the study by Ghosh to provide the ground reality of subalterns and their lives in Sundarban forest. It has no border to divide fresh water from salt, river from sea, even land from water. The tides reach more than two hundred miles inland. It has become a land of man eater and the crocodiles and tigers who rule there. This crucial condition questions the settlers in Sundarbans and makes their lives a big quest.

Amitav Ghosh's *The Hungry Tide* successfully captures the agony of the dispossessed and marginalized people. The novel gives vivid picture of the suffering of dalit refugees in the islands of Sundarban is an archipelago which offers home for a number of endangered and threatened species. Due to partition of India and later the independence of Bangladesh large number of people were displaced. They had to leave their own territory and turn into refugees. Unlike upper caste refugees, who were able to get support to settle down, the low caste Dalit refugees had to struggle hard. Large number of refugees from East Bengal, tried to establish habitats in ecologically sensitive Sundarbans fighting against the devouring tides and dangerous predators. The refugee settlers struggled hard to make a niche in Sundarbans which is otherwise a hostile environment. Later the refugee settlers of Morichjhapi Island had to undergo severe

The refugees are the subaltern classes who are forced to seek out a dwelling elsewhere but unfortunately forced to shelter into resettlement camp somewhere in Central India. Here home is not only something which our hands make, it is a place which the mind decides to be its personal space, a space free of all inhibitions. Nirmal, a revolutionary during his earlier days is enthused by the spectacle of resilience shown by the Morchjhapi residents. He decided to record everything in his notebook so that history can get certain publicity through Kanai. It is brutally repressed by the government forces and finally Kusum is killed. Nirmal as a Marxist believes in rapprochement across class barriers that can bring subaltern people and the elite together which a generation later Piya repeats with Kusum's son Fokir. The inherent cause of the brutal violence, Morchjhapi is for a long time in both for an academia and popular imaginary can be attributed to the invisibility of the low caste and class identity.

The voice of the common men, their struggle and sacrifices which go unnoticed in the annals of the history began to get a prominent voice in the fiction of Amitav Ghosh in a different way. It shows a real picture of subaltern and their survival in the given shelter is an unimaginable challenge for the poor and the voiceless people who run their lives with tiger, crocodiles and other dangerous animal in Sundarbans.

#### CONCLUSION

Ghosh's *The Hungry Tide* is a thoughtful attempt of reconstructing the history through fiction. He successfully captured the universal cry of agony that is uttered by the helpless, dispossessed. This agony and cry many a times fails to secure its due place in history. He made marginalized history alive by making a direct appeal to the reader's mind through his fiction. Brinda Bose writes: "Ghosh's fiction takes upon itself the responsibility of reassessing the troubled antecedents, using history as a tool by which we can begin to make sense of or at least come to terms with our troubling present".

When the lost humanity of the humankind resurfaces, painful history will neither repeat itself nor does it need to take refuge. Besides exploitation of untouchables, one of the themes of subaltern literature is oppression.

#### Bibliography

1. Ghosh, Amitav. *The Hungry Tide*. 2005. Penguin Canada.
2. Guha, Ranjit. Ed. *Subaltern Studies*, Vol. VII. Oxford, 1982

**Student Participated as Volunteer in NSS  
Academic Year 2017-18**

Sr. No.	Name	Class
1.	Patke Monali Sanjay	FYBA
2.	Kothawale Rajrajeshwari Anadrao	SYBA
3.	Pawale Rutuja Sunil	FYBA
4.	Tote Harshal Nagesh	FYBA
5.	Chaudhari Seema Gavaram	FYBA



HEAD  
Department of English  
New Arts, Commerce & Science College  
Parner, Dist. Amravati

41. Land Use & Land Cover Classification in Central Part of Maharashtra Using IRS-P LISS-IV Image

16

# Current Global Reviewer

ISSN 2349-0648

Dr. Vasantee Naraynarao Nethi Bhikthan Prasadok Sanetha's

**ANJMVPS**


Affiliated to Savitribai Phule Pune University  
NAAC Accredited 'B' Grade

**Special Issue**

A Two Day  
State Level Seminar on

## “Role of Geospatial Techniques for Land use / Land cover Change”

07<sup>th</sup> & 08<sup>th</sup> February 2018



Editor in Chief  
Principal Dr. Shantaram Badgujar  
(Chairman, Organizing Committee)

SPONSORED BY  
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

ORGANIZED BY  
DEPARTMENT OF GEOGRAPHY

[www.rjournals.co.in](http://www.rjournals.co.in)

## Index

Sl. No.	Article Title	Author	Page No.
1	Land use / Land Cover Change Detection Analysis in Mithla Valley Catchment, Pune District, Western Maharashtra	Smitra H. Staudle <sup>1</sup> and Sunil W. Gokwad <sup>1</sup>	1
2	Land use change detection and monitoring urban growth with Geoinformatics techniques: A case study of Nashik city	Bharat L. Gokhale <sup>1</sup> and Ravindra G. Jaybhaye <sup>2</sup>	3
3	The Impact of Urbanization on the Geographical area of Yavatmal City: A Research	Dr. Chandrashekhar D. Thakate	11
4	Land use / Land cover Analysis of Upper Darna River Basin Using Remote Sensing and GIS	Dr. Anilkumar R. Pathare <sup>1</sup> Prof. Jyoti A. Pathare <sup>2</sup>	17
5	Assessment of the expansion of impervious surfaces: A case study of Thane Municipal Corporation, Maharashtra	Priti Khansare <sup>1</sup> , Gauri Deshpande <sup>2</sup> and Anurgha Dhorde <sup>3</sup>	21
6	Geographical Study Of Urban Centers: A Case Study Of Malav Tehsil, Pune District (Ms)	Mulik Dhir Dnyaneshwar	26
7	Land use Change analysis using Remote Sensing and GIS : A case study of Sanganner city and surrounding area	Dongare Sagar Bhusare <sup>1</sup> and Karanle Kiran Aambadas <sup>2</sup>	33
8	LU & LC Classification in Central Part of Maharashtra Using IRS- P LISS- IV Image	Ganesh K. Chavhan <sup>1</sup> and Raghunath E. Najan <sup>2</sup>	36
9	Geographical Analysis of Cropping Pattern in Maharashtra State, India	Sanjay D. Pagar	43
10	Pedological Structure and Agricultural Landuse pattern in Daund Tehsil of Pune District, Maharashtra	Durgade D.J.	52
11	Agriculture Land use Pattern in Shirigonda Tehsil in the view of Dairy Farming	Kadam S. M. and Prof. Choudhary A. H.	57
12	Estimation of Spatial Variation of Waste Lands Using Remote Sensing Data- A Study of Ojharikhed Reservoir Catchment, North Maharashtra	Dr. D. N. Pawar <sup>1</sup> , Prof. Smt. P. V. Sonawane <sup>2</sup>	60



## LU & LC Classification in Central Part of Maharashtra Using IRS- P LISS- IV Image

Ganesh K. Chavhan<sup>1</sup> and Raghunath E. Najan<sup>2</sup>

1. Head, Dept. of Geography, K. J. Somaiya College, Koparjain
2. Head, Dept. of Geography, New Arts, Commerce & Science College, Parner

(S)

### Abstract:-

Remote Sensing is applied in several different areas viz. agriculture, forestry, land use studies, urban sprawl, geology, environment, coastal zone management, snow and glacier, disaster monitoring and mitigation, infrastructure development, etc. The main role in remote sensing is, of the images which the satellites acquire for various parts of earth at repetitive period. The data is acquired at the satellite and transmitted to the ground station for further processing and analysis is by which Objects on satellite imagery can be identified within the given range of wavelength by a set of characteristics known as spectral signature (Lillesand and Kiefer, 2001).

The main role in remote sensing is, of the images which the satellites acquire for various parts of earth at repetitive period. The data is acquired at the satellite and transmitted to the ground station for further processing and analysis is by which Objects on satellite imagery can be identified within the given range of wavelength by a set of characteristics known as spectral signature (Lillesand and Kiefer, 2001). Using the Object based classifier for the LISS-IV image classification its gives the (71.25%) overall accuracy. Our resulted in 71.53% accuracy.

**Key word:** Remote sensing, Mahalanobis

### Introduction:-

The land use/land cover pattern of a region is an outcome of natural and socio - economic factors and their utilization by man in time and space. Land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. Often, the satellite data must be processed, enhanced, and manipulated to provide a useful set of information. In general, this technique is known as Digital Image Processing (DIP). DIP is broadly divided into image rectification (pre-processing), image enhancement and image classification. Image classification is the process of assigning classes to pixels.

There are many approaches to classify remotely sensed images. Broadly, the methods are categorized into unsupervised and supervised. Unsupervised classification, proceeds with minimal interaction with the analysts and searches for natural groups of pixels present within the image. The basic processing units in object oriented image analysis are object clusters. The first step is always to form the processing unit by the process called image segmentation followed by classification and feature extraction.

### Objective:-

The main Objective of the present work is to Classify Land use / Land cover (level-III) classification using object based classification method.

**Study Area:-**The study area lies in the central part of Maharashtra covering four talukas namely Jambhed (Dist. - A. nagar), Patoda (Beed), Bhum and Paranda (Osmanabad) with an extension approximately 18°27'00" to 18°43'50"N latitude 75°19'30" to 75°36'20"E longitude. The total area is around 1334 sq. km.

19

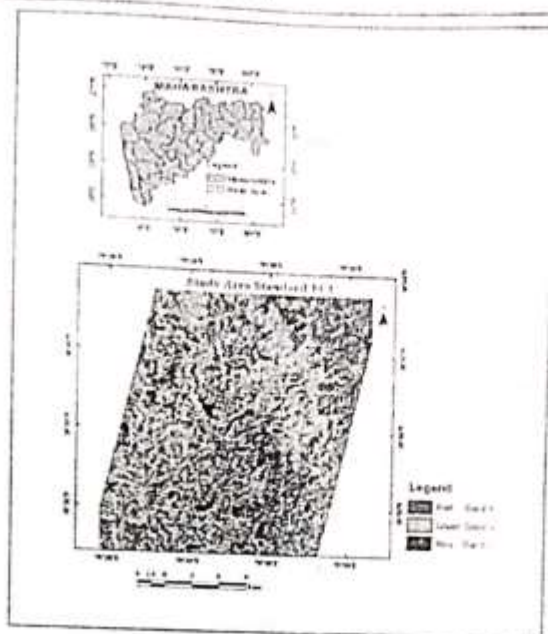


Fig. No. 1 Location Map of Study Area

**Database & Methodology:-**

The present study is based on visual interpretation and as per the objective, a classification scheme for the digital analysis was determined. Brief description of twelve classes is as follows.

Sr.no	Level 1	Level 2	Level 3
1	Built-up	Settlement	
2	Agriculture	Crop land	Sugarcane
			Other Crops
		Fallow	Current Fallow
			Permanent Fallow
3	Forest		
4	Waste land	Land With Scrub	
		Land Without Scrub	
5	Water body	River	
		Water body Deep	
		Water body Medium	
		Water body Shallow	

The use of SOI Topographical maps numbered 47N/6, 47N/7, 47N/10, 47N/11 with scale 1:50,000 were incorporated in the present study to understand the general land use and land cover in the region. The ground truth locations were gathered through field work for generation of training sites for supervised classification and validation.

The different algorithms of digital image classification were performed with aid of softwares such as ERDAS Image 9.1, Arc GIS 9.2 and eCognition Developer Tool.

**Land Use / Land Cover:**

The traditional practice is rain fed agriculture. The sugarcane, Cotton, sorghum, pigeon pea and pearl millet are major kharif season crops. The dry rain prone districts of the region, interestingly, have bimodal rainfall distribution. Therefore, crops are grown during September-October as stored residual soil moisture since there is a significantly long dry period during the first phase of the rains. The post-rainy season crops grown on residual soil moisture are mainly sorghum, safflower and sunflower. Cotton and groundnut are grown under irrigated condition. The natural vegetation in the region comprises tropical, dry deciduous and thorn forests. As the LISS IV scene is of summer season, there is more proportion of fallow land particularly in southern and eastern part of the region. Also there is vast area particularly in central eastern part of the region under degraded lands mainly land with and without scrub.

Code for LULC categories

Code	Thematic Classes
Wtr-D	Waterbody deep
Wtr-M	Waterbody Medium
Wtr-S	Waterbody Shallow
Sugr	Sugarcane
O-Crp	Other Crops
Flw-C	Fallowland Current
Flw-P	Fallowland Permanent
Lws	Land With Scrub
Lwts	Land Without Scrub
Vege	Vegetation
Sett	Settlement
Riv	River

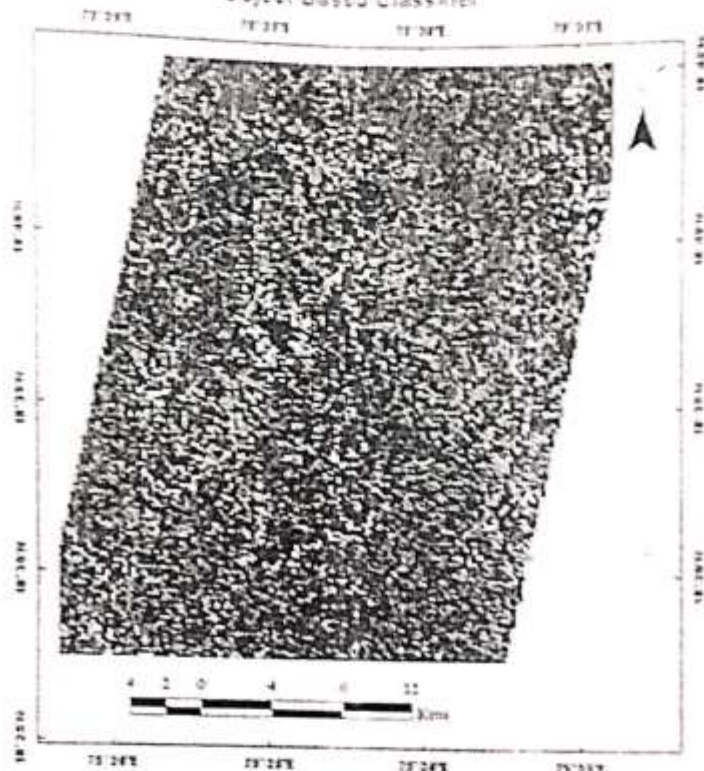
**Object Based Classification:-**

The process and result of object oriented image analysis are divided into three parts: 1) Image segmentation, 2) Classification and 3) Accuracy assessment. Using the object oriented image analysis approach to classify the image is performed in eCognition. eCognition is based on an object oriented approach to image analysis. Object oriented processing of image information is the main feature of eCognition. The first step in eCognition is always to extract image object primitives by grouping pixel. In LISS-iv image segmentation using mustier solution segmentation algorithm and scale parameter is 30 meter. But in this LISS-iv image segmentation 30 meter scale parameter due to software generate large size of segments and effect of this mixing of classes.

21

### Supervised Classification of Study Area

#### Object Based Classifier



#### Legend













 Waterbody Deep	 Settlement
 Waterbody Medium	 Land With Scrub
 Waterbody shallow	 Land Without Scrub
 River	 Fallowland Current
 Sugercane	 Fallowland Permanent
 Other Crops	 Vegetation

Table - Error Matrix by test areas for Object Based Classifier

22

Current Global Reviewer, Vol. 1(1), February 2018

ISSN : 2319-9648

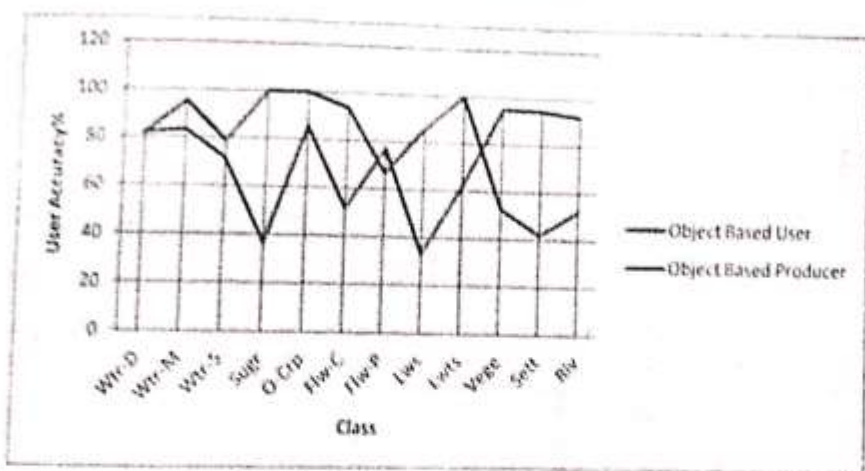
Reference Data

Class	Wtr-D	Wtr-M	Wtr-S	Sugt	O-Crp	Flw-C	Flw-P	Lws	Lws	Vege	Sett	Riv	Total
Wtr-D	18	0	4	0	0	0	0	0	0	0	0	0	22
Wtr-M	0	20	0	0	0	0	1	0	0	0	0	3	24
Wtr-S	4	0	15	0	0	0	0	0	0	0	0	2	21
Sugt	0	0	0	7	0	0	0	0	0	12	0	0	19
O-Crp	0	0	0	0	18	0	0	0	0	2	1	0	21
Flw-C	0	0	0	0	0	15	4	0	0	3	6	1	29
Flw-P	0	0	0	0	0	0	10	0	0	0	1	2	13
Lws	0	0	0	0	0	0	0	6	0	0	12	0	18
Lws	0	0	0	0	0	0	0	0	13	0	5	3	21
Vege	0	0	0	0	0	1	0	0	0	19	0	0	20
Sett	0	0	0	0	0	0	0	1	0	0	18	0	19
Riv	0	1	0	0	0	0	0	0	0	0	0	12	13
Total	22	21	19	7	18	16	15	7	13	36	43	23	240

Overall Accuracy:- 71.25%

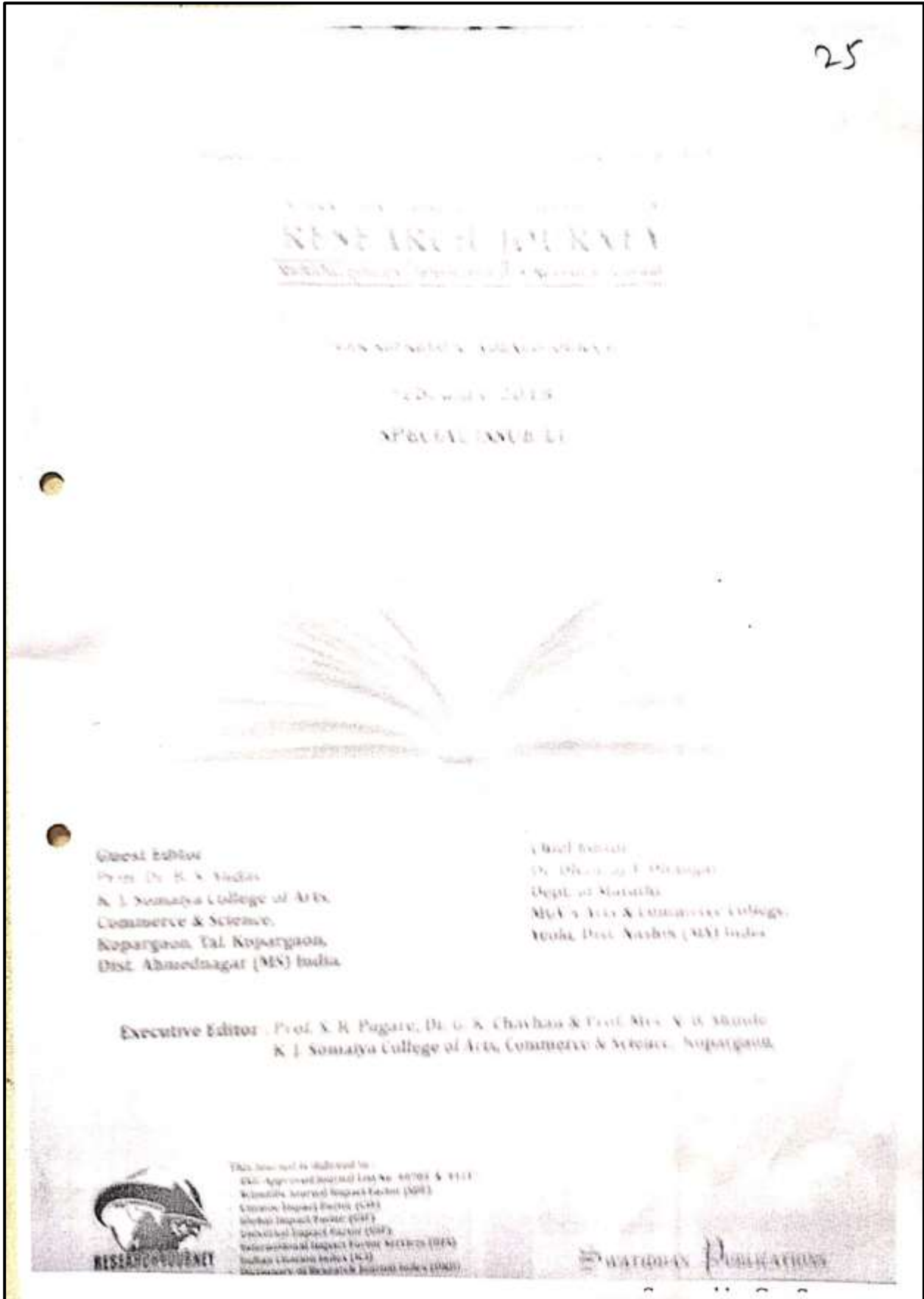
23

Classification Algorithm	Object Based	
	User	Producer
Wtr-D	87.81	81.81
Wtr-M	68.25	85.71
Wtr-S	78.94	71.42
Sugr	100	50.51
O-Crp	100	85.71
Flw-C	67.75	81.71
Flw-n	66.66	76.91
Lws	85.71	33.33
Lwps	100	61.90
Vege	52.77	95.60
Sett	41.88	64.71
Ris	52.17	92.30



Graph No.1 Graphical Presentation of Object base algorithm

42. Physical Impact of Tourism Development



26

RESEARCH JOURNEY International Multidisciplinary Research Journal Impact Factor - (IJEI) - 3.152, (SJIF) - 3.099, (GFI) - 0.575 - 1913 Special Issue 51 UGC Approved No. 40705 & 44117		ISSN: 2348-7143 February 2018
48	Application of QR Code in PVT College Central Library: An Experience Prof. A. S. Rite & Prof. R. J. Dhimal	268
49	Use of Social Networking Sites in Academic Libraries Prof. N. R. Kharjule	274
50	Library Security & RFID (Radio Frequency Identification) Shri. P. R. Kulkhe & Shri. Bhaskar Shinde	277
51	Application of Information Communication Technologies (ICT) in Academic Libraries Deepali Yesh	281
52	Promotion of Open Access Resources by Librarians: A Need of the Time Mrs. Bhakti Goh & Dr. Mrs. Jayshree Waneekar	284
53	Uses of ICT in Agriculture Prof. Rajendra Lawande	289
54	RFID Technology and Its Application in Academic Libraries Dr. (Mrs.) Hemlata Bonde	293
55	The Role of Information Resources in the Popularity of Holy Places in Ahmednagar District Dr. Shivajirao Darandale	297
56	Librarianship in ICT Environment Mrs. Neeta Shinde	299
57	Emerging Trends and Technologies and Library Knowledge Management Raju Gande	302
58	Sustainable Ecological Tourism Development in India Dr. Ganesh Chavhan	309
59	Analysis of Female Status in Different Era Dr. Prakash Salve	313
60	Physical Impact of Tourism Development Dr. R. E. Najan	316
61	Geospatial Technology is Emerging New Trend for our Geographical Study: A Review Study Anand Pandit	319
62	Dynamic Demographic Characteristic Slum Population in Nashik City with Special Reference from 2011 Bharat Gadakh	322
63	Determinants of Under-Five Mortality in Bimaru States of India Dr. Vasudev Salunke	327
64	Basics of Remote Sensing Prof. Miss. S. B. Chine	332
65	Skills and Youth Empowerment Dr. Sanjay Deokar	336
66	Effective Communication and Co-operation for Development of Business Dr. B. B. Nighot	339
67	Skill Development through Higher Education Dr. B. S. Yadav	342
68	Role of Skill Development in Employment Generation in India Dr. Surekha Bhingardive	345
69	Imparting Value Based Higher Education Through E-Learning Prof. Santosh Pagare	348
70	Effect of Profitability and Liquidity on Capital Structure: An Analysis of Indian Listed Retail Industry R. J. Rajani	352
Our Editors have reviewed paper with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. - Executive Editor		
5	Website - <a href="http://www.researchjourney.net">www.researchjourney.net</a>	Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>



'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal



Impact Factor - (CJ) - 3.152, (SIF) - 3.002, (GIF) - 0.676 (2013)

Special Issue 51

UGC Approved No. 40705 & 44117

ISSN:  
2348-7143  
February  
2018

27

## Physical Impact of Tourism Development

Dr. R. E. Najan

New Arts, Commerce & Science College, Parner  
Affiliated to Savitribai Phule Pune University Pune.

### Abstract:

*Tourism is one of the biggest and fastest growing sectors in the global economy and has significant environmental, cultural, social and economic effects, both positive and negative. Tourism can be a major tool for economic development but, if not properly planned it can have destructive effects on biodiversity and pristine environments, and can result in the misuse of natural resources such as freshwater, forests and marine life.*

**Key words:** Physical Impact, Tourism

### Introduction:

"Human communities represent both a primary resource upon which tourism depends, and their existence in a particular place at a particular time may be used to justify the development of tourism itself. Communities are a basic reason for tourists to travel, to experience the way of life and material products of different communities"

### Objectives:

To understand the Physical Impact of tourism on environment

### Research methodology:

The study has been conducted mainly on the basis of literature survey and secondary information. Various seminar papers and summary of discussion in those seminars, taskforce reports of research organization, journals and some periodicals on environmental impacts of tourism have been surveyed for the purpose of the study. Some environmental analyst and expertise person has also been interviewed for the purpose of accumulating facts and information.

### Literature review:

G.R. Cessford and P.R. Dingwall state (1998) in their research that tourism industry absolutely affects the environment. Its negative impact is very dangerous for the environment and the future generation. For this reason planning and sustainable tourism industry is very essential for every country.

Terry Davies and Sarah Cahill (2000) describe that this study uses a framework developed from the industrial ecology literature to assess the impacts of the tourism industry on the environment. Three categories of impact are discussed: direct impacts, including impacts from the travel to a destination, the tourist activities in and of themselves at that destination, such as hiking or boating, and from the creation, operation, and maintenance of facilities that cater to the tourist; "upstream" impacts, resulting from travel service providers' ability to influence suppliers; and "downstream" impacts, where service providers can influence the behavior or consumption patterns of customers.

316

Website - [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

RESEARCH JOURNEY: An International Multidisciplinary E-Research Journal  
 Impact Factor (2017) 3.356, (2018) 3.099, (2019) 6.676 (2021)  
 ISSN: 2748-7143  
 Special Issue 51 February 2018  
 UGC Approved No. 30705 & 34117

Andriana (1999) concludes in his previous research that tourism can be seen as an economic activity that produces a range of positive and negative impacts. However sustainable tourism may be able to achieve the best balance between economic benefits and social and environmental costs if it is planned and developed tourism successfully, economic, environmental and social aspects of a destination will be understood.

Marshall, Munn (2001) argues that the growth of mass tourism has led to a range of problems, which have become more obvious over the recent years. It includes environmental, social and cultural poverty. These problems are often connected with mass tourism, although there is evidence from studies concerning the impacts from tourism which suggests that new forms of tourism also suffer from similar problems.

**Physical impacts on Tourism:**

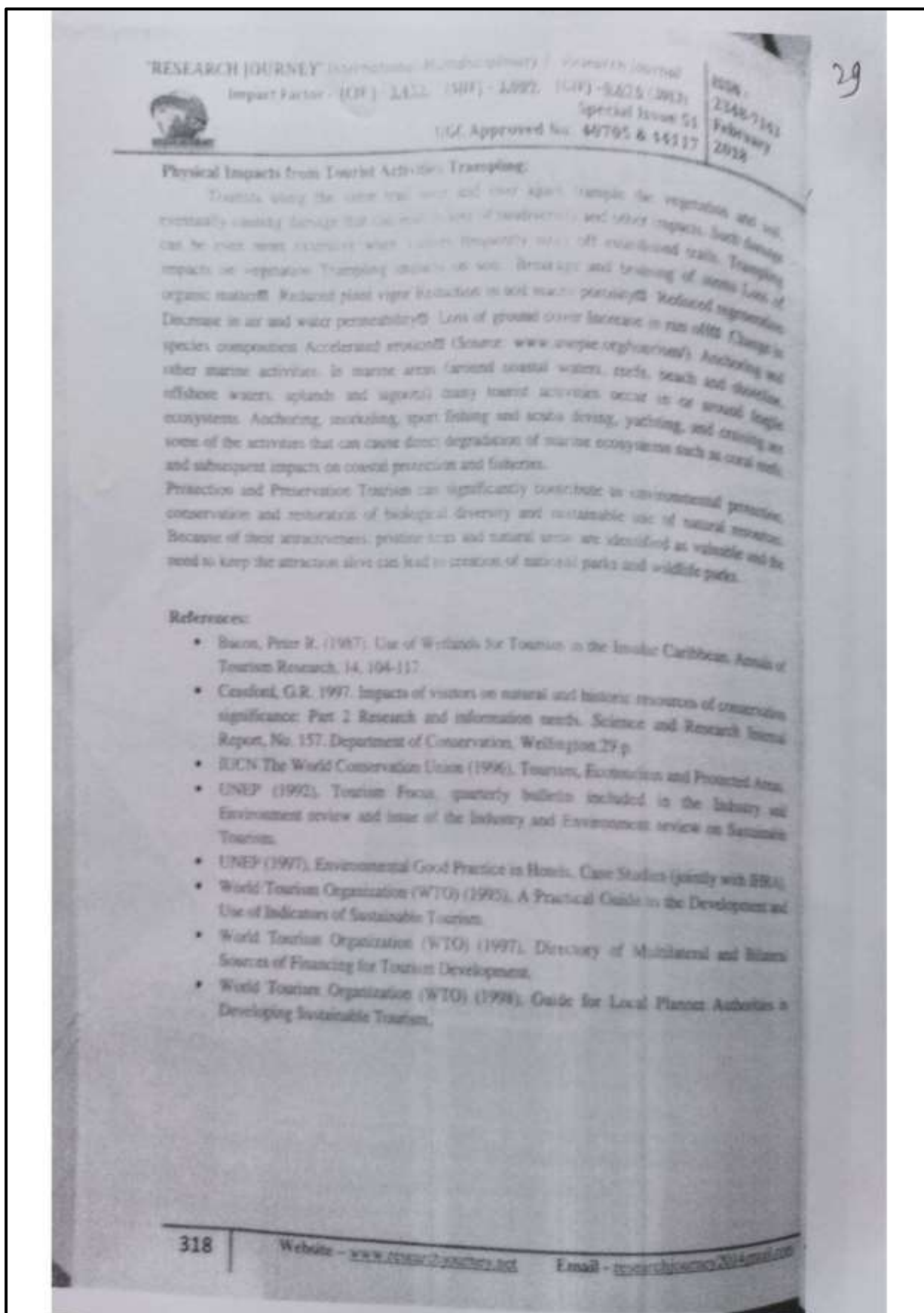
Typical physical impacts include the degradation of such ecosystems. An ecosystem is a geographic area including all the living organisms (people, plants, animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural cycles that sustain them. The ecosystems most threatened with degradation are ecologically fragile areas such as alpine regions, rain forests, wetlands, mangroves, coral reefs and sea grass beds. Threats to and pressures on these ecosystems are often severe because such places are very attractive to both tourists and developers. Physical impacts are caused not only by tourism-related land clearing and construction, but by continuing tourist activities and long-term changes in local economies and ecologies.

**Physical Impacts of Tourism Development Construction activities and infrastructure development:**

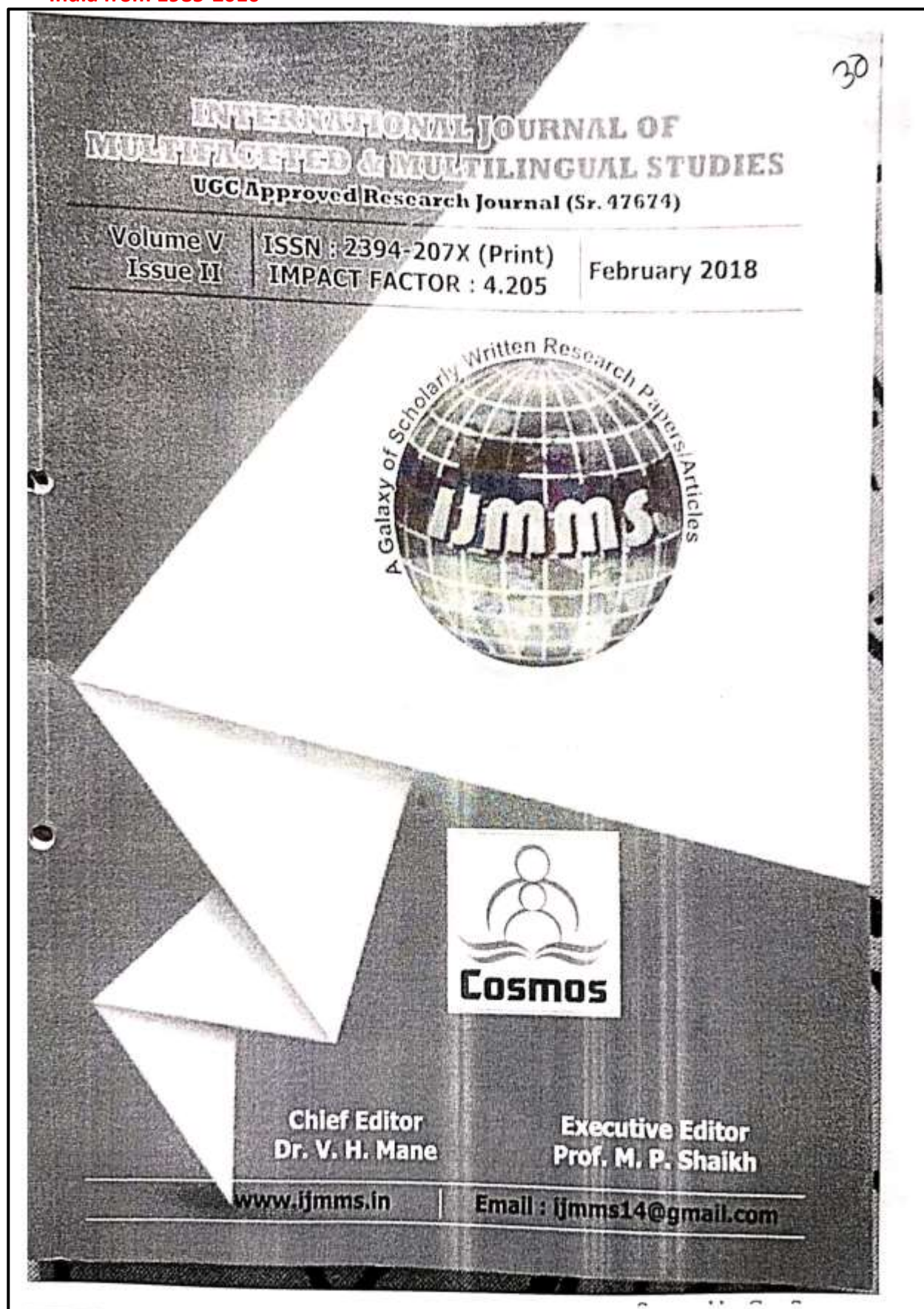
The development of tourism facilities such as accommodation, water supplies, restaurants and recreation facilities can involve sand mining, beach and sand erosion, soil erosion and extensive paving. In addition, road and airport construction can lead to land degradation and loss of wildlife habitats and deterioration of scenery. Deforestation and intensified or unsustainable use of land. Construction of ski resort accommodation and facilities frequently requires clearing forested land. Coastal wetlands are often drained and filled due to lack of more suitable sites for construction of tourism facilities and infrastructure. These activities can cause severe disturbance and erosion of the local ecosystem, even destruction in the long term.

**Marina development:**

Development of marinas and breakwaters can cause changes in currents and coastlines. Furthermore, extraction of building materials such as sand affects coral reefs, mangroves, and riparian forests, leading to erosion and destruction of habitats. In the Philippines and the Maldives, dynamiting and mining of coral for resort building materials has damaged fragile coral reefs and depleted the fisheries (Hall, 2001). Overbuilding and extensive paving of shorelines can result in destruction of habitats and disruption of land-sea connections (such as sea-turtle nesting spots). Coral reefs are especially fragile marine ecosystems and are suffering worldwide from reef-based tourism developments. Evidence suggests a variety of impacts to coral result from shoreline development, increased sediments in the water, trampling by tourists and divers, ship groundings, pollution from sewage, over-fishing, and fishing with poisons and explosives that destroy the coral habitat (Hall, 2001).



43. Brief Analysis of Work done on Temporal Changes in Agriculture Land Use Pattern in India from 1985-2010



VOLUME-V (II) Impact Factor- 1.205 ISSN (Print)- 2394-207X  
INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

## Index

Sr.	Name of the Paper	Name	Page No.
1.	A time series analysis of agriculture debt and credit activities with agriculture Land use pattern and crop production of various crops	<sup>1</sup> Anil S. Memane <sup>2</sup> Dr. K. H. Shinde	1-6
2.	Overview of Cropping Pattern in Purandhar Tahasil of Pune District in Maharashtra	Dr. S.K.Dhage	7-9
3.	Role of Finance in Agriculture Development	Prof. Pravin More	10-12
4.	Challenges Problems and Prospects of Indian Agricultural Sector	Dr. Krishna Shankar Shahane	13-15
5.	Challenges by Agriculture Market in India	Dr.Retwade L.G.	16-19
6.	Changing Cropping Pattern and Unrest Farmers in India	Dr. Chandrakant Bhagvat Chaudhari	20-24
7.	Role of Agriculture in Rural Development of India	Prof. Sherumal P. Shende	25-27
8.	A Case study of Micro irrigation in Agriculture sector of Pune district	<sup>1</sup> Rajeram Prabu Ghawate <sup>2</sup> Nitin Parvati Ghawate	28-32
9.	Role of Agriculture in Rural Development	Dr. Sunil Dadaram Pawar	33-34
10.	A Study of Interdependence of Agricultural Sector and Rural Economy of Maharashtra and its Role in Rural Economic Development	<sup>1</sup> Ms. Dhanashree Laxman Bhujbal <sup>2</sup> Dr. Manasi Kurtkoti	35-37
11.	Comparative Study Economic Development in Maharashtra and Gujrat State	Dr. Ramesh S. Desai	38-41
12.	Geographical Study of Cropping Pattern in Khed Tehsil of Pune District (MS)	<sup>1</sup> Muluk Dilip Dnyaneshwar <sup>2</sup> Dr. Arjun Haribhou Musmade	42-47
13.	Agriculture Development through Sugar Industry in Rural part of Ahmednagar District of Maharashtra	Dr. Ganesh K. Chavhan	48-53
14.	Brief Analysis of Work done on Temporal Changes in Agriculture Land Use Pattern in India from 1985 to 2010	Dr. Raghunath E. Najan	54-56
15.	Role of Agriculture in Rural Development in Daund Tehsil of Pune District, Maharashtra	Dr. Durgade D.J.	57-62
16.	Study of Land Use/ Land Cover In North Parner Tehsil Using Geospatial Data	Dr.Vasudev Shivaaji Salunke	63-66
17.	Agriculture Development and Management Plan:A Case Study of The Wainganga River Basin	Dr. Nanabhau Santujeer Kudnar	67-71

February-2018

Website: [www.ijmms.in](http://www.ijmms.in)Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

VOLUME VIII  
INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY AND MULTILINGUAL STUDIES  
ISSN (Print) 2494-7972  
ISSN (Online) 2494-7980  
Impact Factor: 4.20  
Brief Analysis of Work done on Temporal Changes in Agriculture Land Use  
Pattern in India from 1985 to 2010

Dr. Raghunath E. Nujan  
Head, Dept. of Geography,  
New Arts, Commerce & Science College, Parner

**Abstract:**

Agricultural land use is one of the fundamental natural resources. It forms the basis for all geological, ecological, natural and economic activities. Land is a scarce natural resource in agricultural sector. But, yield agricultural crops mainly depend upon fertility of the land. Therefore, this study is an attempt to study the temporal changes in the cropping pattern of the agricultural land in India. Cropping pattern means the percentage of area under various crops at a given time. The cropping pattern in India progressively modifying since 1985. The area under low value crops, i.e. low yield grain crops, i.e. low yield grain crops, during 1985-87 the share of cereals and pulses in total cultivated area was 67.10 percent and 15.60 percent, which got reduced to 52.60 percent and 12.90 percent respectively during 2010-11.

On this basis the past work regarding cropping pattern in helps in identifying the theoretical and methodological issues applicable to the future study. This study is an attempt to do a short review of the important research work on the area of cropping pattern in various parts of India.

**Keywords:** Temporal Change, Land Use, Cropping Pattern

**Introduction:** Cropping pattern connotes the crop-mix grown in a particular area in an agricultural year. Cropping pattern determines the output mix in a particular region. Cropping pattern refers to acceptance of particular type of crops by the farmers in a particular region. It is expressed at macro level, i.e. district, taluka or village level.<sup>1</sup> A change in cropping pattern implies a change in percentage of area under different crops. It has momentous bearing on widening the geographical inequalities in income allocation. Introduction of new agricultural technologies has influenced the crop-mix which is more well-known in agriculturally developed regions. A dynamic change has been witnessed in agricultural division in our country, particularly during the post-green revolution stage. The technological development in crop varieties and other yield rising factors of production influenced the farmers' performance which has reflected in the changing cropping pattern from cultivation of low value crops to high value crops in most of the regions.<sup>2</sup>

These views are reflected in various works done by various scholars in the field of Temporal Changes in Cropping pattern and Land Use pattern in India.

**Objectives:** The present paper work is the review of various scholars work on the issue of cropping pattern from 1985 to 2010 in India. This wide objectives can be broken into the following most important components.

**Temporal Change in Land Use Pattern:** Pandey and Tiwari, (1987)<sup>3</sup> made an effort to study the ecological implications of land use dynamic in Uttar Pradesh. They reported that, there was a constant increase in fallow lands in all the regions despite approximately a constant net cultivated area. The cultivable waste land was declining constantly, except hilly area.

Pal and Mruthyunjaya, (1990)<sup>4</sup> considered silvipastoral scheme for improvement of waste lands of dry areas in Rajasthan using time series data of sixteen years from 1970-71 to 1986-87. The compound growth rate reveals that the area under forest, grazing land, cultivable waste land, gross cropped area, area sown more than once registered a significant positive growth during the period of investigation. The growth rate of forest was maximum (4.16 percent) followed by double cropped area (4.10 percent). The increasing of barren and uncultivable land was negative. They

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY AND MULTILINGUAL STUDIES  
 Impact factor: 4.205 ISSN (Print) 2394-292X

suggested that the land use plan for the development of dry areas of Rajasthan, which envisaged for the proportionate area under crops should reduce from 44.98 percent to 15 percent of total area.

Karnanah (1980) considered the significance of forest land utilize in Andhra Pradesh and reported that the increase in percentage of forest land in the state during the period 1961-64 was not significant. The non-cultivable land shows increased by 14.9 percent of the total area, forest land by 16.4 percent in 1978-79. The percentage of cultivable waste land decreased by 4 percent and arable land shows decreased by 0.1 percent for the same period.

Singh and Kaur (1991)<sup>11</sup> studied the changing pattern of land operation in Punjab for the period of 1966-67 to 1987-88. The study indicate that the reported area for land utilization still constant while the area under forest, area not available for cultivation, net sown area increased during the period of investigation. Due to intensification of agriculture, gross cropped area, cropping intensity increased. They also reported that the Punjab agriculture had occurred extreme changes due to green revolution.

Vaishya and Sikka (1991)<sup>12</sup> considered the land utilization pattern in Himachal Pradesh in the period of 1966-67 to 1986-87. They reported that there had been no uniform trend in the changes in the land use classes. The area under forest increased while the other categories had shown decreased. They have projected the land use pattern in 2000 on the basis of compound growth rate calculation. The projection shows that the area under all categories increased except the current fallow land.

Sharma and Pandey (1992)<sup>13</sup> considered the dynamics of land utilize in different states of India. This study indicates that the general declining tendency in the area under permanent pastures, grazing lands, barren and uncultivable lands. The area under non agricultural uses, cultivable wastes, and fallow land shows a positive growth in most of the state in India. With regards to area under forest, negative growth rate was indicated in the state of Assam, Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra and Tripura while Jammu and Kashmir and Orissa observed negative growth rate for area put to non agricultural uses. The annual rate of increase in area under non agricultural uses was very high in Gujarat, Tamil Nadu, Rajasthan, Uttar Pradesh, Maharashtra, Karnataka and Madhya Pradesh. Increasing trend was observed in the area under permanent pasture and grazing land in Bihar, Maharashtra, Mizoram and Uttar Pradesh. Correspondingly decreasing trend was indicated in the area under miscellaneous tree crops in Andhra Pradesh, Gujarat, Haryana, Kerala, Orissa, Punjab Tripura and Uttar Pradesh.

Negi (1994)<sup>14</sup> considered the agricultural growth in Himachal Pradesh for the period 1972-73 to 1980-81. The study indicates that the net area sown remained constant, while the area under forest increased from 21 percent to 27 percent during the study period.

Nagbhushan (1994)<sup>15</sup> considered the dynamic of land use in Dharwad District of Karnataka state for the period of 1979 to 1991. He reported that the growth rate of area under woodland, fallow land, net sown area, total cultivated area, and double cropped area were significant and positive. He also stated that the improvement in the management practices was the prime reasons for the increase of double cropped area.

Managoli (1997)<sup>16</sup> considered the land use dimensions in Bijapur district in Karnataka for the period from 1971-72 to 1992-93. The study shows that no change in the forest area in study area. The growth rate of area more than once and land put to non agricultural uses were positive and

February-2018

Website: [www.ijmms.in](http://www.ijmms.in)

Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

Page 55

33

VOLUME VIII  
INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES  
Impact Factor: 1.205  
ISSN (Print): 2299-207X

important in study area. The growth rate of area under crops like growar Bajara and maize were positive and important

Goswami and Challa, (2004)<sup>19</sup> considered the land use pattern in India for the period of 1950-51 to 1997-98. They reported that the forest land had improved from 40.08 million hectares to 68.61 million hectares in the study period. They also reported that there was a significant increase in area under non agricultural uses from 9.36 million hectares to 12.3 million hectares in the period of investigation. It also indicates that net sown area is increased during the study period

Steeja, (2004)<sup>20</sup> studied the dynamic of land use pattern in Kollam district of Kerala. The study reveals that there was a considerable increase in the current fallow. He reported that there was an adverse relationship between rainfall and fallow land; barren and uncultivable land, land under mixed tree crops and groves and cultivable waste recorded a significant negative growth

Harish,(2006)<sup>21</sup> studied the land use dynamic in Mandya district. He reported that the area under fallow, current fallow, cultivable waste and land under mixed tree crop indicate positive increasing

Ramappa and Naidu, (2009)<sup>22</sup> studied the land utilization pattern in Andhra Pradesh. The study reported that the possibility for widespread agriculture was very restricted since the area under agricultural uses had already reached the highest level. The area under non agricultural uses had increased crop time to time. This certainly reduces the volume of cultivable land. Changes in cropping pattern were also necessary to make the most competent use of land.

#### References:

1. Husain, Majid. (1996). *Systematic Agricultural Geography*. (Reprinted 2002). Rawat Publication. Jaipur and New Delhi. P217-218.
2. Husain, Majid. (1996). *Systematic Agricultural Geography*. (Reprinted 2002).Rawat Publication. Jaipur and New Delhi. P45.
3. Rafiullah, S.N. (1976).Region, Regionalism and Regionalization. *The Geographer*. Aligarh, Vol.14(1).
4. Singh, Jasbir, (1976). *An Agricultural Geography of Haryana*. Kurukshetra. Vidyal Publication.P317-355.
5. Pandey, V.K. and Tewari, S.K., (1987). Some Ecological Implications of Land Use Dynamics in Uttar Pradesh. *Indian Journal of Agricultural Economics*, 42(3) P388-394.
6. Pal, S. and Mruthunjaya, (1990). Silvopastoral System for Development of Land Waste Lands of And Region. *Agric. Situ. India* 45 (5).P333-338.
7. Ramanujah, Y.V.and Reddy, N.B.S., (1999). *Land Use Pattern and Dynamics of Land Use in Andhra Pradesh*. Land Utilization Management in India. Chugh Publications. Alahabad, India.
8. Singh, R. (1990). A Study of Inter-Regional Disparities in the Pattern of Land Utilization in Uttar Pradesh. *Indian Journal Agricultural Econom*, 45 (3). P344.
9. Shrivastava,S.N.,Mishra,B.L.,Bhargel,A.S.,Saha,R.M.and Singh,R.P.(1991). Dynamics of Land Use and Cropping Pattern in Tawa Command Area of Hoshangabad District Madhya Pradesh. *Agric.Situ. India* 45(11). P743-748.
10. Singh and Kaur, P., (1991) Structural Changes in Punjab Agriculture. *Agric. Situ. India* 25 (2) P330-335.
11. Vaidya, C.S. and Sikka, B.K. (1991). Land Utilization Pattern in Himachal Pradesh. *Agric. Situ. India* 46 (6). P539-540.
12. Sharma, U.K.and Pandey, V.K. (1992). Dynamics of Land Use in Different States of India. *Agric. Econ. Res. Rev.* 5(1). P24-33.
13. Mishra, R.C., (1994). Changing Profile of Agricultural Economy. *Agric. Situ. India* 49(3). P183-194.
14. Negi,G.C.(1991).Agricultural Growth in Himachal Pradesh. *Agriculture Situ. India* 39 (9). P683-686.

February -2018

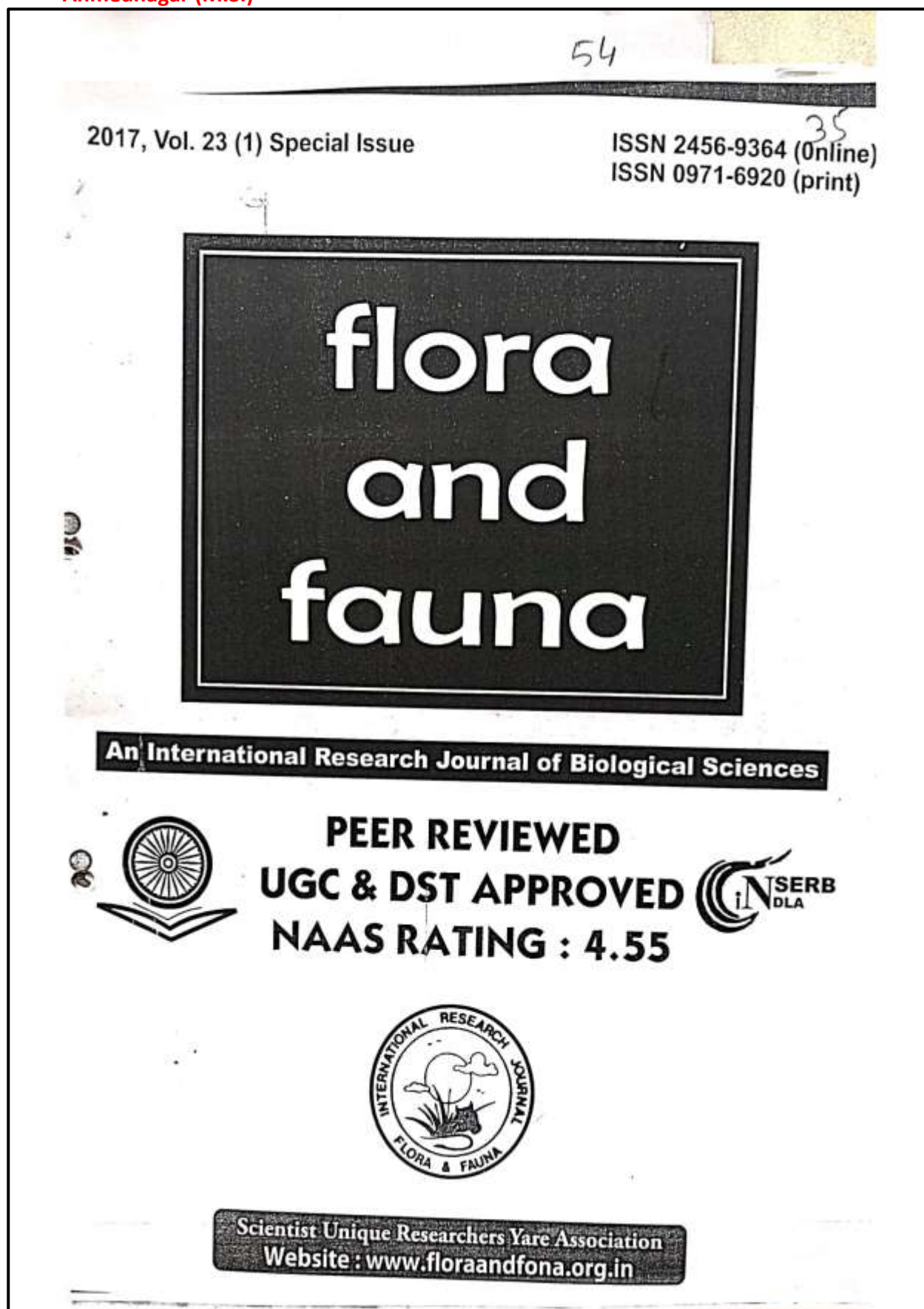
Website: [www.ijmms.in](http://www.ijmms.in)

Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

Page 36



44. The study of rain water harvesting system in New Arts, Com.&Sci.College Parner Dist- Ahmednagar (M.S.)



## FLORA AND FAUNA

(An International Research Journal of Biological Science)

(NAAS Rating: 4.55)

ISSN 0971-6920, Frequency: Half yearly

2017, Vol. 23 No. 1 (Special Issue)

The main objectives of FLORA & FAUNA are:

- To provide a platform to the scientists, Professors, Teachers, Experts and students related with Biological Sciences for exchanging their views on NATURE and Biological STRUCTURES and FUNCTIONS.
- To organize seminars, Conferences, Workshops, etc. for encouraging close interaction among Scientists, Research Scholars, Professors and Experts
- To disseminate their knowledge of FLORA and FAUNA their improvement, conservation and management.

### EXECUTIVE COUNCIL

Patron :	Prof. A. C. Pandey, Vice-Chancellor, Bundelkhand University, Jhansi
President :	Prof. J. P. Purohit, M L B M C., Jhansi
Vice-President :	Dr. V. C. Srivastav, Allahabad
Secretary :	Dr. A. K. Srivastav, B B P G C., Jhansi
Joint Secretary :	Prof. A. K. Chopra, Registrar, GKU, Haridwar
Treasurer:	Mrs. C. K. Srivastav, Jhansi

### BOARD OF ADVISORS

Prof. A. K. Saxena, Kanpur	Dr. P. S. Pathak, Lucknow	Prof. K. L. Tiwari, Raipur
Dr. S. K. Dhyani, Jhansi	Prof. B. N. Pandey, Bodh gaya	Prof. S. S. Bir, Patiala
Prof. D. P. Zutshi, Ambala Cantt.		

### Board of Editors

Dr. U. C. Srivastav, Allahabad	Prof. S. A. Salgore, Mumbai	Prof. G. K. Kulkarni, Aurangabad
Prof. K. P. Sharma, Jaipur	Dr. I. K. Pai, Goa	Dr. S. A. Faruqui, Bhopal
Prof. G. S. Solanki, Mizoram	Prof. (Mrs.) Asha Sinha, Varanasi	Prof. Said Shalaby, Egypt
Prof. P. V. Madhusoodhan, Calicut	Prof. Burt Buchmann, Denmark	Dr. C. B. Singh, Kolkata
Prof. Fatima Bilquees Mujib, Pakistan	Prof. K. Laxminarayana, Waltair	Prof. Rajendra Singh, Gorakhpur
Dr. R. K. Aher, Parner	Dr. S. L. Khapke, Parner	Dr. R. N. Deshmukh, Parner

### EXECUTIVE EDITORS

**Dr. A. K. Sivastav**  
 Head Dept. of Zoology,  
 BBPG College, Jhansi (U.P.) 284 001 Mauranipur  
 Ph.No.- 0510-2480424, Mob- 09415030098  
 Email- akscks@rediffmail.com

**Dr. P. C. Singhal**  
 Ex. Principal, Smt. GPSS College  
 (U.P.)- 284204  
 Ph- 0510-2330221 Mob- 0945268337

### Subscription rates

Category	India	Abroad	
Individual	Annual	500	USD 75
	Life	5000	USD 750
Institutional	Annual	1500	USD 300
	Life	15000	USD 3000

Payments are accepted either in cash or through bank Draft/UNESCO coupons in favor of Flora and Fauna payable at Jhansi(U.P.) all correspondences should be addressed to **Dr. A. K. Srivastav** Executive Editor, Flora and Fauna, post box no- 284001, INDIA.

Note: distributors, Book sellers etc. shall be considered as Institutional members.

LORA AND FAUNA

2017 Vol. 23 (1)

ISSN 0971-6920

37

## CONTENTS

- |      |   |         |
|------|---|---------|
| 90.  | The study of rain water harvesting system in new arts commerce and science college<br>Parner, Dist. Ahmednagar. (M. S). India.<br><b>Ghungarde Dattatray Sheshrao.</b>  | 402-404 |
| 91.  | Tourism development impacts of occupational structure: a case study of Shirdi and<br>Shani-Shinganapur Tourist Place In Ahmednagar District.<br><b>Mhaske Pandurang H. and Dr. Tupe Babasaheb Karbhari.</b>             | 405-410 |
| 92.  | A clean timeless renewable energy sources in environmental protection<br><b>Deore V. P. and Khade A. S.</b>   | 411-415 |
| 93.  | Benefits of probiotics to human health<br><b>Dr. Chetana. V. Donglikar</b>  | 416-420 |
| 94.  | To study preparation of sugar catalyst and its use for production of biodiesel<br><b>Kale Sambhaji Mahipati</b>   | 421-423 |
| 95.  | Drugs, doping and sports performance<br><b>Sanjay M. Gaikwad</b>  | 424-427 |
| 96.  | Effects of short-term magnetic field exposure on germination, growth on seeds of pea<br>( <i>Pisum sativum</i> ), chick-pea ( <i>Cicer arietinum</i> ).<br><b>Ashutosh Khade and Avinash Mancharkar</b>                 | 428-433 |
| 97.  | Isolation and synthesis of Sesquiterpene ar- Himachalene from <i>Cedrus deodara</i> by<br>heck reaction<br><b>T. S. Thopate and R. S. Diggikar</b>  | 434-438 |
| 98.  | Peanut aerobiology At Newasa Dist. Ahmednagar (M.S.)<br><b>C. S. Arsule</b>   | 439-447 |
| 99.  | Role of library science in environment<br><b>Dr. Bhausahab B. Shelke</b>  | 448-450 |
| 100. | Effect on various polluted water on vegetative growth of pomegranate crop.<br><b>Navale Mahesh, R.J.Sawant and M.S.Wadikar</b>  | 451-454 |
| 101. | Enzymatic antioxidant defence mechanism of sorghum under water stress<br><b>Ravindra Deshmukh</b>   | 455-463 |
| 102. | Synthesis and characterization of aluminium oxide ( $Al_2O_3$ ) nanoparticles and its<br>application in malachite green AZO dye Decolorization<br><b>V.P. Dhawale, V. B. Khobragade, K.C. Mohite and S. D. Kulkarni</b> | 464-471 |
| 103. | Study of acute toxicity of inorganic fertilizers urea, potassium sulphate and npk on<br>fresh water fish <i>Clarias batrachus</i><br><b>Bhalsing D. G. and Deokar P. V.</b>   | 472-480 |

FLORA AND FAUNA  
2017 Vol. 23 (1)

ISSN 0971-6920

402

38

FLOI  
2017

**THE STUDY OF RAIN WATER HARVESTING SYSTEM IN NEW ARTS COMMERCE AND SCIENCE COLLEGE PARNER, DIST. AHMEDNAGAR, (M. S). INDIA.**

GHUNGARDE DATTATRAY SHESHRAO.

Dept. of Geography

New Arts Commerce And Sci. College Parner, Ahmednagar. (MS) 414302

Email.Id. [dsghungarde@gmail.com](mailto:dsghungarde@gmail.com)

The m  
implem  
in Coll

collecte  
Average  
departme  
from adn  
tabulabil  
college ca  
equation.

Amount

The calcul  
using the fo  
Cor  
ment (A). 7  
mm). The r  
annual wat

The Par  
led in dr  
Tehsil 1  
annual rainfal  
is need t  
Parner teh  
mentatio  
age campus

By  
Surface Level  
Primary Filter  
Net

**ABSTRACT**  
Water is the most common or major substance on earth, covering more than 70% of the planet's surface. All living things consist mostly of water. For improving per capita water availability in the country, replenishment of ground water resources is a necessity which can be done very effectively through rain water harvesting.

The Parner tehsil of Ahmednagar district is located in drought prone areas of Maharashtra state. Tehsil received about 525 (mm) average annual rainfall during last 10 years. Therefore, there is need to conserved and stored rain water in Parner tehsil.

So college attempt to made implementation of rain water harvesting in college campus. Rain water from roof of building is collected with P.V.C. pipes and is used for refilling of bore wells in the campus. On an average 3.0 lakh liters of rainwater is collected per annum through recharge of bore well.

Figures : 01                      References: 07                      Tables: 02  
Keywords: - Rainwater, Harvesting, Runoff co- efficient, Area, Potential.

**Introduction**

The Rain water harvesting is the process of collection of rainwater from surfaces on which rain falls, filtering it and storing it for multiple uses. Rainwater harvesting puts the supply of water back to normal levels. It is the collection and storage of water from surfaces that rain has fallen upon. In a normal scenario the rainwater is collected from roof buildings and then stored inside of a special tank. Rainwater harvesting systems are designed after assessing site conditions that include rainfall pattern, incident rainfall, subsurface strata and their storage characteristics. Rainwater harvesting is popular all across the world, although in countries that are very dry, such as Australia, it is even more popular.

There are three methods of harvesting rain water as given below:

1. Storing rain water for direct use.
2. Recharging ground water aquifers, from roof top run off
3. Recharging ground water aquifers with runoff from ground area

3. Recharging ground water aquifers with runoff from ground area

**Materials and Methods**

**STUDY AREA**

Ahmednagar district is largest district of Maharashtra state and Parner tehsil is located in Ahmednagar district. The town of Parner is located at co-ordinates 18° 49' 40" North Latitude, and 74° 10' 22" E. To 71° 38' 34" East longitude at an altitude of about 790 meters. Towards the East of the tehsil Ahmednagar and Shrigonda tehsil, West there is Pune district, North it is attached to Sangamner and South there is Shirur tehsil. The total number of villages are 131. Maximum temperature is 40 ° C. and Minimum temperature is 14° C. Average rainfall last ten year is 525 mm. Total area of Parner Tehsil is 164679.5 square kilometer. At the center New Arts, Commerce, and Science College is located with campus area is 11.4 acres.

**OBJECTIVE**

The main objective of present study is the implementation of rain water harvesting system in College campus.

**Database and Methodology**

Fulfilling above objective the data is collected from secondary sources such as Average rainfall data from agriculture department Parner tehsil and area of college from administrative office. Data is collected and tabulated. Rain water harvesting potential in college campus is estimated by following equation.

$$\text{Rain Water harvesting potential} = \text{Amount of Rainfall} \times \text{area of catchment} \times \text{Runoff co-efficient}$$

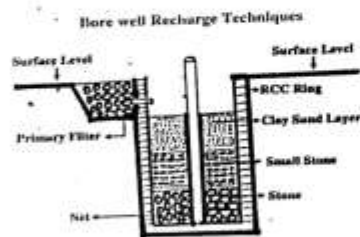
The calculation for runoff can be illustrated using the following

Consider a building with flat terrace Area (A). The average annual Rainfall (R) in (mm). The runoff co-efficient (C).

$$\text{Annual water harvesting potential} = A \times R \times C$$

**Results and Discussion**

The Parner tehsil of Ahmednagar district is located in drought prone areas of Maharashtra state. Tehsil received about 525 (mm) average annual rainfall during last 10 years. Therefore, there is need to conserved and stored rain water in Parner tehsil. So college attempt to made implementation of rain water harvesting in college campus.



Rain water that is collected on the roof top of the building may be diverted by drain pipes to a filtration tank (for bore well) from which it flows into the recharge tube well. The recharge tube well should preferably be shallower than the water table. This method of rain water harvesting is preferable in the areas where the rainfall occurs only for a short period in a year and Water table is at a shallow depth.

**Advantage of Rain water harvesting in college campus**

1. Promotes adequacy of underground water.
2. Mitigates the effect of drought
3. Improves ground water quality.
4. Improves ground water table, thus saving energy to lift water.
5. The cost of recharging subsurface aquifer is lower than surface reservoirs.
6. The subsurface aquifer also serves as storage and distribution system.
7. No land is wasted for storage purpose and no population displacement is involved.
8. Storing water underground is environment friendly.

The total amount of water that is received in the form of rainfall over an area is called the rain water endowment of that area. Out of this, the amount that can be effectively harvested is called rain water harvesting potential

1. The runoff coefficient for various surfaces is given in table

**Table 1 : Runoff coefficients for various surfaces:**

Sr. No.	Type of catchment	Coefficients
<b>Roof Catchments</b>		
1	Tiles	0.8 - 0.9
2	Corrugated metal sheets	0.7 - 0.9
<b>Ground surface covering</b>		
3	Concrete	0.6 - 0.8
4	Brick pavement	0.5 - 0.6
<b>Untreated ground catchments</b>		
5	Soil on slopes less than 10%	0.0 - 0.3
6	Rocky natural catchments	0.2 - 0.5

46

FLORA  
2017 Vc  
TOURI  
STUDY  
DISTR  
GHASK

**Rain Water Harvesting potential in College campus in last five years.**

College has implemented roof rain water harvesting of New Administrative Building, Science Building, Arts and Commerce Building and Hostel Building. (Refer enclosed figures of rain water harvesting). Rain water is collected in college store Tanks, Recharge Bore Well, and used for Botanical garden and other Greenery etc. during summer and winter season. To reduced runoff, college also planted number of trees it helps to conserved and percolate rain water in college campus.

Based on the above table 1, the water harvesting potential of college campus estimated using the following equation

**Annual water harvesting potential = A x R x C**

Sr. No	Year	Area sq.m	Average Annual Rainfall mm	Rain water harvesting potential in college campus
1	2016	1048	219	195080
2	2015	1048	547	487260
3	2014	1048	176	156780
4	2013	1048	544	484590
5	2012	748	248	157670
Total				1481380/5=296276

Source: Pacey, Arnold and Cullis, Adrian 1989, Rain water Harvesting. The collection of rainfall and runoff in rural areas, Intermediate Technology Publications, London p 55.

**References**

1. PACEY, AMOLD AND CULLIS, ADRIAN (1989)., Rain water Harvesting. The collection of rainfall and runoff in rural areas, Intermediate Technology Publications, London p 55
2. LYE, D. (2002). Health risks associated with consumption of untreated water from household roof catchment systems. *J. Am. Water Resour. As.* 38(5): 1301-1306.
3. MAGYAR, M. L., V. G. MITCHELL, LADSON, A. R AND DIAPER, C. (2007). An investigation of rainwater tanks quality and sediment dynamics. *Wat. Sci. Tech.* 56(9): 21-28.
4. MEERA, V. AND AHAMMED, M. M. (2006). Water quality of rooftop rainwater harvesting systems: A review. *J. Water Suppy Res. T.* 55(4): 257-268.
5. MELIDIS, P., AKRATOS, C. S., TSHIRINTZIS, V. A. AND TRIKILIDOU, E. (2007). Characterization of rain and roof drainage water quality in Xanthi, Greece. *Environ. Monit. Assess.* 124: 15-27.
6. USEPA (US Environmental Protection Agency). (1989). Surface water treatment rule: Guidance manual for compliance with the filtration and disinfection requirements for public water systems using surface water sources. Federal Register 54:12

**Conclusion**

Rain water from roof of building is collected through P.V.C. pipes and is used for refilling of bore wells in the campus. On an average 3.0 lakh liters of rainwater is collected per annum through recharge of bore well.

- Rainwater harvesting has helped to replenish ground water of college campus and surrounding areas.
- The college has been using rainwater harvesting from the last five years, so far it has collected 1481380 liters of rain water.
- This water is collected in storage tank. It is also used to recharge ground water through bore wells.
- This water helps to water plants and trees in botanical garden, college campus. This water also used for construction purpose as well.
- Thus rain water harvesting has helped to save run - off water to meet different needs of college. It is also helped to increased ground water level.

This activity has been developed by the college for benefit of the society




encourag  
to a des  
returning  
internati  
Agriculh  
Astronor  
Shoppinj  
has a gre  
variation  
develope  
on Shirdi  
condition  
many fa  
Shani-Sh  
So that t  
Figure:0  
KEY W

Geograpl  
largest di  
this distr  
the state  
field of j  
of the ge  
e.g. ci  
environr  
zoologica  
great to  
diversific  
geograph  
attractive  
style of  
Shirdi :  
changed  
Shani-Sh  
various j

## 45. Parner Talukyatil Koradvahu Sheticha Bhaugolik Aabhyas


**Current Global Reviewer**  
UGC Approved International Research Refereed Journal For All Subjects & All Languages

ISSN 2319-8648    Impact Factor - 2.143    Indexed (IJIF)    UGC Approved Sr. No. 64310

K. Vasantrao Narayanrao Naik Shikshan Prasarak Sanatha's  
**Arts, Commerce and Science College, Nashik**  
Affiliated to Savitribai Phule Pune University  
NAAC Reaccredited 'B' Grade

**Special Issue**  
A Two Day  
State Level Seminar on  
**“Role of Geospatial Techniques for  
Land use / Land cover Change”**  
07<sup>th</sup> & 08<sup>th</sup> February 2018



Editor in Chief  
Principal Dr. Shantaram Badgujar  
(Chairman, Organizing Committee)

SPONSORED BY  
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

ORGANIZED BY  
DEPARTMENT OF GEOGRAPHY

[www.rjournals.co.in](http://www.rjournals.co.in)

Current Global Reviewer, Vol. 1 (1), February 2018

ISSN : 2319-8648

26	Spatial Analysis of under nutrition of children in tribal region, Nashik district	N.U. Rathod <sup>1</sup> and Ravi R. Mishra <sup>2</sup>	124
27	Demographic characteristics of Scheduled Tribes in Nashik District, Maharashtra	Kudnar Changadev Kisan <sup>1</sup> and Kudnar Popatrao <sup>2</sup>	130
28	Impact of Irrigation on Demographic Pattern: A Comparative Case Study of Baramati Tahsil, Pune	Asaram S. Jadhav	135
29	Watershed Management of Ramganga Basin using Remote Sensing and GIS	Dr. S. P. Cholke	137
30	Geographical Analysis of Landuse Pattern in Nashik District	Dr. Rakesh V. Patil	143
31	पारनेर तालुक्यातील कोरडवाहू शेतीचा भौगोलिक अभ्यास	प्रा.म्हस्के ज्योत्सना दत्तात्रय <sup>1</sup> प्रा.ठोकळ अशोक विठ्ठल <sup>2</sup>	148



## पारनेर तालुक्यातील कोरडवाहू शेतीचा भौगोलिक अभ्यास

प्रा.महस्के ज्योत्सना दत्तात्रय प्रा.तोकळ अशोक विठ्ठल  
न्यू आर्ट्स, कॉमर्स अँड सायन्स कॉलेज, पारनेर

(31)

सारांश :

भारतात कोरड्या प्रदेशात केल्या जाणा-या परंपरागत शेतीस कोरडवाहू शेती, जिरायती शेती व पर्जन्याश्रयी शेती अशी अनेक नावे आहेत. ज्या प्रदेशात वार्षिक सरासरी 30-75 से.मी. पाऊस पडतो आणि हवामान उष्ण व कोरडे असते अशा निमशुष्क प्रदेशात कोरडवाहू शेती हा निर्वाही शेतीचा परंपरागत प्रकार आढळतो. प्रस्तुत शोधनिबंधात पारनेर तालुक्यातील कोरडवाहू शेतीच्या समस्या व उपाययोजना यांचा अभ्यास केला आहे. पारनेर तालुका हा दुष्काळग्रस्त प्रदेश म्हणून ओळखला जातो. या तालुक्यात फक्त 8.46 % वनक्षेत्र आढळते. या दुष्काळी तालुक्यात कोरडवाहू शेतीच्या अनेक समस्या असल्याने उत्पादनात म्हाणावी तेवढी वाढ दिसून येत नाही. यासाठी उपाययोजना करणे गरजेचे दिसते.

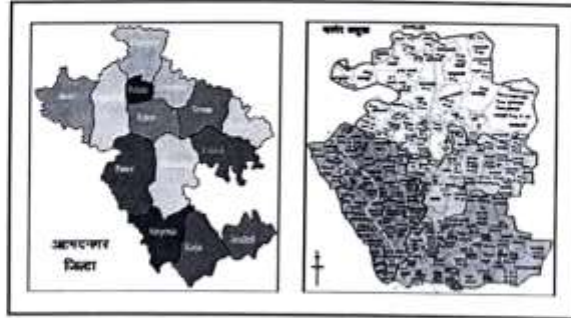
प्रास्ताविक :

भारत उष्णकटिबंधातील मोसमी हवामानाचा देश असल्याने वर्षभर शेतीस अनुकूल हवामान आढळते. देशात लागवडीखालील फार मोठे क्षेत्र कोरडवाहू शेतीखाली असल्याने पावसाचे प्रमाण, कालावधी, चलनशीलता, आकृतीबंध यावर कृषी उत्पादकता अवलंबून असते भारतात सरासरी 110 से.मी. पाऊस पडतो पण त्याचे वितरण असमान आहे. काही प्रदेश अवर्षण प्रवण आहे. यामुळे पर्जन्याश्रयी कोरडवाहू शेतीच्या उत्पादनावर याचा परिणाम होत असतो. भारताच्या लोकसंख्येचा विचार करता जास्तीत जास्त अन्न धान्य उत्पादीत करणे गरजेचे आहे. परंतु कोरडवाहू शेतीमधून म्हाणावे तेवढे उत्पादन होत नाही. या शेतीमध्ये मौढ्या प्रमाणात समस्या निर्माण झाल्या आहेत. त्यांच्यावर उपाययोजना करून कोरडवाहू शेतीतून जास्तीत जास्त उत्पादन काढले पाहिजे उपाययोजनांची अंमलबजावणी योग्यरीत्या झाल्यावर आपोआपच कृषीवर आधारीत औद्योगिकरणात वाढ होईल, रोजगार वाढेल, लोकांच्या राहणीमानात बदल होईल. या दृष्टीने विचार करता अहमदनगर जिल्ह्यातील पारनेर तालुक्यातील कोरडवाहू शेतीचा विकास होणे आवश्यक आहे.

अभ्यासक्षेत्र :

प्रस्तुत शोध निबंधासाठी निवडलेले अभ्यासक्षेत्र हे पारनेर असून ते अहमदनगर जिल्ह्यातील आहे. अहमदनगर जिल्ह्याचा प्राकृतिक भाग विचारात घेतला तर त्याचे तीन विभाग पडतात.

1. पश्चिम डोंगराळ प्रदेश
2. मध्यम पठारी प्रदेश
3. उत्तर आणि दक्षिण मैदानी प्रदेश



Current Global Reviewer, Vol. 1 (1), February 2018

ISSN : 2319-8648

यातील मध्यम पठारी प्रदेशामध्ये पारनेर तालुक्याचा समावेश होतो. याचे अक्षवृत्तीय स्थान  $18^{\circ} 49' 40''$  ते  $19^{\circ} 21' 13''$  उत्तर व रेखावृत्तीय स्थान  $74^{\circ} 10' 22''$  पुर्व ते  $74^{\circ} 38' 34''$  पुर्व असा आहे. पारनेर तालुका नगर जिल्ह्यातील सर्वात मोठा तालुका असून त्याचे एकूण क्षेत्रफळ 1930 चौ.कि.मी. एवढे आहे. नगर जिल्ह्याचा 11.33 % प्रदेश पारनेर तालुक्याने व्यापला आहे. पारनेरची 2018 ची लोकसंख्या 2,58,743 एवढी आहे.

**उद्दीष्टे :**

1. पारनेर तालुक्यातील कोरडवाहू शेतीच्या स्थितीचा अभ्यास करणे.
2. पारनेर तालुक्यातील प्रमुख पिकांचा अभ्यास करणे.
3. पारनेर तालुक्यातील कोरडवाहू शेतीच्या समस्या जाणून घेणे.
4. कोरडवाहू शेतीच्या सुधारणेसाठी उपाययोजना सुचविणे.

**सांख्यिकीय माहिती व अभ्यासपध्दती :**

प्रस्तुत शोधनिबंधात माहितीचे स्रोत दुय्यम स्वरूपाचे आहे.त्यासाठी तालुक्यातील गावामध्ये भेट देऊन तेथील तलाठ्यांकडून व जिल्ह्याचे सामाजिक व आर्थिक समालोचन पुस्तिका, पंचायत समिती व कृषी विभाग यांकडून माहिती गोळा करून अभ्यास केलेला आहे.

**विषय विवेचन :**

- 1) जी शेती पूर्णपणे पर्जन्याधारित असते त्या शेतीस जिरायती शेती म्हणतात.
- 2) पावसाचे पाणी मृदेत जिरल्याने प्राप्त होणा-या मृदाजलावर जी शेती केली जाते. त्या शेतीस कोरड्या प्रदेशातील जिरायती शेती असे म्हणतात.
- 3) दीर्घ कोरड्या ऋतुचा कालावधी असलेल्या प्रदेशातील पर्जन्याधारित शेती म्हणजे कोरड्या प्रदेशातील शेती होय. कोरडवाहू शेती प्रदेश निरिधती करण्यासाठी पुढील निकष विचारात घेतले जातात.

- 1) वार्षिक सरासरी पर्जन्य 30 से.मी. ते 75 से.मी.
  - 2) जलसिंचन – एकूण लागवडीखालील क्षेत्राच्या 30% कमी क्षेत्र जलसिंचनाखाली असावे.
  - 3) पर्जन्य चलनशिलता – 20% पेक्षा जास्त.
- वरील निकषांच्या आधारे पारनेर मधील सर्वत्र शेती कोरड्या प्रदेशात येते.

**1. कोरडवाहू शेती निर्वाही स्वरूपाची आहे :**

पावसाची अनिश्चितता, अवर्षण, सिंचनाचा अभाव, अल्पमूधारकता यामुळे या शेतीत अन्नधान्य उत्पादने घेतली जातात. उदा. ज्वारी, बाजरी, मका, सोयाबीन, सूर्यफूल, तीळ, मुईमुग, तूर, हरभरा, वाटाणे, बाल, उडीद, मटकी, मूग, मसूर अशी उत्पादने घेतली जातात. या पिकाचे पोषणमूल्य अत्यंत महत्त्वाचे आहे. त्यातून कार्बोदके, प्रथिने, सिन्थांश, खनिजे प्राप्त होतात.



## 2. समस्याग्रस्त शेती :

कोरडवाहू शेती परंपरागत असल्याने तिच्यात नाविन्यपूर्ण उपक्रम राबविले जात नाहीत. ही शेती बेमबरवशाच्या कमी पावसाच्या प्रदेशात केली जात असल्याने या शेतीच्या भौगोलिक आर्थिक व सामाजिक समस्या दिसून येतात. त्या पारनेर तालुक्याचा बराचसा भाग हा डोंगराळ असल्याने म्हणाव्या तेवढ्या सुविधा येथे आढळत नाहीत.

## • भौगोलिक समस्या

1. कमी व अनिश्चित स्वरूपाचा पाऊस.
2. अवर्षणप्रणवता.
3. पावसाळा संपताच दोन महिन्यांनंतर पाण्याचा तुटवडा निर्माण होतो.
4. बाष्पीभवनाचा वेग जास्त त्यामुळे विहीरी, तळे कोरडे पडतात.
5. मृदेचा -हास वेगाने होतो.

## • आर्थिक व सामाजिक समस्या

1. उत्पादनाची हमी नाही.
2. शेतजूर व शेतकरी दारिद्री व कर्जबाजारी आढळतात.
3. पशुधन वर्षभर सांभाळता येत नाही.
4. पुरुष कामाच्या शोधात मुंबई, पुणे येथे स्थलांतर करतात.
5. शेतकरी कुटूंबातील आरोग्य व सुरक्षितता धोक्यात येते.
6. वर्षातून फक्त दोनच पिके घेतल्यामुळे आर्थिक बाजू नेहमीच कमकुवत राहते.
7. जमनीचे तुकडीकरण.
8. उच्च शिक्षणाकडे दुर्लक्ष.  
इत्यादी समस्या निर्माण होत आहेत.

पारनेर तालुक्यातील क्षेत्राचा आढावा खालील तक्त्यात दिला आहे. त्यामध्ये 1970-71 या वर्षातील जमिनीचा वापर व 2010-11 या वर्षातील जमिनीचा वापर यांची तुलना केलेली आहे.

पारनेर तालुक्यातील क्षेत्राचा तुलनात्मक अभ्यास

अ.नं.	क्षेत्र	1970-71	%	2010-11	%	झालेला बदल
1	वनक्षेत्र	25278	13.53	18792	10.07	-3.46
2	बिगर शेती क्षेत्र	23512	12.59	19210	10.28	-2.31
3	शेती योग्य पडीक क्षेत्र	4682	2.51	10.931	5.85	3.34
4	पडीक क्षेत्र	3644	1.95	11044	5.91	3.96
5	लागवडीखालील क्षेत्र	129981	69.42	126820	67.89	-53
	भौगोलिक क्षेत्र	1,87,097	100	186797	100	

वरील तक्त्यात दिलेल्या आकडेवारीनुसार वनक्षेत्र कमी होत असून, बिगर शेती क्षेत्राचा वापर वसाहतीसाठी वाढत आहे. याशिवाय लागवडीखालील क्षेत्र कमी होत असून पडीक क्षेत्रात दिवसेंदिवस वाढ होत आहे. कारण पारनेर तालुक्यातील शेती कमी पर्जन्यामुळे कोरडवाहू आहे. कोरडवाहू शेती ही पावसावर अवलंबून असल्याने उत्पादनाची हमी नाही. तसेच शेतक-याने घेतलेल्या पिकांना हमी भाव देखील मिळत नाही. शेती क्षेत्राचा वापर इतर गोष्टींसाठी वाढताना

दिसून येतो. याशिवाय पारंपारीक पध्दती रूढीपरंपरा यामुळे गंशपरंपरागत जमीनीचे वाटप या घटकांमुळे शेतीचा आकार कमी होत आहे.

वरील समस्यांचा विचार करता या कोरडवाहू शेतीचे व्यवस्थापन पारंपारीक पध्दतीने व आधुनिक या दोन्ही पध्दतीने करता येते. यासाठी पुढील उपाययोजना महत्त्वपूर्ण ठरतात.

1. आंतरपीक पध्दती वापरणे.
2. शेतजमीनी भोवती स्थानिक (बोर, लिंब, आंबा, निरगुडी) कणखर वनस्पतीची लागवड करून आर्द्रता वाढविणे.
3. मृदाजलाचा -हास रोखणे.
4. उताराला आडवी मशागत व पेरणी करणे.
5. रासायनिक खताएवजी शेणखत, लॅडीखत, कंपोस्ट व हिरवळीचे खत वापरणे त्यामुळे पाणी जास्त लागणार नाही.
6. पडीक जमीनी लागवडीखाली आणणे व त्यावर फळझाडांची लागवड करून इतर आंतरपिके घेणे.
7. पडीक जमीनी, डोंगराळ प्रदेश येथे चर खाणून त्यामध्ये वृक्ष लागवड करून वृक्ष तग धरपर्यंत त्यांना पाणी देणे. यासाठी गावातील लोकांचा सहभाग, विद्यार्थ्यांचा सहभाग महत्त्वपूर्ण ठरतो.
8. सलग समतल चर खोदणे यासाठी उतार मंद असावा.
9. प्रत्येक गावातील छोट्या ओढ्यावर किंवा ओहोळ यावर गेबियन बंधारा बांधणे.
10. लहान मोसमी व बारामही ओढे व नाले यांच्यावर नालाबंडिंग करणे.
11. पाणलोट क्षेत्राच्या वरच्या बाजूस पडीक जमीन किंवा विंगरशेतीच्या क्षेत्रावर जैविक बांध घालणे.
12. वनराई बंधारे बांधणे.
13. या तालुक्यातील बरेचसे क्षेत्र डोंगर उताराचे असल्याने पाझर तलाव बांधून पाणी अडविले जाऊ शकते.
14. कोरडवाहू शेतीमध्ये प्लॅस्टीक शिटचा वापर उपयुक्त ठरू शकतो.

#### निष्कर्ष

पारनेर तालुक्यातील 67.89% क्षेत्र लागवडीखालील आहे. कोरडवाहू शेतीमुळे पाण्याचे प्रमाण कमी यामुळे या शेती क्षेत्रात दिवसेंदिवस घट होताना दिसत आहे. पारनेर तालुक्यातील काही गावांमध्ये पाणलोट क्षेत्र व्यवस्थापन होत आहे. तरीही पाण्याचे संकट म्हणावे तेवढे कमी झालेले नाही. यासाठी शेतीतून उत्पादन वाढविण्यासाठी मूजल साठा वाढविणे जास्त गरजेचे आहे. पृष्ठजल कितीही अडविले तरीही बाष्पीभवनाचा वेग जास्त असल्याने डिसेंबर नंतर पाण्याचे संकट सुरू होते. यासाठी कृषी पध्दती बदलवून, आंतरपिके व वृक्षलागवड वाढविणे गरजेचे आहे. त्यामुळे मूजल साठा वाढला जाऊन कृषीतील उत्पादनात निश्चित वाढ होईल. या कृषीतील शेतीला मोठे बांध असणे आवश्यक आहेत व त्यावर स्थानिक कणखर वृक्षांची लागवड केल्यास निश्चित मृदा धूप थांबून मूजल साठा वाढण्यास मदत होईल आणि हवेतील आर्द्रतेत वाढ होईल.

#### संदर्भ ग्रंथ :

1. Problems and solution for the Dryland Agriculture in India.net
2. Ahmednagar District Census Hand Book.
3. कृषी भूगोल – डॉ.विजया साळुंके, प्रथम आवृत्ती, जून 2015, डायमंड पब्लिकेशन.
4. Agricultural Geography, Mohammed Shafi, Pearson, Education, New Delhi (2006)

**46. Geographical Analysis of Irrigation Resources: A Case Study of Ahmednagar District**

**SHODHANKAN**  
UGC APPROVED  
(ISS. No. 25307) Journal No. 48999

ISSN-2250-0383  
IMPACT FACTOR - 0.421  
Special Issue-15  
January-2018

A State Level Workshop on  
**RECURRING  
DROUGHTS &  
WATERSHED  
DEVELOPMENT**

10<sup>th</sup> and 11<sup>th</sup> January 2018,  
Ahmednagar, Maharashtra

- Organized By -  
**Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
NEW ARTS, COMMERCE AND SCIENCE COLLEGE, AHMEDNAGAR**

**DEPARTMENT OF GEOGRAPHY**

- Sponsored By -  
**Savitribai Phule Pune University, Pune**

## INDEX

Sr. No.	Paper Title	Name	Page No.
1	Agriculture Crisis And Governance In India : Issues And Challenges	Dr. R.N.Sable	01 to 04
2	पाणलोट विकास आणि जलसाक्षरता	श्री. पोटपराव पवार,	05 to 10
3	महाराष्ट्रातील पाणी, शेत व पर्यावरणाचे प्रश्न सोडविण्यास निबबोचा पथदर्शक प्रकल्प	प्रा. वा.एन. शिंदे	11 to 17
4	"Role OFNGO For Jalyuktashivarabhiyanand Its Impact On Underground Water Table: A Case Study Of Shiurvillage Tal- Jamkhed, Dist-Ahmednagar(ms)"	Dr. Narke S.Y.	18 to 23
5	Drought Severity Assessment For Understanding Climate Change: A Case Study Of Ahmednagar District, Maharashtra	Mr. Sandip Sasane	24 to 28
6	Concept of Droughts Situationand An Application of "Jalyukt Shivar Abhiyaan" In Maharashtra, A Special Reference to Ahmednagar District.	Prof.Dr. Raviprakash Thombre	29 to 34
7	A Study Of Rainfall Characteristics In Ahmednagar District (Ms)	Gadekar Deepak Jarnardhan Dr. P.H. Mhaske	35 to 39
8	The Role Of Irrigation And Agricultural Development: A Case Study	A. P.,Pandit, A. H. Choudhar and B. S. Murade	40 to 48
9	Accessment Of Economic Development Of Model Watershed Village – A Case Study Of Hivrebazsar In Nagar Tahesil	Lagad Santosh Jabaji	49 to 56
10	Roof top Rain Water Harvesting Potentials of M. J. S. College Educational Complex	Mr. B.D. Deokar Dr. A.P.Pandit and D.S.Bhosale	57 to 63
11	A Review Study On Application Of Remote Sensing For Irrigation Water Resource Management	Anand P. Pandit, M. R. Karale, S. K. More	64 to 71
12	Drought Issues And Strategies For Efficient Droughts Management	Dr.Udhav Chavan Dr. P.H. Mhaske	72 to 79
13	A Geographical Study On Water Management, Special Reference To Baramati Tehsil (MAHARASHTRA).	Prof. Jawahar Chaudhari	80 to 88
14	"Geographical Analysis of Irrigation Resources: A Case Study of Ahmednagar District"	Mr. A.V. Thokal, Mrs. J.D. Mhaske	89 to 91
15	"Spatio-Temporal Changein Urban Morphology Of Ahmednagar City, Maharashtra, India"	Dr. S.A. Borude	92 to 98
16	"मृदा प्रदूषण व नियंत्रण एक भौगोलिक अभ्यास"	डा. पुणे राम पा डा. यशवंत के.एम	99 to 102
17	Characteristics Of Watershed : A Brief Study	Prof. P. N. Dhage Prof. S.K. More	103 to 109
18	Drought: Causes and Consequences.	Kadam S.M. Kadam Y.G.	110 to 115
19	Watershed Management – A Future Need	Prof. B.N. Kumbhar	114 to 120

ISSN-2250-0383

## “GEOGRAPHICAL ANALYSIS OF IRRIGATION RESOURCES: A CASE STUDY OF AHMEDNAGAR DISTRICT”

14

By\*Mr. Ashok V. Thokal

\*\*Mrs. Jyotsana D. Mhaske

\*&\*\* Assistant Professor, Post Graduate Department of Geography,  
New Arts commerce & Science College, Parner Dist-Ahmednagar

### Abstract-

Irrigation is defined as “Artificially supplying & systematically dividing of water for agriculture & horticulture in order to obtain higher or qualitatively better production” Today, India is considered to be a water stressed country. We were highly water-surplus in 1950s. This change has come mainly due to two reasons. First – increasing population; and second – highly wasteful flood method of irrigation (FMI). Given that around 65% of irrigation and 85% if the drinking water comes from the groundwater resources, majority of the groundwater sources in the country are registering a fall in water levels. To arrest the decline in per capita water availability and per capita food grain availability, we need to increase production with judicious water use in farming. Monsoons are not certain in nature. So, farming cannot entirely depend upon rains.

Irrigation also allows farmers to grow more crops in one year on the same land. The constant availability of water for irrigation provides a sense of stability to the farmer, and also encourages him to practice newer farming methods and patterns to maximize the productivity.

Present paper attempted to analyzing various resources of the study area

### Introduction-

Ahmednagar district is known as the drought prone region (FFC, 1973). Average rainfall receives 575.8 mm. of the district. Major, medium, minor irrigation dams are available in the district. But it is not sufficient to increase area under irrigation. Surface irrigation consumes more water. So there is a need of proper irrigation like micro irrigation which consumes appropriate water according to need of crops.

It is necessary to reduce the dependency on rainfall and stabilize the cropping pattern. For example in South India without perennial rainfall, water supply replenishment is dependent on a cycle of dry seasons alternating with monsoon seasons. Monsoons are not

Shodhankan Special ISSUE-15

January 2018

Page 89

ISSN-2250-0383

certain in nature. So, farming cannot entirely depend upon rains. Irrigation also allows farmers to grow more crops in one year on the same land. The constant availability of water for irrigation provides a sense of stability to the farmer, and also encourages him to practice newer farming methods and patterns to maximize the productivity.

#### Objective-

1. To analyze the irrigation resources in the study area.

#### Discussion-

##### Irrigation and Groundwater

Ahmednagar district has a net sown area (NSA) of 11.86 lakh hectares of which net irrigated area accounts for 4.32 lakh hectares. This indicates that only 36.43 per cent of net sown area is irrigated. The percent of irrigated area in Ahmednagar district was 44.95 percent during 2011-12, which very high as compared to the state average (17 percent). Out of total net irrigated area, 78 percent area irrigated through well irrigation (including lift) and remaining as surface irrigation, i.e. canal irrigation.

**Table 1 Sources of Irrigation and Groundwater in Ahmednagar district**

(Area in '00 ha)

Year	Surface Irrigation	Well Irrigation	Net Irrigated Area (NIA)	Gross Irrigated Area (GIA)	Percentage of GIA to GCA	% of groundwater Irrigation to NIA
1960-61	464	894	1358	1545	11.66	65.83
1970-71	439	1149	1588	1856	14.44	72.36
1980-81	642	1271	1913	2806	22.08	66.44
1990-91	941	1973	2914	3507	27.37	67.71
2000-01	922	2688	3610	3939	28.24	74.46
2001-02	890	2475	3365	3687	29.81	73.55
2004-05	960	3360	4320	5960	29.81	77.78

Source: Season and Crop Report, various issues.

Above table shows continuously increase in surface irrigation except the 1970-71, because major draught conditions occurs in this period. In all other category like percentage to gross irrigated area to gross cropped area also increased.



Table No.2. Talukawise Source wise Area Irrigated in Ahmednagar district 2012(Area in Ha)

Sr. No.	Taluka	Surface	Wells	Total Net irrigated area	Total Gross irrigated area	Irrigation Intensity (%)
1	Ahmednagar	335	20129	20464	23430	114.49
2	Parner	2023	15634	17657	27864	157.81
3	Pathardi	669	10514	11183	14430	129.04
4	Karjat	1352	19355	20707	24948	120.48
5	Jamkhed	1290	6840	8130	10400	127.92
6	Shrigonda	2625	35475	38100	60786	159.54
7	Shrirampur	3711	27669	31440	31680	100.76
8	Shevgaon	1700	10673	12373	20747	167.68
9	Newasa	13378	25344	38722	61778	159.54
10	Rahuri	13408	28985	42393	60226	142.07
11	Sangamner	1768	19076	20844	24533	117.70
12	Akole	1100	8484	9584	11006	114.84
13	Kopergaon	11739	15384	27123	30955	114.13
14	Rahata	4239	11240	15479	22317	144.18
	<b>Total</b>	<b>59397</b>	<b>254802</b>	<b>314199</b>	<b>425100</b>	<b>135.30</b>

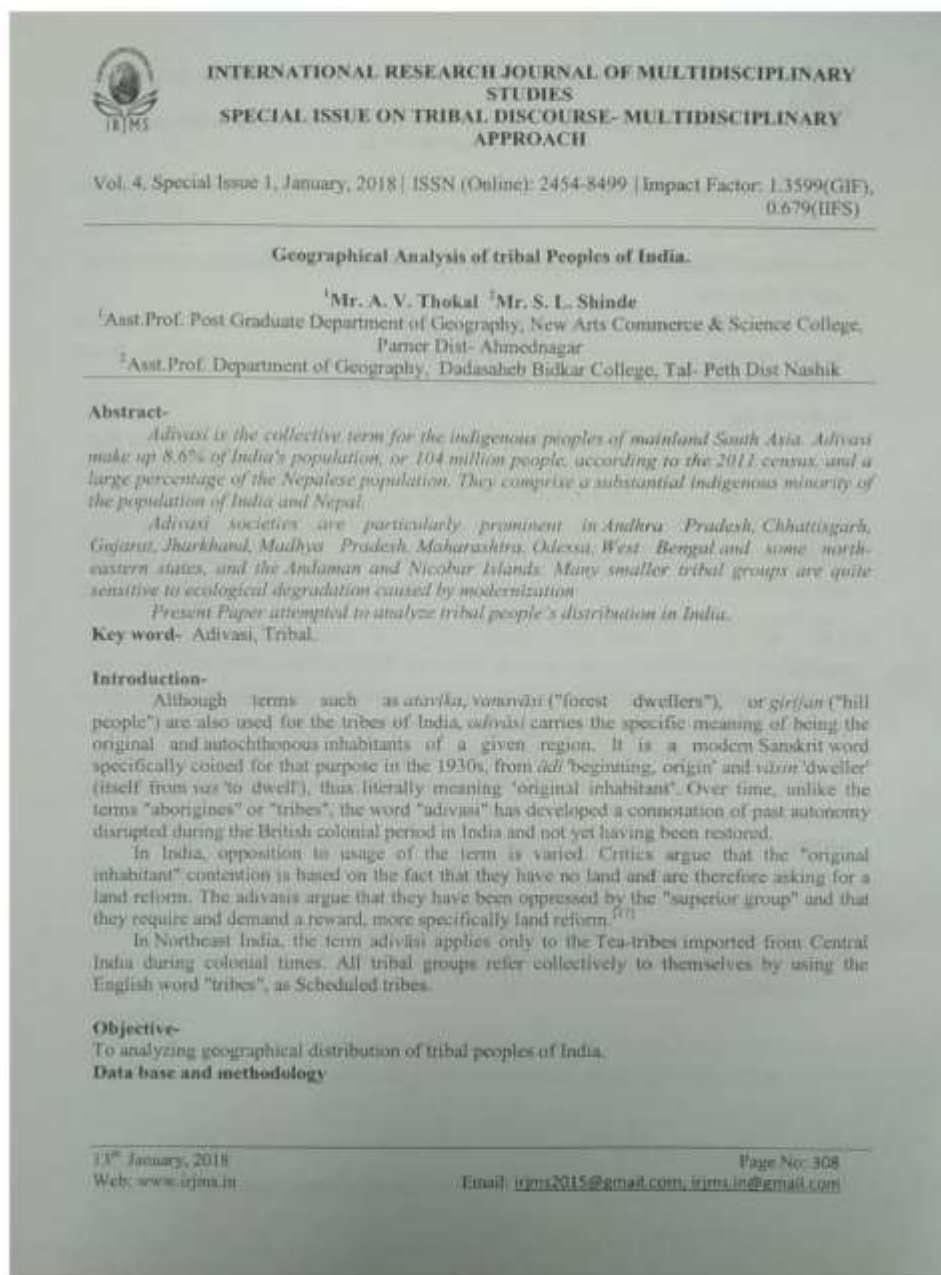
Above table showing surface irrigation is more in the Kopergaon, Rahur and Newasa talukas, lowest in the Ahmednagar and Pathardi talukas.

**Conclusion-** Although Ahmednagar district is draught prone district, but availability of surface and ground water is satisfactory as compare to the state level.

#### References-

1. Department of Agriculture. Agri. Plan of A'nagar District.
2. Socio-Economic Abstract of Ahmednagar district (2014)pp-61-72.
3. Majid Hussain(2002) AgricultureGeography. pp 229-231

## 47. Geographical Analysis of Tribal Peoples of India





INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES  
SPECIAL ISSUE ON TRIBAL DISCOURSE- MULTIDISCIPLINARY  
APPROACH

Vol. 4, Special Issue 1, January, 2018 | ISSN (Online): 2454-8499 | Impact Factor: 1.3599(GIF),  
0.679(IJPS)

For the present paper secondary data collected from website Wikipedia and census of India. Analyzing and interpretation method applied to fulfill the main objective of this paper.

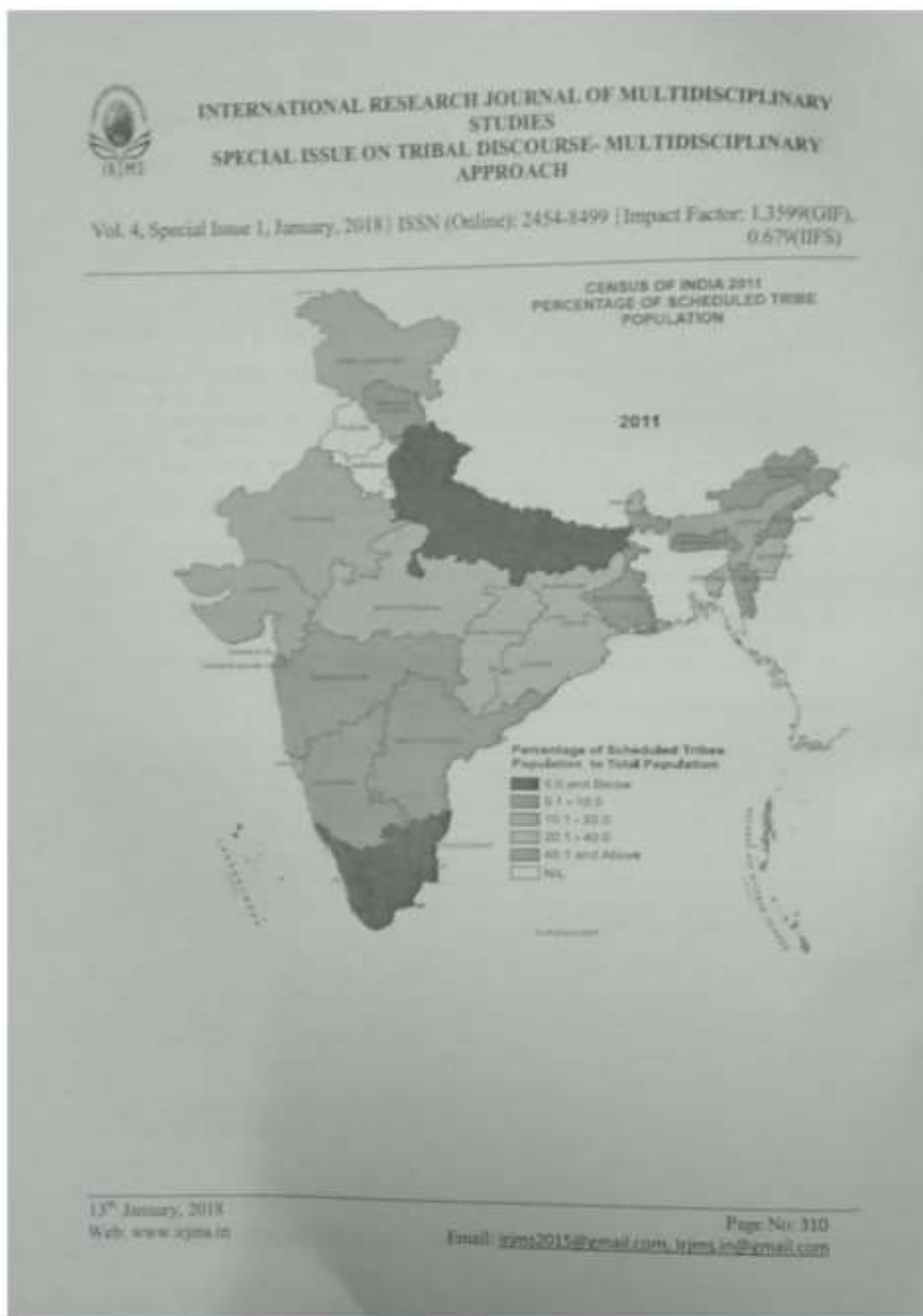
**Discussion-**

The Constitution of India, Article 366 (25) defines Scheduled Tribes as "such tribes or tribal communities or part of or groups within such tribes or tribal communities as are deemed under Article 342 to be the scheduled Tribes (STs) for the purposes of this Constitution". In Article 342, the procedure to be followed for specification of a scheduled tribe is prescribed. However, it does not contain the criterion for the specification of any community as scheduled tribe. An often-used criterion is based on attributes such as:

- Geographical isolation – they live in cloistered, exclusive, remote and inhospitable areas such as hills and forests.
- Backwardness – their livelihood is based on primitive agriculture, a low-value closed economy with a low level of technology that leads to their poverty. They have low levels of literacy and health.
- Distinctive culture, language and religion – communities have developed their own distinctive culture, language and religion.
- Shyness of contact – they have a marginal degree of contact with other cultures and people.

**Geographical distribution of Scheduled Tribe in India.**

Highly concentration of S.T. population observed in the states of Arunachal Pradesh, Meghalaya, Mizoram and Nagaland i.e. above 40 percentages. These states located in the north eastern parts of Himalaya which is hilly area, which having natural vegetation. Between twenty to forty percent S.T. population observed during 2011 census period, these states are Madhya Pradesh, Jharkhand, Odisha, Tripura, Manipur and Chhattisgarh. These states having abundant natural minerals. Ten to twenty percent S.T. populations observed in the states of Gujarat, Rajasthan, Jammu & Kashmir, and Assam. Below ten percent S.T. population observed in the states of Himachal Pradesh, West Bengal, Maharashtra, Karnataka, Andhra Pradesh, U.P., Uttarakhand, Bihar, Kerala and Tamil Nadu.





**INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES**  
**SPECIAL ISSUE ON TRIBAL DISCOURSE- MULTIDISCIPLINARY APPROACH**  
 Vol. 4, Special Issue 1, January, 2018 | ISSN (Online): 2454-8499 | Impact Factor: 1.3599(GIF), 0.679(IIFS)

Table | State wise Scheduled Tribe population and decadal change by residence : 2011 (TOTAL)

State /UT Code	India/State/Union Territory	Scheduled Tribe population 2011			Decadal change 2001-2011		
		Total	Rural	Urban	Total	Rural	Urban
1	Jammu & Kashmir	1,493,299	1,406,833	86,466	35	33.4	67.9
2	Himachal Pradesh	392,126	374,392	17,734	60.3	57.9	135.6
3	Punjab	NST	NST	NST	NST	NST	NST
4	Chandigarh #	NST	NST	NST	NST	NST	NST
5	Uttarakhand	291,903	264,819	27,084	14	10.2	70.1
6	Haryana	NST	NST	NST	NST	NST	NST
7	NCT of Delhi #	NST	NST	NST	NST	NST	NST
8	Rajasthan	9,238,534	8,693,123	545,411	30.2	29.4	43.6
9	Uttar Pradesh	1,134,273	1,031,076	103,197	950.6	876	750.4
10	Bihar	1,336,573	1,270,851	65,722	76.2	77.1	61.7
11	Sikkim	206,360	167,346	39,014	85.2	64	313
12	Arunachal Pradesh	951,821	789,846	161,975	35	30.3	63.8
13	Nagaland	1,710,973	1,306,838	404,135	-3.6	-15.4	25.7
14	Manipur	902,740	791,126	111,614	21.8	12.1	216.8
15	Mizoram	1,036,115	507,467	528,648	23.4	17.8	29.4
16	Tripura	1,166,813	1,117,566	49,247	17.5	15.5	93.7
17	Meghalaya	2,555,861	2,136,891	418,970	28.3	27	35.1
18	Assam	3,884,371	3,665,405	218,966	17.4	16.2	42.2
19	West Bengal	5,296,953	4,855,115	441,838	20.2	17.4	63.4
20	Jharkhand	8,645,042	7,868,150	776,892	22	21	32.3
21	Odisha	9,590,756	8,994,967	595,789	17.7	16.8	33.4
22	Chhattisgarh	7,822,902	7,231,082	591,820	18.2	15.4	68.2
23	Madhya Pradesh	15,316,784	14,276,874	1,039,910	25.2	24.7	32.1
24	Gujarat	8,917,174	8,021,848	895,326	19.2	16.8	45.7
25	Daman & Diu #	15,363	7,617	7,746	9.8	-31.9	175.8
26	D & N Haveli #	178,564	150,944	27,620	30.1	18.5	181.4
27	Maharashtra	10,510,213	9,006,077	1,504,136	22.5	20.3	37.9
28	Andhra Pradesh	5,918,073	5,232,129	685,944	17.8	12.6	81.9
29	Karnataka	4,248,987	3,429,791	819,196	22.7	16.9	54.7
30	Goa	149,275	87,039	61,636	-	-	-

13<sup>th</sup> January, 2018  
 Web: www.ijms.in

Page No: 311  
 Email: ijms2015@gmail.com, ijms.in@gmail.com



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES  
SPECIAL ISSUE ON TRIBAL DISCOURSE- MULTIDISCIPLINARY APPROACH

Vol. 4, Special Issue 1, January, 2018 | ISSN (Online): 2454-9499 | Impact Factor: 3.3799(GDF), 0.6796(IPIF)

31	Ladakh region #	61,120	11,463	47,657	6.6	58.2	89.8
32	Kerala	404,839	433,262	51,787	33.1	23.7	285.2
33	Tamil Nadu	794,037	680,280	134,417	22	19.8	34.2
34	Puducherry #	857	857	857	857	857	857
35	A & N islands #	28,530	26,715	1,815	-3.2	-6.1	78.2

Above table shows rural and urban distribution as well as decadal change of rural urban population since 2001 to 2011

Substantial list of Scheduled Tribes in India are recognised as tribal under the Constitution of India. Tribal people constitute 8.6% of the nation's total population, over 104 million people according to the 2011 census. One concentration lives in a belt along the Himalayas stretching through Jammu and Kashmir, Himachal Pradesh, and Uttarakhand in the west, to Assam, Meghalaya, Tripura, Arunachal Pradesh, Mizoram, Manipur, and Nagaland in the northeast. In the northeastern states of Arunachal Pradesh, Meghalaya, Mizoram, and Nagaland, more than 90% of the population is tribal. However, in the remaining northeast states of Assam, Manipur, Sikkim, and Tripura, tribal peoples form between 20 and 30% of the population. Other tribal peoples, including the Santals, live in Jharkhand and West Bengal. Central Indian states have the country's largest tribes, and, taken as a whole, roughly 75% of the total tribal population live there, although the tribal population there accounts for only around 10% of the region's total population.

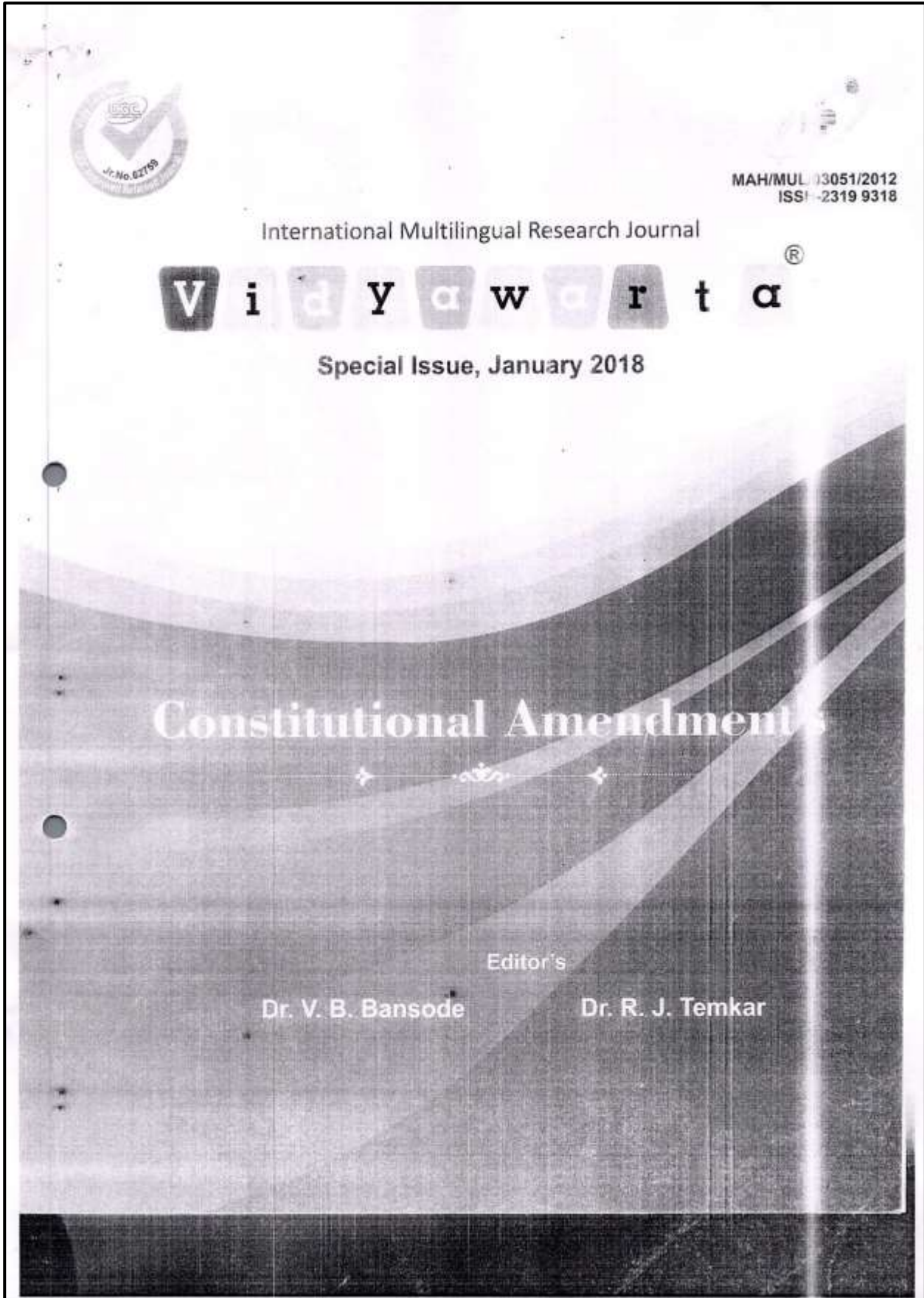
**Conclusion: -**

Tribal peoples spread all over India except Punjab, Haryana and NCR. Decadal change 2001-2011 is observed positive growth in urban area.

**References:-**

1. [www.wikipedia.org](http://www.wikipedia.org)
2. *Census of India 2011*

48. 73 vya ghatanadurustiche Mahatva



MAH MUL/D3051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.62759

Vidyawarta®

January 2018  
Special Issue

05

|| index ||

01) 73 th and 74th Constitutional Amendment and Maharashtra Harshvardhan S. Kolhapure, Latur	07
02) 73rd And 74th Constitution Amendments and Women Dr. Suresh Devare, Dr. Vilas Awari (HOD), Kopergaon	13
03) POLITICAL PARTICIPATION AND REPRESENTATION OF WOMEN IN INDIAN POLITICS Dr. Dudhkawade Suresh Ramji, Pune	15
04) Position of Women in Indian Society Dr. B. B. Tilekar, Ahmednagar	19
05) ७३ व ७४ वी घटनादुरुस्तीची २५ वर्षे : एक विश्लेषणात्मक आढावा प्रा. डॉ. विलास भारतराव बनसोडे, जि. अहमदनगर	23
06) ७३ वी, ७४ वी राज्यघटनादुरुस्ती आणि महिलांचे राजकीय सशक्तीकरण एक चिंतन प्रा.डॉ. भालेराव श्रीराम हनमंतराव, लातूर	26
07) ७३ व ७४ वी घटनादुरुस्ती व महिलांचा राजकीय सहभाग : वामन प्रा. डॉ. संजय वामनराव पोळे, शेदुर्णा	29
08) न्यायशास्त्रातील ग्रामीण राजकारण आणि महिलांचा सहभाग प्रा. डॉ. चंद्रकांत प्रभाकर काळे, जि. अहमदनगर	32
09) ७३ वी व ७४ वी घटनादुरुस्तीची समर्पकता प्रा. फलके अविनाश बी., जि.अहमदनगर	34
10) ७३वी व ७४वी घटनादुरुस्तीची समर्पकता प्रा. मिलिंद विठ्ठल खांदवे, तळेगाव दाभाडे	39
11) स्थानिक स्वयंराज्य संस्था आणि ७३, ७४वी घटनादुरुस्तीचे महत्त्व डॉ. वेग रेहानाआरा ईस्माइल, पावळ	43
12) ७३व ७४वा घटना दुरुस्तीची समर्पकता प्रा. डॉ. देशमुख सुभाष, श्री. तिजोरे महेंद्र, अहमदनगर	46

विद्यार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)



MAH MUL/D3051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.62759

Vidyawarta®

January 2018  
Special Issue

06

13) पंचायतराजची २५ वर्षे- अवलोकन व आव्हाने बुले जिजाभाऊ सिताराम, नदिड	51
14) ७३ वी व ७४ वी घटना दुरुस्तीची समर्पकता मोहन भानुदास परतवाध, नदिड	55
15) ७३ वी व ७४ वी घटनादुरुस्ती व महिला सहभाग प्रा. बाळासाहेब बनसोडे, जि. अहमदनगर	59
16) ७३ वी घटना दुरुस्तीचे महत्त्व प्रा. फुलारी अर्चना सुभाष, जि. अहमदनगर	60
17) ७३ व ७४ वी घटनादुरुस्ती व महायुद्धातील पंचायतीराज व्यवस्थेतील महिलांचा सहभाग कु. कोमल भालेराव, जि. अहमदनगर	62
18) ७३ वी घटना दुरुस्ती व पंचायत राज व्यवस्था प्रा. अरुण महादेव राख, पाथर्डी.	64
19) शिवसेना आणि राष्ट्रवादी काँग्रेस पक्षांचे स्थानिक स्वराज्य संघाला निवडणुकीतील राजकीय यशापयस प्रा. डॉ. किशोर गटकळ, नेवासा	66
20) ७३ वी घटना दुरुस्ती - एक सामाजिक अविष्कार प्रा. डॉ. राजकुमार पंढरीनाथ बुले, आदिनाथनगर	70

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal | Impact Factor 5.131 (IJIF)

MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.62759

Vidyawarta®

January 2018  
Special Issue

060

कल्पनात आले आहे. राष्ट्रीय जागा संवेधी केंद्रेल्या कायद्यास न्यायालयाने आव्हान देता येणार नाही. म्हणजेच न्यायालयीन हस्तक्षेपास प्रतिबंध केल्या दिवस येतो.

पन्नासतराज संस्थामधील सन्तापदे किंवा अनिकतराष्ट्रे हे ज्या म्त्र्यांना राजकीय पाठ्याळ आहे अनिकतर असाच महिला राजकारणात उतरतात. महिला आरक्षण जरी असले तरी त्या महिलां पेतजे त्यांचे पत्नीदेवच कारभार पाहत असतात. आरक्षणाचा उद्देशच या दिक्काणी असफल होत असतात दिवस येतो. लोकशाहीच्या पाठशाळा म्हणून स्थानिक स्वराज्य संस्थांना ओळखले जाते.

स्थानिक शासनात महिलांना कार्यक्षम पद्धतीने कामकाज करणे याचे यासाठी कटोर कायदे कल्पनात याचे तसेच योग्य प्रशिक्षण देवून त्यांना सक्षमक कल्पनात याचे स्थानिक शासन संशोधनात्मक महिलांना लोकसभेत व विधानसभेत पन्नास टक्के आरक्षण ठरू केले जावे. चातुस महिला नेतृत्वाचा विकास घडून येईल.

संदर्भ—

१. राजकीय संरचना — डॉ. सुनिल दाते
२. घटनेत महाराष्ट्र विधेयक — डॉ. जयश्री अजिंकार
३. भारतीय संविधान — महाराष्ट्र राज्य साहित्य आणि संस्कृती मंडळ
४. महाराष्ट्रातील स्थानिक स्वराज्य संस्था — प्रा. र. व. बयाडकर

□□□

16

## ७३ वी घटना दुरुस्तीचे महत्व

प्रा.: फुलारी अर्चना सुभाष

न्यू आर्टेम, कॉमर्स अँड सायन्स कॉलेज, पारनेर  
जि. अहमदनगर

\*\*\*\*\*

देशाच्या विकसामाच्या दृष्टीने पन्नासत राज्या महत्त्व ओळखून त्याच्या आपल्या राजकीय कार्यक्रमा महत्त्वाचे स्थान देण्याचा निर्णय भारताचे मा. पंतप्रधान राजीव गांधी यांनी केला. परिश्रम मेखाली लोकसभेची फेड संसदेच्या योजना राज्य सरकार देणे व त्याच्या मदतगानेच संघर्षात शक्य होते. पन्नास राज व्यवस्थेविषयी राज्य सरकार त्रवसोत होती देशातील लोकसभेमध्ये पन्नासत राज व्यवस्थेला स्वायत्त संस्था म्हणून स्थान देण्याचाच अर्थ होत त्याच मुलभूत व्यवस्थेची तसूद अगणारी घटना दुरुस्ती करणाचे नकती ठरले त्यासाठी ६.४ वे घटना दुरुस्ती विधेयक लोकसभेकडे मांडण्यात आले लोकसभेने १४.४.९९ च्या आगस्टमध्ये मंजूर केले परंतु काँग्रेस सत्ताधारी पक्षाच्या राज्य संघाने बहुमत नसल्यामुळे हा विधेयकाला राज्य संघेची मंजुरी मिळाली नाही. त्यानंत त्यांनी ते विधेयक पुन्हा दुसऱ्यांदा १९९० च्या सप्टेंबर महिन्यात व्ही. पी. सिंग यांच्या नेतृत्वाखालील राष्ट्रीय आपाची सरकार केंद्रमळले व लोकसभेचा संसदेच्या डायरी त्यामुळे ते विधेयक आपोआप चारमळले. त्यानंतर विधेयक पी. व्ही. सुमित्रदेव संसदेचे सप्टेंबर १९९० मध्ये लोकसभेत निराच्यांदा मांडले. त्याच्या २२ डिसेंबर १९९० रोजी मंजुरी मिळी आणि दुसऱ्याच दिवस म्हणजे २३ डिसेंबर १९९० रोजी राज्य संघेने ते मंजूर केले.

अशा संघेने फेड संसदेच्या पन्नासत राज संघातील घटकट करणाये ७३ वी घटना दुरुस्ती २० एप्रिल १९९३ रोजी मान्यता दिली आणि भारता विधी अमलवजावणी २४ एप्रिल १९९३ पासून सुरु

विद्यावार्ता: Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)

MAI MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.62759

Vidyawarta®

January 2018  
Special Issue

061

शाली केंद्र सरकारने राज्य सरकारंना पंचायती राज्य पध्दती मूळ करण्याकरिता कायदे करण्यास सांगितले. लोकसभेने ७३ वी व ७४ वी घटना दुरुस्ती कायदा केला.

**राज्य घटनेत करण्यात आलेला बदल —**

७३ व्या घटना दुरुस्ती कायद्याने पंचायती या विषयक खाली भाग ९ अ हा नवा भाग राज्य घटनेत समाविष्ट करण्यात आला आहे. त्यामध्ये कलम २४३ ने कलम २४३ आ अशी कलमे समाविष्ट केली आहेत. त्यामध्ये पंचायती आणि ग्राम पंचायती यांच्या विषयांची माहिती दिली आहे.

७३ व्या घटना दुरुस्तीने पंचायत राज्याची स्थापना करण्याचे बंधन प्रत्येक राज्यावर घातले आहे. त्यामुळे पंचायत राज्याची स्थापना ही अशा राज्यांची घटना एक जबाबदारी ठरली आहे. राज्य घटनेच्या २४३ अ या कलमान्वये राज्यामध्ये ग्राम, मध्य व जिल्हा स्तरावर पंचायतीची स्थापना करता येईल. याच ज्या ज्या लोकसंख्या वीस व्याख्याने कमी असेल अशा राज्यात मध्यमस्तरीय वरील पंचायतीची स्थापना करता येईल असे म्हणले आहे. अशी संकल्पना देण्यात आली आहे.

**घटना दुरुस्तीचा मुख्य उद्देश —**

पंचायत राज्य संस्थांना घटनात्मक दर्जा प्राप्त करून देणे हा ७३ व्या घटना दुरुस्ती कायद्याचा मुख्य उद्देश होता. या घटनादुरुस्तीमुळे पंचायत राज्य संस्थांना घटनात्मक संरक्षण मिळाले आहे. याचाच अर्थ असा होतो की, केंद्र सरकार आणि राज्य सरकार यांच्या प्रमाणे पंचायत राज्याच्यासाठी राज्य घटनेची मान्यता मिळाली आहे. या घटनादुरुस्तीमुळे राज्य सरकार आता पंचायत राज्याच्या बाबत पूर्वीप्रमाणे असतोय व सवमाना करू शकत नाहीत. पंचायत राज्य संस्थांच्या निवडणुका पणे त्यांच्या अधिकार देणे या गोष्टी आता राज्य सरकारच्या मजबूत पूर्वीप्रमाणे अवलंबून राहिलेल्या नाहीत. पंचायत राज्यामध्ये शासन करणाऱ्या राज्यात पक्षांना निवडणूक घेण्याकरिता अनुसूचित परिणती नसल्यास, स्थानिक स्वराज्य संस्थांच्या निवडणुकांना मूदतवाह देऊन निवडणुका पुढे ढकलल्या

जात असत. महाराष्ट्रात एकेकाळी निवडणुकांना मूदतवाह देऊन जिल्हा परिषद, पंचायत समिती व ग्रामपंचायतीच्या निवडणुका तब्बल १० वर्षांनंतर घेण्यात आल्या होत्या. आता दर पाच वर्षांनी निवडणुका घेण्याचे बंधन घालण्यात आले आहे. घटना दुरुस्तीमुळे राज्य घटनेमध्ये ज्याकाही तरतुदी असतील त्यांचे पालन करणे राज्य सरकारना बंधनकारक आहे.

**सर्व सामान्य माणसाला विकास काम व नियोजनात सहभाग देणारा कायदा —**

२४ ऑगस्ट १९९३ या दिवसापासून ७३ वी घटना दुरुस्ती अंमलात आली. यामुळे भारतातील सर्व राज्यात गावपालिके, जिल्हापालिके आणि या संस्थांमधील वास्तुचक्र विकास वट पालिके अशी विस्तृत पंचायत राज्य पध्दती मूळ झाली. महाराष्ट्रामध्ये १९९४ च्या मुंबई ग्रामपंचायत अधिनियमाने आणि १९९१ च्या महाराष्ट्र जिल्हा परिषद व पंचायत समिती कायद्याने ही अंगोदरन मूळ झाली होती. ७३ व्या घटना दुरुस्तीने त्यास घटनात्मक दर्जा मिळाला आहे.

स्थानिक स्वराज्य संस्थांना आपल्या वेगळ्या सामाजिक त्याच आणि आर्थिक विकासाच्या क्षेत्रांमध्ये निर्माण होणाऱ्या आणि अंमलबजावणी करण्याचे अधिकार दिल्यास ते विकासाच्या म्हणजेच समाज परिवर्तनाच्या कामात महत्त्वाची भूमिका त्यांची स्वतः निर्माण होण्यामुळे उत्तर सापल्याचा भावना निर्माण होईल. सामुदायिक कामांना चालवता मिळेल आणि ग्रामीण भागात त्यापेक्षा प्रमाणात स्थानिक नेतृत्वाना कार्य होईल असा या घटना दुरुस्तीचा उद्देश आहे. देशाच्या शासन व्यवस्थेमध्ये हा महत्त्वाचा टप्पा असून त्यामुळे स्थानिक स्वराज्य संस्थांना घटनात्मक दर्जा प्राप्त झाला.

या घटना दुरुस्तीतील कलम २४३ अन्वये गावकारभारात लोकतांत्रिक सहभाग वाढवणे या हेतूने ग्रामसभेचे आयोजन करणे हे ग्रामपंचायतीचे सर्जन, उपसर्जन व ग्रामसेवक यांच्यावर बंधनकारक केलेले आहे. गावच्या विकासाची दिशा व विचार केंद्र सरकारतील तसेच राज्य सरकारतील राज्यकल्पनांसाठी गावतील स्थानिक गावकरी, स्त्री, पुरुष अधिक चांगल्या पध्दतीने करू शकतात यावर या कायद्याने शिक्कामोर्तब केले.

✶**विद्यार्ता: Interdisciplinary Multilingual Refereed Journal | Impact Factor 5.131 (IIJF)**

MAH MUL/03051/2012  
ISSN: 2319 9318

UGC Approved  
Sr.No.62759

Vidyawarta®

January 2018  
Special Issue

062

संदर्भसूची -

१. पार्टील वा.भा., पंचायत राज, प्रशांत पब्लिकेशन, जळगाव - २०१२
२. पार्टील व्ही.व्ही., भारतीय राज्यव्यवस्था महाराष्ट्राच्या विशेष संदर्भग्रह के सागर पब्लिकेशन, पुणे, २००८
३. डोंयरे सतीश, साम प्रशासन पंचायत राज क नागरा प्रशासन, कॅलकस पब्लिकेशन, औरंगाबाद, २०१०
४. धोरसागर मोनल, तनपुरे संभाजी, फिद खंडद, पाथरकर सुभाश, महाराष्ट्रातील स्थानिक स्वराज्य संस्था, सवसंग पब्लिकेशन, पुणे २०१५
५. पळशीकर सुहास, विरमल नीतीन, महाराष्ट्राचे राजकारण-राजकीय प्रक्रियेचे स्थानिक संदर्भ, प्रतिमक प्रकाशन, पुणे २००४
६. <http://mr.vikaspedia.in/social-welfare/social-Awareness>

□□□

17

## ७३ व ७४ वी घटनादुरुस्ती व महाराष्ट्रातील पंचायतीराज व्यवस्थेतील महिलांचा सहभाग

कु. कोमल भालेराव

एम. वाय. सी.ए. राज्याशाखा,

महाराष्ट्रातील राजवळे कला व विज्ञान महाविद्यालय  
आदिनाथनगर, ता. पाथर्डी, जि. अहमदनगर

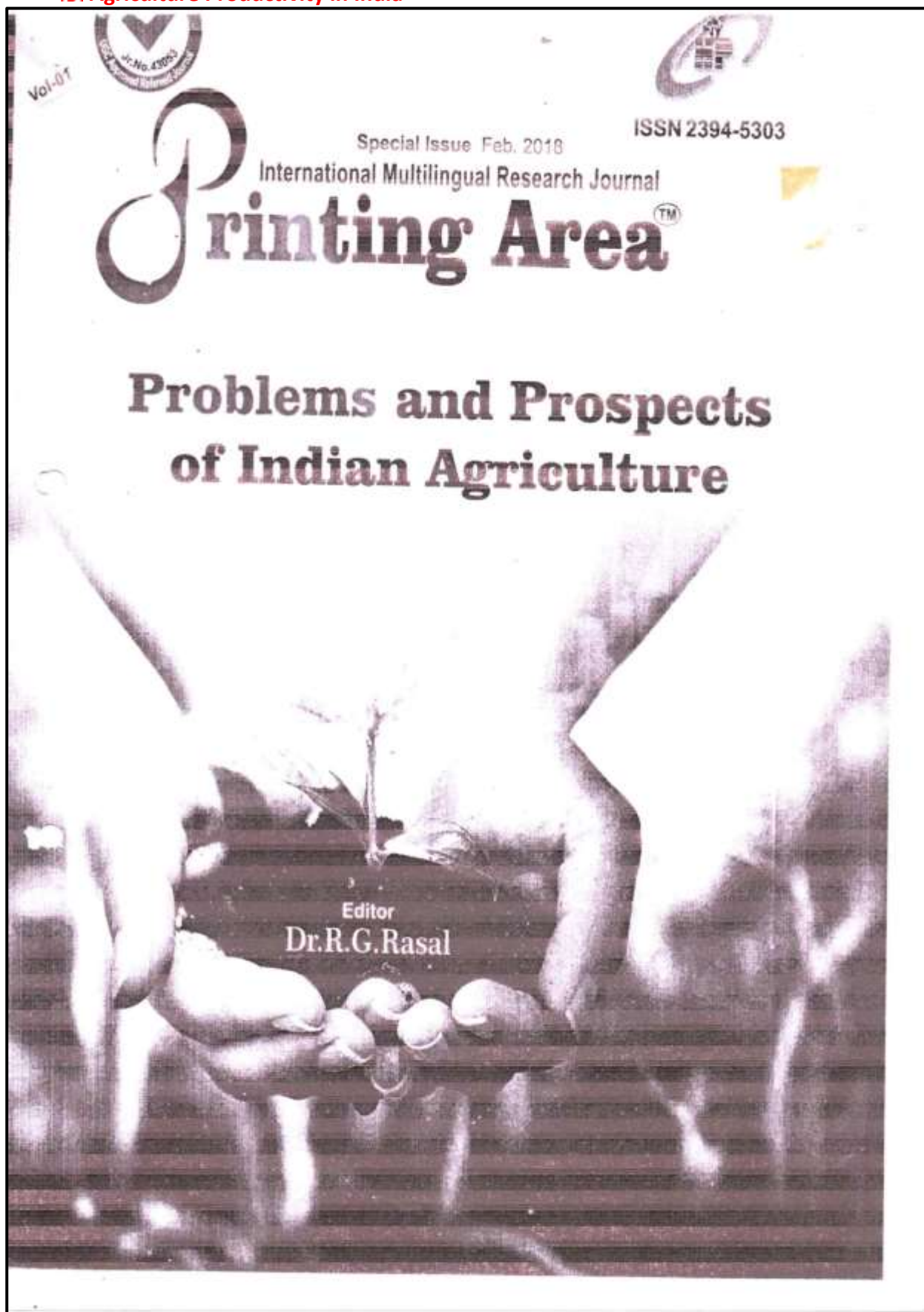
प्रस्तावना:

भाय्यासांगल्या लोकशाही प्रभान देशाम लोकशाहीने भवितव्य लोकशाहीभागावर अवलंबून आहे. २०११ मध्ये घेतलेल्या खानसुमांगेत भारतीची फर लोकसंख्या ही १२५ कोटी आहे. त्यात ६० को महिला आहेत. जवळपास अर्धी लोकसंख्या ही महिला आहे. राजकीय विचारयंत फेरीत स्त्री-पुरुष समानते वर्णन करत असताना मोठे विनिध मात्र वर्तुस्थितोदण उदारण देऊन स्त्री-पुरुष समानतेचा पुरस्कार कर आहे. तो म्हणतो, "पुरुष संरक्षण ज्या कार्यक्षमते कृपा करू शकतो त्या कार्यक्षमते स्त्री सुद्धा करू शकते." महिला वर्गाकडे दुर्लक्ष करणे म्हण समाजातील ५० टक्के उर्जेकडे किंवा मनुष्यबळाक दुर्लक्ष करणे होय.

लोकशाही व्यवस्था ही राजकीय सहभागाने अवलंबून आहे. अधिकाधिक लोकांचा सहभाग भरो लोकशाही हे समीकरण आहे. या पार्श्वभूमीवर लोकशाहीचा पायाभूत तटक असलेल्या पंचायतरा संस्थामध्ये सन १९९३ ला ७३ वी घटनादुरुस्ती कर पंचायतराजला घटनात्मक दर्जा यहाल करणाने आले. महिलांकाम्या ३३ टक्के आरक्षण देऊन त्यांना जाणोवपुरक राजकीय सहभाग वाढविलेला आहे. महाराष्ट्र शासनाने सन २०११ मध्ये पंचायतरा

विद्यार्त : Interdisciplinary Multilingual Refereed Journal Impact Factor 5.131 (IJIF)

49. Agriculture Productivity in India



ISSN: 2394 5303	Volume 5, Issue 1	Printing Area™ International Research Journal	February 2018 Special Issue	010
28)	Potential of Agro-tourism in Ahmednagar District, M.S., India N. M. Patil, Loni Kd., Dist. Ahmednagar,			117
29)	SEEEMPLOYMENT-IN CO-OPERATIVE DAIRY FEDERATION Mr. Dighe Machindra Bapurao			120
30)	Agro-tourism and its future in India: A brief review Prof. Ashok Rahane, Shrirampur			123
31)	Agriculture Productivity in India Prof. D. P. Sontakke, Parner			126
32)	Agriculture Marketing Dr. SASANE ASHOK NAMDEV, Pirangut, Dist. Pune			128
33)	Challenges before Indian Economy Prof. Randhavane D.S, Ahmednagar			132
34)	Government Policies and Agriculture Development Aurade Shankar Govind, Naldurg, Dist. Osmanabad			134
35)	IMPORTANCE OF AGRICULTURE IN INDIAN ECONOMY Dr. Ganesh Raosaheb Patil, Saikheda.			137
36)	NEW AGRICULTURE POLICY IN INDIA Dr. Kapadi Ambadas Sampat, Saikheda.			140
37)	Challenges before Indian Agriculture Dr. R. G. Rasal, Pravaranagar, Dist. Ahmednagar			144
38)	Impact of Special Economic Zones on the Agriculture Sector Dr. Sadashiv Sitaram Mengal, Taligatn Dabhade.			149
39)	Organic Farming and Indian Agriculture Dr. Samadhan Borse, Shirur, Dist. Pune,			151
40)	Organic Agriculture in India Prof. Mohan B. Shinde, Rajur, Dist. Ahmednagar			157
41)	Organic Aables - Status and Prospects Dr. B.D. Undre, Ahmednagar.			160

Printing Area : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr.No.43053

ISSN: 2394 5303

Impact Factor  
5.011 (IIJF)*Printing Area™*  
International Research JournalFebruary 2018  
Special Issue

0126

two and a half times more than the growth rate at global level. The scope of tourism has varied branches very often depending upon the purpose and circumstances under which the activity is being taken up. In India of late the unique tourism arteries that have gained momentum are health tourism (medical tourism), religious tourism, sports tourism, educational tourism etc. Agro-tourism is now an additional artery of the tourism sector in India. Though at present it is in nascent stage, with proper government incubation it can gain flight. There by introducing agro-tourism concept all over India not only the present growth rate can be sustained but it is also a value addition and can accelerate further growth.

#### References

- Krishna, A.G., 1993 "Case study on the effects of tourism on culture and the environment: India; Jaisalmer, Khajuraho and Goa"
- Honey, Martha and Gilpin, Raymond, Special Report, 2009, "Tourism in the Developing World - Promoting Peace and Reducing Poverty"
- Market Research Division, Ministry of tourism, GOI, 2009 "Tourism Statistics 2008"



31

## Agriculture Productivity in India

Prof. D. P. Sontakke,  
Head, Dept. of Economics,  
New Arts, Commerce & Science College,  
Parner.

#### Introduction:

Agriculture is the core sector of Indian economy; it accounts for about 34.8 percent of the national income and provides livelihood to 66.7 percent of the working population of the country. Agriculture is commonly grouped with farming, mining, forestry and fisheries under the head of primary industries. The importance of agricultural sector of the economy, rich/poor, is borne out by the fact that it is primary sector of the economy which provides the basic ingredients necessary for the existence of mankind. History of economic development of various advanced nations shows that development of their secondary and tertiary sector to some extent was preceded by the development of agriculture. Agriculture is the backbone of our country. Major part of country's income /population earns its livelihood from agriculture. It has also been the source of raw materials to our leading industries such as sugar, cotton, jute, textiles, hydrogenated oils, soap and other agro-based industries which together accounts for 50 percent of the income generated in the manufacturing sector in India. A sustained and wide spread agricultural growth is pre condition of development of a country like India which is an agrarian economy. The slow growth in agriculture whether allied or non allied can be of great strain for the economy.

**Printing Area** : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr.No.43053

ISSN: 2394 5303	Impact Factor 5.011(00P)	<i>Printing Area™</i> International Research Journal	February 2018 Special Issue	0128
-----------------	-----------------------------	---	--------------------------------	------

major food grains, yield per hectare, and production of major food grains from reports of Ministry of agriculture and Farmers welfare, 4th revised estimates of output of Reserve Bank of India, publications, newspapers etc. It has been observed that the data is showing a slow trend of increase of production, fall in area under cultivation, low rate of yield per hectare. These are the issues that Indian agriculture is facing these days most commonly low productivity of crops. These need to be sort out with the support of government by taking new initiatives as well as investments from private sector, cooperation of farmers, awareness campaign and last but not the least spread of education related to crops, seeds, fertilizers, irrigation, diversification etc.

**References:**

1. Time of India
2. Economics Times
3. www.wikipedia.com
4. RBI Reports

□□□

32

## Agriculture Marketing

Prof. Dr. SASANE ASHOK NAMDEV  
(Department Of Economics)  
Anantrao Pawar College, Pirangut.Tal-Mulshi  
Dist.-Pune

---

**Introduction:**

Agriculture is the most important sector of Indian economy. Indian agriculture sector account for 18% of India across domestic product. India is the world largest producer of rice, wheat, spices and spice product. The commitment of agribusiness in the national income in India is all the more, subsequently, it is said that agriculture in India is a backbone for Indian economy most of the Indians are directly or indirectly depending on the agriculture. Indian has the capacity to produce the food grains which can make vast difference in Indian economy.

Agriculture is the backbone of Indian economy as the economic development of this country is very much veiled upon the agriculture activities. Increase in the production of various agriculture products is not sufficient for the economic development process in this country. Agriculture marketing is the study of all the activities agencies and policies involved in the procurement of farm inputs by the farmers and movement of agriculture product from the farms to the consumers. Marketing is as critical to better agriculture as a farming itself. Marketing covers the entire sequence of activities starting from purchase, packing, grading, transportation and storage, wholesale and ultimately retail sale of produce.

**Agricultural Marketing: Definition**

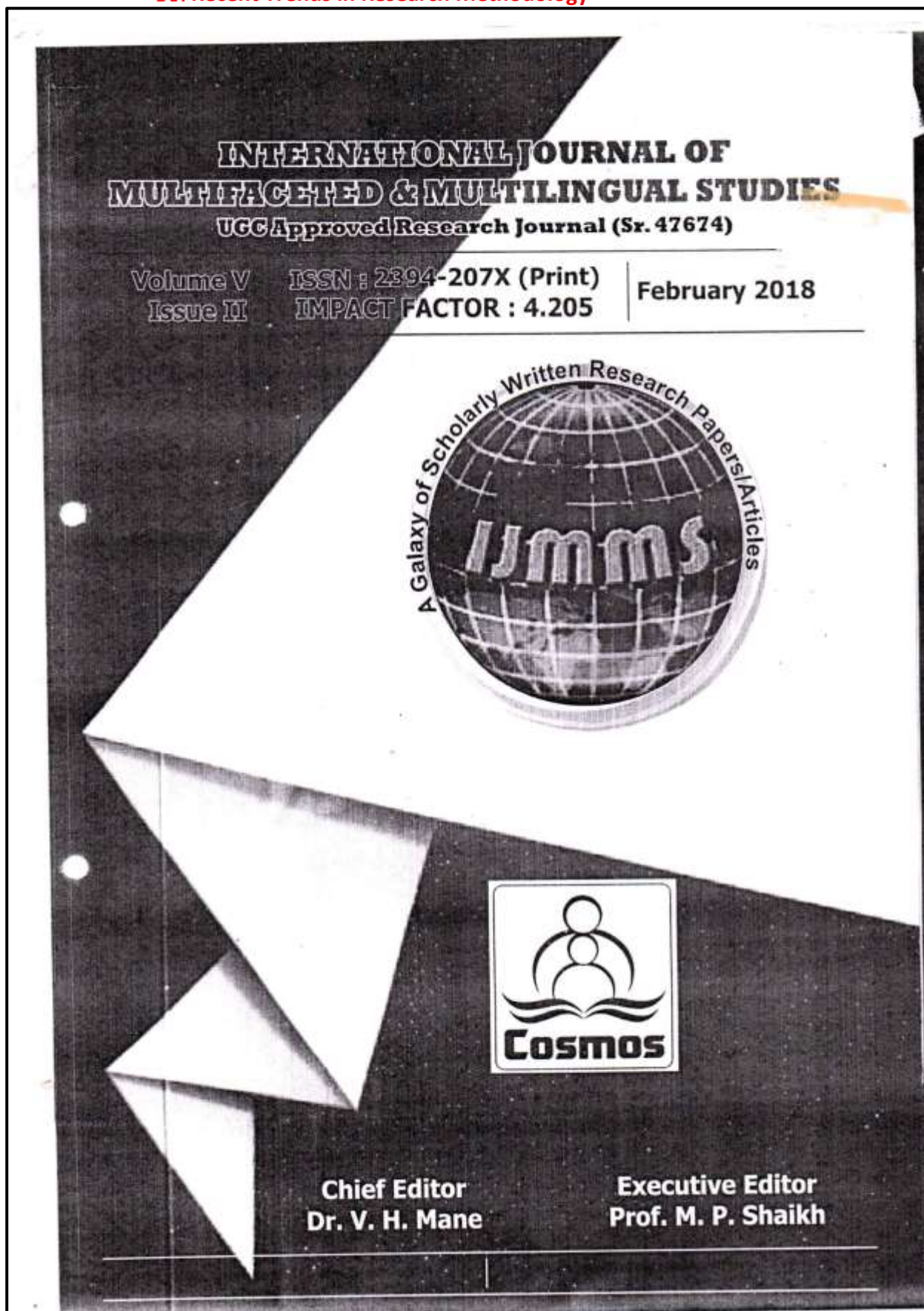
Agriculture marketing, therefore

**Printing Area** : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr.No.43063



50. Recent Trends in Research Methodology



VOLUME-V (II) Impact Factor: 4.205 ISSN (Print): 2394-207X  
INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

13.	Research Methods in Geography	Ramakant Kaspate	84-86
14.	Evaluation of Land use/Land-Cover Dynamics, Soil Properties and Surface Runoff of Vincharna-Bhor Watershed of Sina River Basin	Mr. Rajendra Mahadeo Shingate	87-90
15.	Assessment of Ecological Changes in Lonar Crater Lake	<sup>1</sup> Mrs. Pratibha P. Kale <sup>2</sup> Dr. Atul M. Jethe	91-93
16.	Geomorphic Study of Kurli Cliff Ratnagiri Maharashtra	<sup>1</sup> Raghunath N. Sawant <sup>2</sup> Dattatray P. Karande	94-100
17.	An Assessments of Socio-Economic characteristics and Rural Development: a case study of Pimpri Pathar Village in Parner Tahsil, Ahmednagar, Maharashtra	<sup>1</sup> Vikas Shantaram Jadhav <sup>2</sup> Jyoti Bhagwan Dhotre	101-107
18.	A Geographical Study of Tourism Potential in Karia Village, Maval Tahsil, Pune District Maharashtra	Kale Nilesh Ashok	108-111
19.	Tikekarwadi Developing As Smart Village in Junnar Tehsil, Pune District, Maharashtra	<sup>1</sup> D Nalwade <sup>2</sup> P. Mahakal <sup>3</sup> N. P. Kale	112-115
20.	Need of Enhancing and Sustaining Agricultural: A Case Study of Pimpalgaon (Alwa)	Dr. N.T.Deshmukh	116-120
21.	A Geographical Analysis: Typology of Market Centers in Washim District	<sup>1</sup> Pathan Maheboob C. Khan <sup>2</sup> Dr. Mane D.G.	121-124
22.	Recent Trends in Economics: Especial Reference to Implementation of GST in India and Its Impact on SME Sector	Dr. S.K.Dhage	125-128
23.	A Analysis of Fundamentals Research in Social Science	Dr.Kashide R.T.	129-130
24.	SHGs: The Tool of Women Empowerment in India	<sup>1</sup> Prof. Ramdas S. Jamnuke <sup>2</sup> Dr. Yashwant H.Ulvekr	131-135
25.	Recent Trends in Research Methodology	<sup>1</sup> Deepak Sontakke <sup>2</sup> Shivaji Pathare	136-138
26.	Social Research and Utility	Dr. N.G. Suryavanshi	139-141
27.	Social Science Research in Globalising India:Historical Development and Recent Trends	Dr. Vishal B.Pawase	142-145
28.	Review of Research Methodology	Kasbe Sachin Nagorao	146-148

February-2018

Website: [www.ijmms.in](http://www.ijmms.in)Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

VOLUME-V (II)

Impact Factor: 4.205

ISSN (Print): 2394-207X

INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

### Recent Trends in Research Methodology

<sup>1</sup>Deepak SontakkeHead, Dept. of Economics,  
New Arts, Commerce & Science College, Parner<sup>2</sup>Shivaji PathareAsst. Prof. Dept. of Commerce  
New Arts, Commerce & Science College, Parner.

**Introduction:** The term "research" is often loosely defined and thus used in a similar way. This unfortunate development results from a misconception about what is research. To properly understand what is research, it is good to start with common misconceptions about research. First, fact transferal is not research. Consider a typical high school research project. The teacher assigns a "research project" on some topic. The students went to the library, checked out several books, and might have copied several pertinent pages from the book. The typical student organized collected information and wrote up the "research report". What these students did is information gathering and organization; it is nothing more or nothing less. No doubt the student went through some motions associated with research. But finding fact and fact transferal alone is not research. Transfer of information from one source, namely books and pertinent pages, to another source, namely the so-called research report, is nothing more than fact transferal, but not research. To my distress I find many college students repeat this same mistake by submitting a 'research report' which is nothing but fact transferal from one source to their report.

A research method is a systematic plan for conducting research. Sociologists draw on a variety of both qualitative and quantitative research. methods, including experiments, survey research, participant observation, and secondary data. Quantitative methods aim to classify features, count them, and create statistical models to test hypotheses and explain observations. Qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances.

It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained.

#### Objective

Above research work is undertaken for the purpose of to find out the recent trends is research methodology.

**Research Methodology:** Secondary information is used in this research paper which is collected from different secondary sources.

Eg. Books, Journal, Websites and Magazines etc.

**Data Analysis:** According to Vanderbilt University, Economics is the study of how people choose to use resources including time and talent people have available, the land, buildings, equipment,

February -2018

Website: [www.ijmms.in](http://www.ijmms.in)Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

Page 136

VOLUME-V (II)

Impact Factor: 4.205

ISSN (Print): 2394-207X

INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

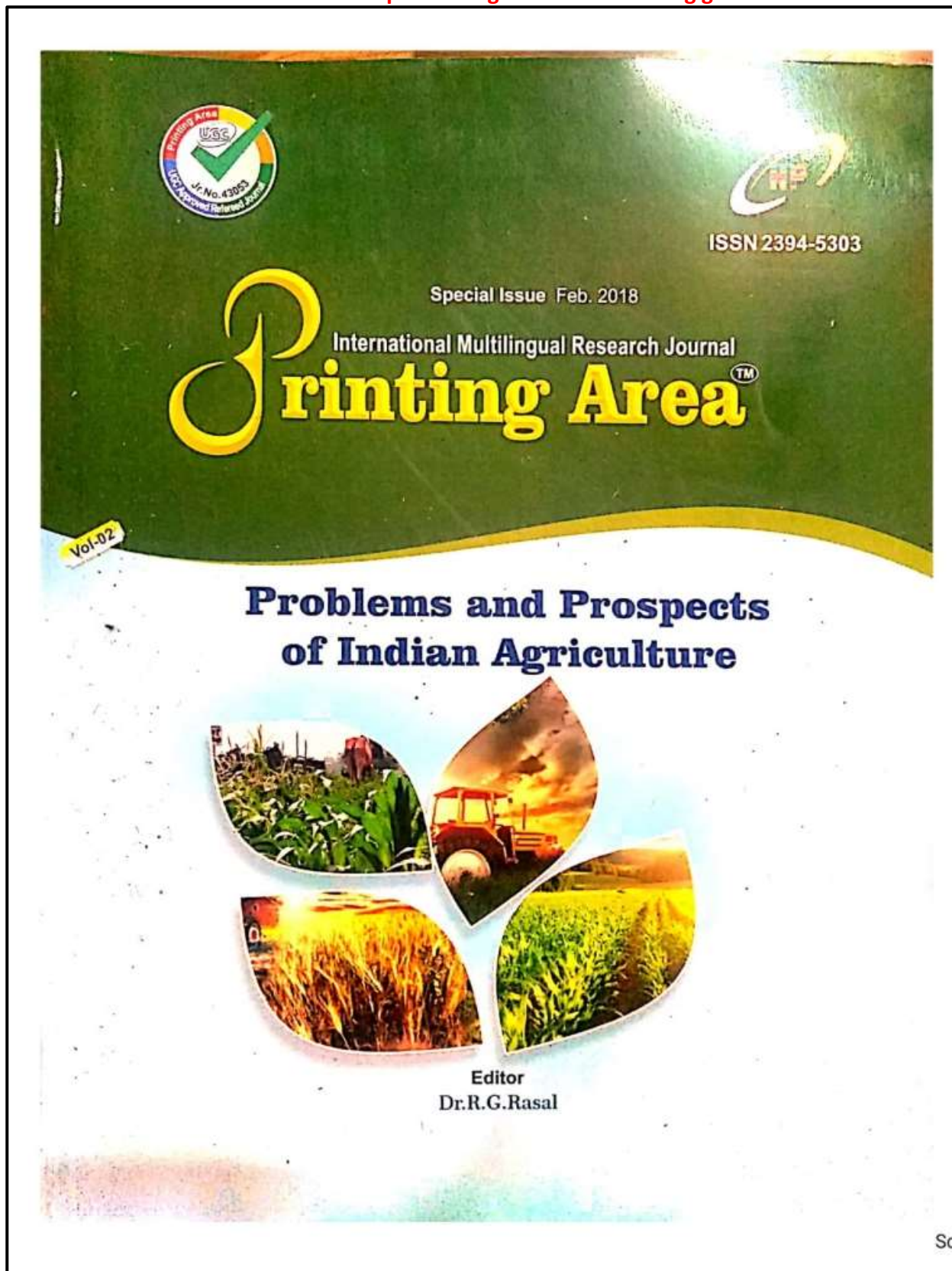
**5. Design-based research:** The aim of this methodological description is to illustrate the application of mixed methods research in architectural design using a hybrid model consisting of a taxonomy development model and an embedded quasi-experimental model. The research employed qualitative and quantitative methods to explore the design of an architectural intervention and determine its effectiveness in improving environmental knowledge, attitudes, and behavior among primary school students. It also outlined strategies adopted to overcome the challenges related to the use of a hybrid design. Combining sequential and embedded mixed methods designs is a relatively new approach in architectural research, providing new insights that contribute to future mixed methods exploration in the field of design and planning.

**Conclusion:** From the above study it is clear that **Digital Qualitative Methods, Online Interviews and Focus Groups, Applied Anthropology methods, qualitative/ethnography, Complexity theory and Design-based research** are the recent origin concepts in research methodology.

**References:**

1. Book on 'Research Methodology'- by Ranjit Kumar.
2. Books on 'Research Methodology Techniques and Methods'- By C. R. Kothari
3. [www.wikipedia.com](http://www.wikipedia.com)
4. [www.connection.sagepub.com](http://www.connection.sagepub.com)
5. International Journal of Social Research Methodology

51. Problems and Prospects of Agriculture Marketing goods



ISSN: 2394 5303	Impact Factor 5.011(IJRF)	<i>Printing Area</i> <sup>TM</sup> <i>International Research Journal</i>	February 2018 Special Issue Vol.02	06
14) PROBLEMS AND PROSPECTS OF AGRICULTURAL MARKETING GOODS Dr. Ashok Ghorpade, Dr. R. G. Rasal, Pravaranagar.				49
15) Spatial- temporal study of agricultural work forces in Akole.... Gadekar Deepak Janardhan, Dr. P.H. Mhaske				53
16) Agricultural Productivity in Ahmednagar District, Maharashtra. Gulave Santosh Dattatraya, Pravaranagar				57
17) Agriculture: Backbone of Indian Economy Aurade Shankar Govind, Naldurg				61
18) जागतिकीकरणाच्या संदर्भात भारतीय शेती प्रा. एस.जी.मूंज, प्रा. जी. जी. गायकवाड, गडहिंग्लज				64
19) भारतीय अर्थव्यवस्थेत शेती क्षेत्राचे योगदान प्रा. डॉ. भोसले आर. डी., मनमाड, जि. नाशिक				66
20) भारतातील कृषी क्षेत्रासाठी विविध पंचवार्षिक योजनेत वेलेली सार्वजनिक तरतूद व प्रत्यक्ष खर्च डॉ. शिवाजी पाते, परभणी				68
21) 'शेतकऱ्यांच्या आत्महत्या : कारणे आणि उपाय' प्रा. डॉ. सुदाम वसंतराव पवार, लातूर				71
22) नवीन कृषी तंत्रज्ञानाच्या वापराना कृषी उत्पादन व उत्पन्नावर झालेला परिणाम..... प्रविण सुरेशराव शिंगणे, डॉ.कल्याणकर पी.एम.				76
23) भारतातील अन्नसुरक्षा समस्या व उपाय प्रा.नलिनी विठ्ठल पाचर्णे, औंध, पुणे.				81
24) कृषीक्षेत्रामध्ये सौरऊर्जेचा वापर : एक अयंशास्त्रीय अभ्यास मनेष गंगाराम खटावे, नांदेड				84
25) भारतीय शेतीमधील विविध पैलूंचा संशोधनात्मक अभ्यास प्रा.हर्षवर्धन दामोदर जाधव, अमळनेर				88
26) भारतीय शेती : एक शापित प्रा. डॉ. कृष्णा शंकर शहाणे, नाशिक				91

ISSN: 2394 5303

Impact Factor  
5.011(IIII)*Printing Area*<sup>TM</sup>  
International Research JournalFebruary 2018  
Special Issue Vol.02

049

as a safety net for farmers through a guarantee that if their produce is left unsold in the market, will be bought by the government. Another purpose was to incentivize farmer to produce more crops so as to ensure food security in India.

#### References

- <http://www.insightsonindia.com/2014/11/14/agriculture-issues-related-minimum-support-prices-msp-wto-subsidies/>
- <https://www.inflibnet.ac.in/ojs/index.php/MI/article/viewFile/4887/3579>
- <https://scroll.in/article/841346/farm-protests-why-the-governments-promise-to-buy-crops-at-minimum-support-prices-is-often-hollow>
- <http://www.economicdiscussion.net/agriculture/problems-agriculture/indian-agriculture-problems-7-major-problems-of-indian-agriculture/12859>
- <http://questessay.com/agriculture-insurance-in-india-problems-and-prospectus/>
- <http://www.thehindubusinessline.com/opinion/columns/all-you-wanted-to-know-about-minimum-support-prices/article8697244.ece>
- [www.igidr.ac.in/pdf/publication/WP-2012-014.pdf](http://www.igidr.ac.in/pdf/publication/WP-2012-014.pdf)
- [https://thewire.in/52228/what-is-the-future-of-agriculture-in-india/icrier.org/pdf/Price\\_Distortions\\_in\\_Indian\\_Agriculture\\_2017.pdf](https://thewire.in/52228/what-is-the-future-of-agriculture-in-india/icrier.org/pdf/Price_Distortions_in_Indian_Agriculture_2017.pdf)
- [www.thehindu.com/2001/09/13/stories/0413211e.htm](http://www.thehindu.com/2001/09/13/stories/0413211e.htm)



14

## PROBLEMS AND PROSPECTS OF AGRICULTURAL MARKETING GOODS

Dr. Ashok Ghorpade,

Asst. Prof. Dept. of Economics  
New A. Com. & Sci. College, Parner

Dr. R. G. Rasal,

Vice Principal, Head Dept. Of Economics  
P.V.P. College Pravaranagar.

#### Introduction:

India is basically an agrarian society where sole dependence has been on agriculture since time immemorial. In the olden days, the agricultural produce was fundamentally barter by nature where farmers exchanged goods for goods and also against services. Gradually the scenario changed with the changing times and agriculture produce began being sold with an element of commercial value. Trading of agriculture produce began for exchange of money. And from trading to marketing of agricultural produce began although mostly it is a way of traditional selling. The marketing as a term is broader than traditional trading. And agricultural marketing as a concept is still evolving in the Indian agrarian society.

#### Objectives of the Study :

- The objectives of present studies are,
- To study the problems and prospect on agriculture marketing in India.
- To provide suggestions for their improvement.

#### Research Methodology:

The study focuses on extensive study of Secondary data collected from various books,

**Printing Area** : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr.No.43053

ISSN: 2394 5303

Impact Factor  
5.011(IJIF)*Printing Area™*  
*International Research Journal*February 2018  
Special Issue Vol.02

050

National & international Journals, government reports, publications from various websites which focused on various aspects on agriculture marketing. The accessible secondary data is used only for study.

#### Problem Agricultural Marketing Goods:

##### 1. Lack of warehousing and storage facilities

(cold storage or otherwise): Farmers have to sell out their produce as soon as it is ready because there is a lack of adequate number of warehousing and storage facilities in India. It results in getting poor prices by the farmers. Most of the existing storage facilities are having very poor quality (are in very poor condition) which also affects the quality of the agricultural produce.

##### 2. Lack of transportation facilities:

Agricultural sector is affected mostly by lack of transport facilities which includes all weather roads, approp transporting perishable goods and lack of linkage roads to mandis. Due to this, a chunk of money is expanded over transportation.

##### 3. Lack of Agricultural Credit facilities:

Lack of availability of cheap credit facility and high dependence on informal credit channel has affected the expansion and modernisation of agricultural productivity. Due to rigid norms of banking sector, farmers are forced to borrow money from moneylenders at a very high rate of interest. They use to sell their produce at the earliest to repay the amount taken from moneylenders to avoid heavy interest charge

##### 4. Lack of Uniformity in Grading and Standardisation:

Lack of proper grading facilities and standardised measures for categorisation of agricultural produce at the farmers' level results in weak bargaining power and sale of produce at the lower pricon Marketing.

##### 5. Poor Handling, Packing, Packaging, and Processing Facilities:

Lack of proper instruments for handling and processing and lack of scientific techniques

for packaging of agricultural produce result in heavy wastage and loss to the farmers. Poor handling and packaging expose the product to substantial physical damage and quality deterioration.

##### 6. Lack of market information:

Generally, in rural areas there is unavailability of proper infrastructure. Many villages are still out of the reach of Information and Communication Technology. Due to this, farmers are unaware of the present and future prices of their produces prevailing in big markets. Thus, they have to accept any price for their produce offered by middlemen.

##### 7. Presence of large number of middlemen:

Due to lack of proper transportation, warehousing and infrastructural facilities farmers are forced to sell their produce at the point of origin. This widens the scope of middlemen as farmers are not directly connected to consumers. These middlemen charge abrupt high prices of these agricultural produce from the customers and also resort to malpractices like hoarding and black-money.

##### 8. Inadequate Research on Marketing:

All the efforts of the government are directed towards maximising the agricultural production but less emphasis has been given on the conduction of new researches for developing new marketing, storage, warehousing and preservation techniques. There is also need for research on consumer demands and preferences, handling and packaging

##### 9. Lack of Farmers' Organisation:

In India, the farmers are in scattered form and they use to sell their produces individually. This high dependence on informal credit channel has affected the expansion and modernisation of agricultural productivity. Due to rigid norms of banking sector, farmers are forced to borrow money from moneylenders at a very high rate of interest. They use to sell their results in distribution of small amount of agricultural produces with high cost of transportation. Along

**Printing Area** : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr. No. 43053



ISSN: 2394 5303

Impact Factor  
5.011 (IIJIF)*Printing Area™*  
*International Research Journal*February 2018  
Special Issue Vol.02

051

with this, farmers have not any authorised body to guide and protect their businesses.

#### 1. Technological Measures:

Initiation of measures to increase agricultural production substantially to meet the growing needs of the population and also to provide a base for industrial development included steps to increase both extensive cultivation and intensive cultivation. For the former, irrigation facilities were provided to a large area on an increasing basis and area hitherto unfit for cultivation was made fit for cultivation.

#### 2. Land Reforms:

Land reform measures to abolish intermediary interests in land and transfer of land to actual tiller of the soil were expected to be taken up on a priority basis. Measures taken under this head included:

#### 3. Institutional Credit:

After nationalisation of banks in 1969, nationalised banks have paid increasing attention to the needs of agriculture. Regional Rural Banks were also set up to deal specially with the needs of agricultural credit. A National Bank for Agriculture and Rural Development (NABARD) was also set up.

#### 4. Procurement and Support Prices:

Another policy measure of significant importance is the announcement of procurement and support prices to ensure fair returns to the farmers so that even in years of surplus, the prices do not tumble down and farmers do not suffer losses. This is necessary to ensure that farmers are not 'penalized' for producing more. In fact, the policy of the Commission for Agricultural Costs and Prices has been adopted to announce fairly high prices in a bid to provide incentive to the farmers to expand production.

#### 5. Input Subsidies to Agriculture:

The objective of input subsidisation is to increase agricultural production and productivity by encouraging the use of modern inputs in agriculture. Under the government policy, various inputs to the farmers are supplied

at prices which are below the level that would have prevailed in the open market.

#### 6. Food Security System:

In a bid to provide food grains and other essential goods to consumers at cheap and subsidised rates, the Government of India has built up an elaborate food security system in the form of Public Distribution System during the planning period. PDS not only ensures availability of food grains at cheap prices to the consumers but also operates as a 'safety net' by maintaining larger stocks of food grains in order to combat any shortages and shortfalls that might occur in some years and/or in certain areas of the country.

#### 7. Targeted Public Distribution System (TPDS):

The Government has streamlined the PDS by issuing special cards to people below poverty line (BPL) and selling essential articles under PDS to them at specially subsidised prices with better monitoring of the delivery system.

Under the new system the states are required to formulate and implement foolproof arrangements for identification of the poor, for delivery of food grains to fair-price shops and for its distribution in a transparent and accountable manner at the FPS level. Under TPDS each poor family is entitled to 10 kg of food grains per month at specially subsidised prices. With effect from April 2002, the BPL allocation of food grains was increased from 20 kg (in April 2000) to 35 kg per family per month. According to Economic Survey 2007-08, 73% of the poor and very poor families were benefited from TPDS.

#### 8. Rural Employment Programmes:

PDS alone cannot serve as an effective safety net. This is due to the reason that unless the poor have adequate purchasing power they cannot buy their requirements from the PDS. Therefore, large-scale poverty alleviation programmes in the form of rural employment programmes are required to provide purchasing power to the poor.

**Printing Area** : Interdisciplinary Multilingual Refereed Journal

UGC Approved  
Sr.No.43053

ISSN: 2394 5303

Impact Factor  
5.011 (IJJF)*Printing Area™*  
International Research JournalFebruary 2018  
Special Issue Vol.02

052

**Suggestion Of Agricultural Marketing Goods:****1. More investment in Market Research and Surveys:**

To make the agricultural marketing more effective it is required to conduct marketing research in the field of agriculture on regular basis. This involves huge amount to conduct marketing research to get the real and effective solutions for agricultural problems. For this, the government should allocate sufficient amount for marketing research and survey.

**2. Dissemination of marketing information:**

The government has made various efforts to provide marketing information to the farmers relating to market trends, market price, consumer behaviour, technical equipments, etc. This information should be provided to the farmers in time so that they can use this information for improving their performance in agricultural marketing.

**3. Establishment of regulated market:**

The govt. of India has established number of regulated markets in all over India. But it is insufficient to serve large number of population of the country.

**4. Storage and warehousing facilities:**

The government should extent and construct additional storage and warehousing facilities and improve their features to improve and retain the qualities of agricultural produce of the farmers. The government should provide loan facilities to the farmers for storage facilities.

**5. Improvement and extension of transportation facilities:**

It is suggested that the government should make investment for the improvement and extension of roads and transportation facilities for connecting the villages with mandis. This will help the farmers to sell their produce to the customers directly, i.e. without taking the services of number of intermediaries.

**6. More easy norms for credit facilities:**

The banks are providing credit facilities to the farmers but it is insufficient for completing their requirements. Marginal and

small farmers are facing los of problems for getting credit facilities. For this, the government should make adequate arrangements for providing loans to the farmers on more easy norms.

**Conclusion:**

In this paper it is concluded that if the government and farmers work together the problems of marketing agriculture products can be solved. The Central and State government should frame policies to protect the welfare of the farmers, because farmers are the backbone of Indian economy. The government should provide special incentives and motivation to the farmers to incorporate an agriculture based production and marketing companies in their location.

**References:**

1. Pillai R.S.N and Bagavathi (2010) "Modern Marketing Principles and Practices", S.Chand & Company Ltd, New Delhi.
2. Vadivelu. A and Kiran. B. R (2013) "Problems and Prospects of Agricultural Marketing in India: An Overview" International Journal of Agricultural and Food Science Universal Research Publications.pp.108-118.ing.
- 3• Hoda, A. & Terway, P.(2015). Credit Policy for Agriculture in India – An Evaluation, Indian Council for Research on International Economic Relations.
- 4• Kahlon, A.S., & Tyagi, D. S. (1983). Agricultural Price Policy in India. Allied Publishers Pvt.Ltd. New Delhi.
- 5• Kashyap, P., & Raut, S. (2006). The rural marketing book. Biztantra, New Delhi, India. • Megagriculture.gov.in/public/marketing/agri.marketing.aspx
- 6• Rajendran, G & Karthikesan, P (2014). Agricultural Marketing in India – An Overview, Asia Pacific Journal of Research 1 (17) 159-164.
- 7• Report on warehousing in India study commissioned by the Warehousing Development and Regulatory authority (2015) National Institute of Public Finance and Policy.

**Printing Area : Interdisciplinary Multilingual Refereed Journal**

UGC Approved  
Sr.No.43053

**52. Working Women having Stress at Home and Work Place and its Management with Reference to Ahmednagar District Rural Area**

**INTERNATIONAL RESEARCH JOURNAL OF  
MANAGEMENT SOCIOLOGY & HUMANITIES**

ISSN 2277 – 9809 (online)  
ISSN 2348 - 9359 (Print)

A REFEREED JOURNAL OF



Explore Innovate Educate

**Shri Param Hans Education &  
Research Foundation Trust**

[www.IRJMSH.com](http://www.IRJMSH.com)  
[www.SPHERT.org](http://www.SPHERT.org)

Published by ISaRa

**Working Women having Stress at Home and Work Place and its Management with Reference to Ahmednagar District Rural Area****Dr. Sunita Sadashiv Thube****(M.Com., MCM, M.Phil., Ph.D.)**

**Abstract :** Today we find that the responsibility and role of Indian women is changing rapidly. Tremendous changes in the whole society like traditional values, education, industrialization, competitions, high profile career goals and high prices have changed the role of women. Many of them not only look after their home and family but also opt for jobs. Some of them are career oriented while some work to help their family economically with the income earned. Today not only men are considered as bread earners but women too are considered the same. Balance in all diverse roles has to be sought by her and accomplish all the responsibilities alone. By managing duties and responsibilities at home, society and work place it causes tension and stress arises as how to accomplish all the tasks on time that too effectively and efficiently. Thus, when tension starts accumulating they have to face problems of poor health both physically and mentally. The objective of the study is to study the factors which cause stress on working women in rural areas, who have home stress and work place stress. It is seen that working women in places like home, work place and in the society are not content with the working environment provided for them and have stress problems. Managing obstacles is not an easy task for a working women but she is trying to maintain balance in all.

**Keywords :** working women, home place, work place, family, household

**Introduction :** Formerly in the olden days the responsibility or work of a woman was to look after her family and her home. She did not share the responsibility of earning and providing economical assistance for home and family. At present like men, women too are working and also performing the duties related to their home and society. Education plays a vital role in women career advancements. Jobs are given according to the educational qualifications or work profile. Even work experience is considered to get jobs. The standard of living and life style has changed. Day by day there are increased price rates for essential commodities and livelihood is

not easy as before. Challenges faced in a working place for a woman are many in every field and at all levels of position. They work on permanent basis and contract basis. In the low level where women are working face issues related to low wages, inconsiderate treatment, few holidays or leaves, lack of respect and extra work demands. Majority of the staff working here is men which gives an unsecured feeling. The next is the middle level where the salary is low and compared to it more work, legal protection is not provided, harassment, work shifts, working conditions are poor, unsecured job and are not able to work according to the organizations expectations, as they are not able to have a balance in their varied responsibilities and tasks. At the topmost higher level, high demanding job, work pressure is excess, strict organization policies and transfers are the challenges faced by the working women. Relating to all the levels, one can find some factors which increase women challenges at workplace relating to socio-cultural effect. Gender difference if exists in the working place than it can affect the senior subordinate relationship and the working environmental overall.

With the increased need of getting more income at home, women work harder. She tries to maintain the balance at home and workplace but if the job demands more time and efficacy than she is unable to give proper, required and quality time at home. She is not able to give required time for herself and family and adjustments start both at home and work place to cope with both responsibilities. To make adjustments she does job work at home mostly at night times and cuts off her sleeping or personal time. This brings resentment at home, workplace, society and she herself is not satisfied as she is unable to handle work with proper time management. This change brings about stress both mentally and physically which because of lack of proper work management and time management passes on to all the work she does. If given job is not accomplished according to its requirement or expectations then the stress and frustration level goes up causing poor health effects. Her mind is disturbed and if this goes on, she is not able to handle the situation effectively, efficiently and tactfully and face harassment from the superiors at work place and people at home too. She is unable to please them or give proper satisfaction from her work or the responsibilities she shares. Male dominance in the society also leads women harassment and to prove her ability women has to work harder than men to achieve quality in her job. There is also gender discrimination regarding payment. Sometimes due to

IRJMSH Vol 9 Issue 7 [Year 2018] ISSN 2277 – 9809 (Online) 2348–9359 (Print)

**Selection of sample :** Ahmednagar is the district of Maharashtra State in India, having a population of 4,5,43,159 according to the 2011 census. Among them the male population is 2,342,825 and female population is 2,200,334. In rural areas the male population is 1,872,907 and female population is 1, 757,635. 79.05 is the literacy rate of Ahmednagar district. The male literates in rural areas are 86.82 % and females are 70.89 %. The study being limited to working women in the Ahmednagar district rural area, total 200 working women having home stress and work place stress. This was divided into two types : permanent basis (70 in number) and contract basis (130 in number ) women workers, selected on random selection basis. Data required was collected by observation and by asking questions through questionnaire.

**Context of the study :** In Maharashtra there are total 36 districts. Ahmednagar is the largest district in Maharashtra. It has 14 talukas. On the banks of river Sina, Ahmednagar district is situated. It spreads over 17412 square kilometers. According to the Brief Industrial Profile of the Ahmednagar District – MSME – Development Institute ([www.msmedimumbai.gov.in](http://www.msmedimumbai.gov.in)) there are total number of 2849 Large Scale, Cottage and Village Units (2011-12).

#### **Review of Related Literature :**

Vijaya Mani (2013) 3: Focused on the main factors which influence the working life balance of women professionals in India like – dissemination in gender, role confide, politics in organization, time management issues, social support and health issues.

N.Gayathri and P.Karthikeyan, (2013) 1: According to them work life balance involves that only ones own effects but also the effects of the colleagues, the society environment in which they are living, household conditions (family life), the organization environment in which she works for. For having work life balance all levels it requires mutual understanding with respect for each others.

Shalini and Bhawana, (2012) 7: In, their survey have stated that the organizations in which the woman is working uses the quality work life as a strategy tool for attracting and retaining the employees. It also helps them in maintaining work life balance by having equal attention on their performance and work commitment.

---

International Research Journal of Management Sociology & Humanity ( IRJMSH ) Page 163  
[www.irjms.com](http://www.irjms.com)

IRJMSH Vol 9 Issue 7 [Year 2018] ISSN 2277 – 9809 (Online) 2348–9359 (Print)

Heather S. MC Millan et al, (2011) 2: According to him individual harmony and individual harmonies' effects have developed a new harmony which is based on their conflicts and enrichment. In having co-ordination of balancing their personal family like and work life, it is alone while experiencing work family conflict. For having job satisfaction and efficient and effective work performance through the married working women the organizations in which they are working should formulate such guidelines which will help them is harmonies or balance their work family conflict.

K.Santhana Laxmi, et al, (2013) 6: Reseated on the work life balance of women working in educational institutions. According to their examinations, they have found that for having work life balance specially related to women, needs a holistic approach for supporting the teaching staff in managing their work life balance.

Goyal and Arora (2012) : In their study have attempted is measure the total impact of working as work pressure on working women's family life and their family expectations of these women's work commitments who are 120 teachers from different educational institutes. It was found in their study, the factors like long working hours, family commitments, negative support while working, health issues, safely and their work load create stress on them and also an imbalance in both their professional and personal lives.

S.Rajesh and Manoj P.K. (2016) : Investigated respondents who were personally contacted for intensives duty time hours. They found that due to work in shifts, job insecurity, poor working environment, low salary, lack of security and legal protection, harassment at work place contributed is dissatisfaction amongst study stating that, is create awareness of all aspects in the women working workforce, there is a need awareness programs.

MS.Shivi Mittal, MS Sapna Sharma and Prof.(Dr.)Prabhat Shrivastawa (2014): They have researched on working women's who on work field area face gender challenges. According to them women do not have maternal leaves as required and also consideration for higher posts is not considered. In such organizations they also have mental and physical stress. There is no effective mechanism regarding many law implementations where interest related is women are considered.

---

International Research Journal of Management Sociology & Humanity ( IRJMSH ) Page 164  
[www.irjmsb.com](http://www.irjmsb.com)

IRJMSH Vol 9 Issue 7 [Year 2018] ISSN 2277 – 9809 (Online) 2348–9359 (Print)

Dr.Patil Amol and Ashok Kumar (2017) : In their study method research design was descriptive type where method of sampling was also adopted. According is them there is suppression of women and etc. also discriminated at visit place of their home. Wearing women take lots of hurdles in maintain a balance between their work life and at home. They are unable is spend quality time with their families.

Paul Agarwal (2014) : has focused on how working women employees should be provided with programs that will help is restore their mental happiness. Work life programs help to improve the moral of the working women reducing their absenteeism and have organizational working knowledge. It helps is reduce stress and improve quality of work both at home and workplace.

Sachine Pawar, K.C.Ramotra (2016) : In their analysis they have revealed that here being a significant spatial variation in the women states at the level of "tahsil". These analysis have also made progress regarding industrialization and urbanization are also better regarding women status from 1991-2011. Consistently there was all identification of Nagar Tahsil having lightest level position working women's during 1991-2011. There was lowest level of position identified in Shevgaon and Jamkhed in the year 1991 and 2011 respectively. Shevgaon and Jamkhed tahsil are a bit fast in progress when composed to other tahsils. Tahsils like Parner, Karjat, Newasa, kole and Pathardi, for over last two decades are having a category of modulate level. This is so because of Sangamner, Kopargaon and Rahuri Tahsil have been consistently maintaining high status in this period. This improvement is due to women's higher literacy rate and in parallel the increased rate of women's working in the agricultural billed. The obstacle in progress of woman status is due to decline in sex ratio, women discrimination.

Popat P. Pahare and Chandrashekhar J.Hiware (2017) : According is their survey conducted they have tacked that, in rural India the women's economic conditions have been some critical due is improves work in their hand. In Ahmednagar rural areas sericulture is one of the best occupation and employment producing industry. Women empowerment is possible through this sericulture industry. This paper has its main focus over women farmers' participation in mulberry sericulture. From the very past years in India, the female gender has played and will also play a very important role in the development of agriculture and its allied fields. Sericulture helps the

---

International Research Journal of Management Sociology & Humanity ( IRJMSH ) Page 165  
[www.irjmsh.com](http://www.irjmsh.com)



women workers in increasing their economic conditions. Sericulture activity is noted as labors intensive which is also an aid to women's for their self development. In Ahmednagar district, women empowerment is possible through Sericulture industry.

**Methodology :** The study was to analyze factors which cause stress of working women's at home and work place in rural areas in a descriptive way. To collect data, survey method was used and it was collected from women working in industries.

**Selection of sample :**

Total 200 working women having home stress and work place stress are selected. This was divided into two types : permanent basis (70) and contract basis (130) women workers, selected on random selection basis. Data required was collected by observation and by asking questions through questionnaire.

Table No. 1

Working women work type

Work Type	Total No.
Permanent Type	70
Contract Type	30
<b>Total =</b>	<b>200</b>

Source: Questionnaire

**Interpretation of Data :**

70 working women of permanent type, 100 working women of contract type from Ahmednagar rural area were selected.

**Age wise selection of sample :**The age wise selection is done according to women workers opting for a job at the age of 25 to 35 because at this time many of them have attained the qualifications required for the job and have to share economic responsibilities at home. Some of them join service sector for growth and career advancement. Many of them are fresh joiners and do not know their job related responsibilities. They are in the learning stage and are becoming

known to the work environment. The age group of 36 to 47 is where they are quiet settled in their job and have experience in performing their job related tasks. They are able to perform their job with better ability and efficiency. Here the company may face women employee turnover because of marriage, their opting for other better jobs due to their work experience, their household problems, transfers, not able to adjust in the work environment, feeling of over worked and tired due to dual role as house wife and service women and for other reasons. 47 to 56 is that age group in which they are well settled in their service and now share face the problems related to health because of age factor, their children are growing up and need more attention at home and in their studies, they have to share higher level of home responsibilities e.g. their in laws are now old and require more attention and also share their responsibilities which they were doing to some extent, they have to play many roles at home because of their growing importance as bread earner and matured person, their age factor or they being elder in the family or relatives and others. Age group between 57 and above is where many of them face physical, mental and psychological or health problems. Many of them may be doing service because it's the need of the hour to provide some economical assistance at home, because they feel like doing job, or because they want to have facilities given after retirement by the organization like provident fund, gratuity and other.

Table No. 2  
Age wise selection of sample

Age group	Permanent Type	Contract Type	Total
25 – 35	15	28	43
36 – 46	25	55	80
47 – 56	22	34	56
57 & above	08	13	21
<b>Total =</b>	<b>70</b>	<b>130</b>	<b>200</b>

Source : Questionnaire

Interpretation of Data :

The information required for data analysis purpose was collected from the total 200 working women in industries of Ahmednagar district rural area. Some of them were qualified as per the needs of the organizations where as some of them were not. Their required working hours were according to their job work.

Survey of working women :

A Survey of working women was conducted to know about their work environment conditions. They were observed and asked questions relating to it.

Table No. 3  
Survey of working women

Sr. No.	Questions	Permanent			Contract Basis		
		Yes	No	Total	Yes	No	Total
1.	Are you satisfied with the salary or wages paid to you?	55	15	70	20	110	130
2-	Is it paid regularly on time?	63	07	70	43	87	130
3.	Do you have to work in shifts?	64	06	70	93	37	130
4.	Is conveyance facility provided to you?	67	03	70	17	113	130
5.	Do you have to face transfer issues?	65	05	70	39	91	130
Total		70			130		

Source : Questionnaire

Interpretation of Data :

According to the above table, 78.57% permanent women workers were satisfied with the salary or wages paid to them whereas 21.42% are not satisfied with it. 15.38% women working on contract basis were satisfied with the salary or wages paid to them whereas 84.61% are not satisfied with it. When asked about whether their salary or wages were paid regularly on time 90% permanent women workers replied it to be paid regularly on time and 10% said no. 33.07% contract basis women workers replied it to be paid regularly on time and 66.92% replied as no. Women workers were also asked if they had to work in shifts and according to their reply it was found that 91.42% permanent women workers had to work in shifts and 08.57% did not had to do so. Out of the total women selected who were working on contract basis, 71.53% women stated that they had to work in shifts while 28.46% did not work under shift basis. Amongst the selected 70 permanent basis women workers 95.17% had conveyance facility and 04.28 did not

have this facility. The same question when answered by the contract basis women it was seen that 13.07% availed this facility and 86.92% did not. 92.85% Permanent basis women workers gave their consent for having problems related to transfer and 07.14% did not face this issue. 30% women working on contract basis had issues related to transfers while 70% did not face this transfer problem.

Causes of stress in women workers having stress at home and work place :

To find the factors or causes of working women having stress at home and work place a study was conducted.

Table No. 4  
Causes of stress at home and work place

Sr. No.	Questions	Permanent			Contract Basis		
		Yes	No	Total	Yes	No	Total
1.	Do you work for providing economical assistance at home?	56	14	70	97	33	130
2.	Are the family members supportive for doing job?	23	47	70	43	87	130
3.	Are they having a positive approach while working in shifts?	11	59	70	39	91	130
4.	Do you have work overload in the given working hours?	40	30	70	82	58	130
5.	Is there a friendly work environment?	21	49	70	51	79	130
6.	Are there security problems at work place?	56	14	70	73	57	130
7.	Because of job are there any health issues?	60	10	70	82	48	130
8.	Do you face any stress problems due to job?	59	11	70	87	43	130
9.	Do you have satisfaction of working in rural areas?	13	57	70	57	73	130

Source : Questionnaire

Interpretation of Data :

From the above given table it can be seen that, the women workers working on both permanent and contract basis were asked if they worked for providing economical assistance at home, 80%

permanent based women workers replied positively whereas 20% had a negative answer. 74.61% contract based women workers also had a positive answer whereas 25.38% said that they did not work for economical assistance at home. Out of the total permanent basis women workers 32.85% said that their family members supported them for doing job and 67.14% did not had support from their family. The same question was asked to the contract basis women workers where 33.07% replied they did have family support and 66.92% did not have the same. There were many women workers both permanent and contract basis who were working shifts and had to do the job at night time too. When the permanent basis were asked whether their family had a positive approach while working in shifts 15.71% replied about having a positive approach and 84.28% responded that did not had a positive approach. The same question was put to the contract basis women workers and 30% responded a positive approach where 70% had a negative approach. 57.14% permanent women workers answered that they had work overload in the given working hours and 42.85% had a no answer for it. When asked the same to the contract basis women 63.07% answered as yes while 44.61% had no work overload in the given working hours. Out of the total permanent basis women workers 30% said that there was a friendly work environment and 70% did not felt that there was a friendly work environment. The same question was asked to the contract basis women workers where 39.23% replied they did had a friendly work environment and 60.76% did not have the same. 80% permanent based women workers replied positively when asked if they faced security problems at work place whereas 20% had a negative answer. 56.15% contract based women workers also had a positive answer whereas 43.84% said that they did not faced security problems at work place. Women workers both permanent and contract basis were asked if they faced health issues while doing the job where 85.71% permanent women workers said yes and 14.28% said no. 63.07% contract women basis women said yes and 36.92% answered no. 84.28% permanent basis women workers faced stress problems due to job and 15.71% did not face stress problems. 66.92% contract basis women workers also faced stress problems due to job and 33.07% did not face this problem. When asked if they had satisfaction of working in rural areas, 18.57% permanent basis women workers responded that they did had satisfaction in rural areas and 81.42% did not had a favorable answer to it. 43.84% of the contract basis working women had satisfaction by working in rural areas and 56.15% did not feel the same.

**Findings :**

Some of the working women whether permanent or on contract basis, both have to perform dual role as a housewife and bread earner. They have commitment to both roles and maintain balance in them so that they are able to give proper time to them and also have time for their personal space. Most of these women workers do not get a positive support for their job. They are allowed to do so because of the economical help given by them. They have to perform the household duties and then attain to the job requirements. At home their family members expect them to give first priority to their household duties and then the job. Women workers have to take care of their children and other family members. There is resentment from home to work late night shifts. They are really exhausted in fulfilling the expectations of all. Thus, this creates stress at home place and they find it difficult to cope with it. Some of them work because of liking, career oriented and status.

At work place there is gender discrimination. There is discrimination in salary or wage too. The payment made is many of the time late and at irregular intervals. It could become an issue and conflict arises at home. They are not having proper conveyance facility and therefore travelling is a tedious job. They have to face late marks, memos or other actions taken. They do not have proper sanitation facility. Working women face security problems, mostly night shifts. Sometimes because of pending work they have work overload in the given working hours. The environment in which they are working is not very much friendly and so most of the problems at work place have to be self-tackled. Colleagues with whom they are working are not always supportive and therefore face issues of mutual understanding. There is dominance by the male gender colleagues because of women workers submissive nature. Proper medical facilities at reasonable cost is lacking in many of the organizations. When women workers have to face transfer issues, family members at home are not enthusiastic about it and have a negative approach. Sometimes because of this, they have to forego promotion, increased income and other benefits. Thus, women workers at work place too are not happy to work as they face many problems and the result not being able to adjust with it, they have accumulating stress as problems go on accumulating simultaneously.

By managing duties and responsibilities at home, society and work place it causes tension and stress arises as how to accomplish all the tasks on time that too effectively and efficiently. Thus, when tension starts accumulating due to home stress and work place stress they have to face problems of poor health both physically and mentally.

**Suggestions to manage stress both at home and work place :**

Symptoms of stress are like emotional, physical and behavioral signs. To manage stress one should be able to detect the source of it so that proper remedies can be found. When the problem is found either try to avoid it, alter it, adapt it or accept it. Remove time for exercise to relieve tension. Try to discuss the problem with your close family member or at work place so that you can confide and receive some ways to reduce or remove stress /tension. Spending time for where you can take care of your personal needs. Set priority for task management. They should maintain balance in all walks of life by healthy lifestyle. In should be able to relieve tension as it comes up. This can be done with proper practice. For not to have misinterpretation of communication, have a proper understanding with people at home and at work place.

**Conclusions :**

To survive or have a better living life style we find a dual earner family at present. The working areas which were meant to be men dominated are now being well accomplished by women also. They have shown their ability to perform job tasks in an excellent way. They are now nearly working almost in every field as men do. Women at present are more open-minded than earlier days. Today's women spent less time for their home compared to the women of past decade or two. They have to properly plan and balance all their activities for maintaining healthy environment at home and work place. Managing obstacles is not an easy task for a working women but she is trying to maintain balance in all.

**References :**

1. Mani V., (2013) "Work-Life Balance and Women Professionals". Global Journal of Management s and Business Research Interdisciplinary; Vol. 13(5).
2. Gayathri N, Karthikeyan P. (2013), "Work life balance in India"--A social responsibility or a Competitive tool", International Research Journal of Business and Management; Vol. 1, Pp.103- 109.
3. Shalini sheel, Dr Bhawna Khosla Sindhwani etal, (2012), ' Quality of Work life, employee performance and career growth opportunities: a literature review', ZENITH International Journal of Multidisciplinary Research Vol.2 Issue 2, February 2012.
4. Heather MS, Morris ML, (2011) "Constructs of the Work / Life interface : A Synthesis of the Literature and Introduction of the Concept of Work / Life Harmony", Human resource Development Review; Vol. 10(1), Pp.6-25.
5. Santhana Lakshmi K, (2013) "Work Life Balance of Women Employees with reference to teaching faculties", International Monthly Refereed Journal of Research in Management and Technology; Vol. II.
6. Goyal, M. and Arora, S. (2012). "Harnessing Work: Family Life Balance among Teachers in Educational Institutions", International Journal of Applied Services Marketing Perspectives, Vol. 1 No. 2, pp. 170-176.
7. S Rajesh & Manoj PK, Women employee work life and challenges to industrial relations: Evidences from North Kerala, International journal of computational engineering and management Volume 19, Issue 4, July 2016
8. Ms Shivi Mittal, Ms Sapna Sharma & Prof (Dr) Prabhat Srivastava, "Challenges faced by working women at workplace, family and society: its major issues, impact and remedial measures", International journal of research in social science and Humanities Volume 5, issue 11
9. Parul Agarwal, "A study of work life balance with special reference to Indian call center employees", International journal of engineering and management research Volume 4, Issue 1, February 2014
10. Sachin Pawar, K.C.RAmrotra and P.V.Patil, "Socio-economic status of women in Ahmednagar District of Maharashtra: A geographic Study", Indian Streams Research Journal, Vol.6 issue 4, May 2016



11. Popat P. Pathare, Chandrashekhar J. Hiware, "Participation of Woman in Sericulture Activities of Ahmednagar District (M.S.) India, IOSR Journal of Humanities and Social Science, Vol 22, Issue 8, Ver II, August 2017, pp. 90-93
12. Lonetti, I. A. (2012). Transcending towards personal freedom: Exploring the lived experiences of professional working mothers (Order No.3510825). Available from ProQuest Dissertations & Theses Full Text: The Humanities and Social Sciences Collection. (1018416122). Retrieved from <http://search.proquest.com/docview/1018416122?accountid=10359>
13. Campbell DJ, Campbell KM, Kennard D. The effects of family responsibilities on the work commitment and job performance of non-professional women. *J Occupa Organ Psych.* 1994;67:283–96.
14. Haslam, D., Patrick, P., & Kirby, J. (2015). Giving Voice to Working Mothers: A Consumer Informed Study to Program Design for Working Mothers. *Journal of Child & Family Studies*, 24(8), 2463-2473. doi:10.1007/s10826-014-0049-7
15. Maskowska Z. Psychosocial characteristics of work and family as a determinant of stress and well-being of women: A preliminary study. *Int J Occup Med Environ Health.* 1995;8:215–22. [PubMed: 8581328 American Psychological Association. (2014). Coping with stress at work. Retrieved from <http://www.apa.org/helpcenter/work-stress.aspx>
16. Dr. Rinku Rani, "Marital Adjustment Problems of Working and Non-Working Women in Contrast of Their Husband", *International Journal for Research in Education*, Vol. 2, Issue:7, July 2013.



INTERNATIONAL RESEARCH JOURNAL OF MANAGEMENT  
SOCIOLOGY & HUMANITIES  
*An Internationally Indexed Peer Reviewed & Refereed Journal*  
Impact Factor\* : 0.2311

Ref:IRJMSH/2018/A107438

DOI : [HTTPS://DOI.ORG/10.32804/IRJMSH](https://doi.org/10.32804/IRJMSH) ISSN 2277 - 9609 (O) 2348 - 9359 (P)


THIS CERTIFIES THAT  
DR. SUNITA SADASHIV THUBE  
HAS/HAVE WRITTEN AN ARTICLE / RESEARCH PAPER ON  
WORKING WOMEN HAVING STRESS AT HOME AND WORK PLACE AND ITS MANAGEMENT  
WITH REFERENCE TO AHMEDNAGAR DISTRICT RURAL AREA

APPROVED BY THE REVIEW COMMITTEE, AND IS THEREFORE PUBLISHED IN  
Vol - 9 , Issue - 7 Jul , 2018

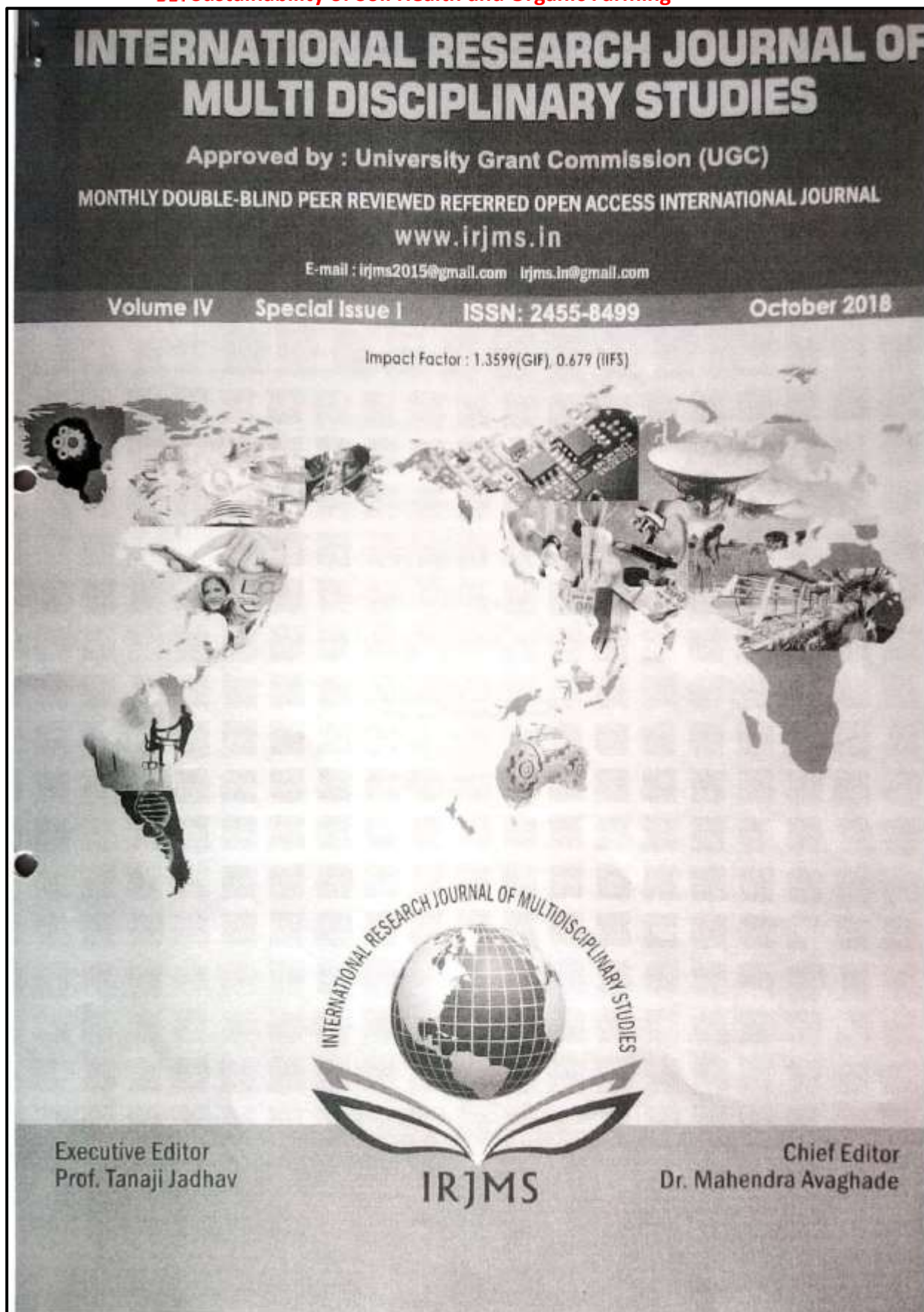


www.IRJMSH.com

Editor in Chief



53. Sustainability of Soil Health and Organic Farming





## INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

42	Effects of Cr <sup>3+</sup> on semiconducting properties of the Lithium ferrites <i>S.B.Patil</i>	190-196
43	DERIVATIZATION FINGER PRINTING ANALYSIS OF THE AMARANTHUS SPINOSUS LEAVES USING HPTLC METHODS. <i>Sable K. V<sup>1</sup>, Arsule C. S<sup>1</sup>, and Saswade R. R.<sup>2</sup></i>	197-200
44	Effect of human hair solution on growth and development of Zea maize as Bio fertilizers <i>Sandip Ingale<sup>1</sup>, Pradip J. Unde, Mangesh Doke, Avinash Anpat</i>	201-203
45	Use of ICT in Physical Education & Sports <i>Sanjay M. Gaikwad</i>	204-207
46	Effect of Temperature on Electrical Conductivity of Canada Balsam <i><sup>1</sup>K. Dambari Devi, A. <sup>2</sup>Joy Singh, <sup>3</sup>Sanjeev Girase</i>	208-213
47	Screening of drought tolerant wheat varieties using different indices <i>Savant, K.S<sup>1</sup>, Dr. Deshmukh, R.N<sup>2</sup></i>	214-220
48	ADDITIONS OF CYANOPHYCEAE FROM THE SOILS OF SAI DAM LATUR MAHARASHTRA <i>Yadav S.G. and Awasthi R.S</i>	221-225
49	Studies on some traditional plant medicines by local tribes of kinwat forest <i>S.R. Shinde</i>	226-230
50	Wind Electricity and Rural Development: Case Study Mbekari Village, Ahmednagar <i>*Shoukat Z. Fakir, R.R. Bhalshing</i>	231-233
51	Evaluation of antioxidant potential of halophyte <i>Sesuvium portulacastrum</i> : A nutraceutical perspective. <i><sup>1</sup>. *S.B. Gagare, <sup>2</sup>P.S. Jadhav</i>	234-240
52	Study of Behavioral Aspects of Broiler Chicks Reared Under Light Sources in Different Poultry Farming. <i><sup>1</sup>S. T. Naphade, <sup>2</sup>S. G. Badhe, <sup>3</sup>S. R. Naphade</i>	241-244
53	Causes of formation of Pink Berry in Grapes ( <i>Vitis Vinefera</i> L.) using Physical Techniques <i><sup>1</sup>Dhakane S. F., <sup>2</sup>Bhise R. B.</i>	245-249
54	Prevalence of acute malnutrition/wasting and its associated factors among pre-school children in Rajshahi City, Bangladesh <i>Kumlam Yeasmin<sup>1</sup> and Tanzima Yeasmin<sup>2</sup></i>	250-259
55	Sustainability of Soil Health and Organic Farming <i><sup>1</sup>S.S.Thube, <sup>2</sup>S.R.Wagh</i>	260-266
56	Exotic Genus Bauhinia L. (Caesalpinaceae) from Maharashtra <i>Vinod Raghaji Jogdand</i>	267-270

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com)

Page No: IV



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

**Sustainability of Soil Health and Organic Farming**

<sup>1</sup>S.S.Thube, <sup>2</sup>S.R.Wagh

<sup>1</sup>Department of BBA – CA, <sup>2</sup>Head, Department of Zoology  
New Arts, Commerce and Science College, Parner  
thube.sunita@gmail.com, srwagh@rediffmail.com

**Abstract**

To have sustainable agriculture is now a universal need and through intensive empirical research the way for achieving it is defined. Development of several indicators has been developed for sustainable agricultural systems. Relating to agricultural sustainability where synthetic fertilizers have been used, their effects on biodiversity consumption, soil health, crop production environmental quality and self-reliant farming systems. Use of synthetic fertilizers and their effects on crop production, soil health, environmental quality, biodiversity conservation and self-reliance of farming system has been discussed. One of the chief factors which have been mostly considered to be affective in the degradation of soil fertility is the use of agro inputs which are synthetic in nature. For the productivity of both livestock and crops and also for soil health the presence of the soil organic matter and the soil microbial population are the basic useful indicators. To standardize fertility management related to organic farming in consideration with the complex interactions amongst the no similar components of this system, a solution of long term integrated approach will be appropriate. A broad and methodical review on different quantitative and qualitative changes of soil health parameters for the management of improved nutrients supports the observations.

**Key words:** Sustainable agriculture, soil health, synthetic fertilizers, organic farming

**Introduction**

Sustainable production of crop is the basic objective of organic farming to maintain the long term fertility of the soil in accordance with the natural systems (International Federation of Organic Movement) and so for all the stakeholders of agricultural development the basic concern is to maintain the environmental quality and agricultural productivity through soil health management. The earth itself has a friendly atmosphere which not only nourishes the plant but also creates an atmosphere where soil organisms can survive. Thus, high production is achievable if the health of the soil is in good condition which also helps in enhanced development and growth of crop. For maintaining the good quality of surrounding environment and sustaining the biological productivity biological elements are the key to any ecosystem within the land use boundaries. This also leads to good and healthy conditions human health, animals and plants or degradation in soil can also lead to low production of goods and services. Imbalance of nutrient management, high use of chemical fertilizers and soil pollution are the main reasons of soil degradation.

India has an agricultural economy. In India, at present we find the same conditions of soil degradation where in past history it can be seen that India had a magnificent agricultural economy based on natural resources like green manure, oil cakes, animal manure and others which were free of manmade chemicals which leads to degradation in the soil quality. With the arrival of green revolution technologies or industrial agriculture based on chemical fertilizers there is degradation in the quality of soil due to intensive and continued use of chemical fertilizers for improving the quality of the soil. There is a continuing decline in the productivity factor and degradation in the quality of the soil.

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@gmail.com](mailto:irjms2015@gmail.com), [irjms.in@gmail.com](mailto:irjms.in@gmail.com)

Page No: 260



Organic farming system which is based on the management of soil organic matter helps to maintain the chemical, biological and physical soil properties. Organically managed soil shows high soil organic carbon and nitrogen contents, biological soil quality and lower nitrate leaching than chemical or conventional management. Under long term management studies it was seen that under organic management soil biomass carbon is high than the conventional management.

#### Materials and Methods

##### Conceptualization of the Impact of Organic Farming on Soil Quality

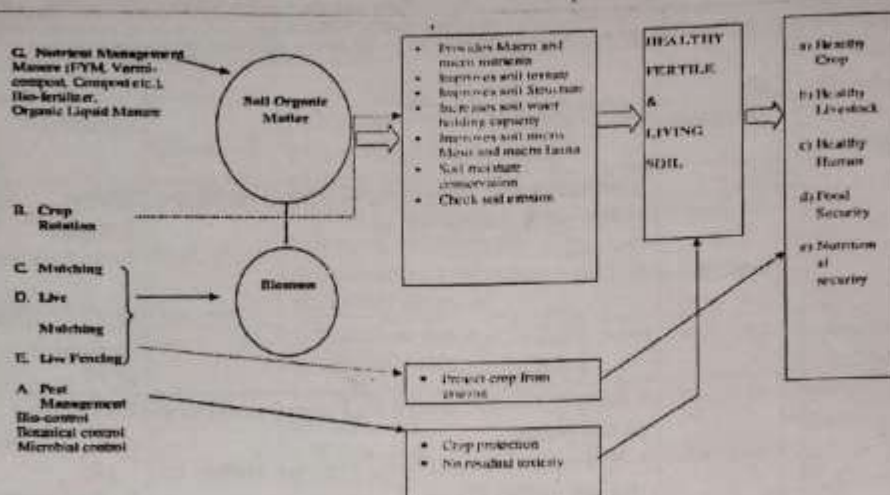
Crop productivity is the outcome of good quality soil often claimed as an ecosystem concept which integrates the diverse soil functions with nutrient supply. Figure No. 1 it shows the integration of different components of organic practices which enhances the soil properties for sustaining soil health.

#### Methodology

"Although systematic reviews have widely been quantitative in nature, recently, qualitative systematic reviews have been used as useful methodology [68]. Following Plummer *et al* [61], [78] a four-step approach for the systematic review and analysis of literature was undertaken for the present paper. First, the objectives of the review were set to study the impact of organic farming on soil health in terms of physical, chemical and biological properties of soil, and to compare the outcomes of organic and conventional soil health management. Second, we established a search protocol including selection of key words, bibliographic databases, establishing selection criteria for search engine 'hit' etc. We used a combination of key words involving "organic farming"/"organic agriculture" and all the soil quality parameters conceptualized in Fig. 1. Science direct, Google Scholar and DOAJ were used as the bibliographic database and the first 50 'hits' were considered for screening literature. Third, we screened the results as per the screening criteria, i.e. publication in the last 20 years, article published in English, key word match etc. Fourth, analysis of the literature was performed through the principle of qualitative analysis of literature. This employed iterative coding of themes related to soil quality parameters and their relationship with organic agricultural practices." [71]

#### Figure No. 1

Integration of different organic practices for sustainability of soil health.



Source : Journal of Food, Agriculture and Environment, 2014

**Results and Discussion**

**Outcome of Soil Management through Organic and Inorganic Means**

“At the end of 40-47 years of dairy farm management in Denmark, organically managed soil had greater fragment size, aggregate stability in water, and microbial biomass carbon than conventionally managed soil. Moreover, at the end of 21 years of long-term crop rotation management in Switzerland, soil organic carbon and total N were greater under biodynamic than conventional management, but organic management and integrated management (combination of manures, inorganic fertilizers, and herbicides) were moderate. Soil microbial biomass carbon and dehydrogenase activity were greater under organic than that of conventional management, but basal soil respiration did not vary between systems. In North Dakota and Nebraska, total and microbial C and N, and mineralizable C and N were greater under organic than that of conventional management. In Washington State, a comparative study of organic, conventional and integrated apple production systems from 1994 to 1999 indicated that the organic and integrated systems had higher soil quality and potentially lower negative environmental impact than the conventional system. Limited studies of intensive organic farming systems in Australia have generally shown an increase in soil health compared to conventional practice. Lampkin reported that nitrate leaching may be less under organic than conventional systems. It is reported that the bulk density of organic soil is less than the soil which was managed chemically, indicating better soil aggregations and soil physical conditions owing to increased soil organic matter. There is a 29.7% increase in organic carbon under organically managed farm (1.22%) as compared to conventionally managed farm (0.94%) 83. Dehydrogenase, alkaline phosphate, and microbial biomass carbon were higher in organic soils by 52.3%, 28.4%, and 34.4%, respectively, as compared on soil health are summarized in Table 1.” [3]



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

Table No. 1 Effects of selected organic farming practices on soil health properties.

Organic Components / Management	Soil Properties	Effects on Soil Properties	Citation
FYM, Vermicompost, Green Manuring, Household waste and sewage sludge and Soil Organic Matter	Physical	<ul style="list-style-type: none"> <li>• Improve soil structure, porosity, moisture retention capacity etc. in the soil.</li> </ul>	Altieri and Nicholls <sup>[14]</sup> , Papadopoulos <i>et al.</i> <sup>[15]</sup> and Jannoura <i>et al.</i> <sup>[16]</sup> .
	Chemical	<ul style="list-style-type: none"> <li>• Supply several macro and micro nutrients to the plants.</li> <li>• Increase total nitrogen, organic matter in the soil which "is an important substrate of cationic exchange, is the warehouse of most of the nitrogen, phosphorus, and sulphur potentially available to plants</li> </ul>	Bharadwaj and Guar <sup>[17]</sup> and Parthasarathy <i>et al.</i> <sup>[18]</sup> .
	Biological	<ul style="list-style-type: none"> <li>• Soil Organic Matter is the main energy source for microorganisms and it increases the microbial population in the soil.</li> <li>• Soil micro-organisms are the living part of the soil organic matter.</li> <li>• Soil organic matter has a capacity to sink the atmospheric CO<sub>2</sub> and thereby increase in the carbon content in the soil which further enhance the microbial biomass and elevate respiration</li> <li>• In general, organic fertilizer application improved nodule dry weight (DW), photosynthetic rates, N<sub>2</sub> fixation, and N accumulation as well as N concentration in several crops.</li> <li>• Household waste and sewage sludge helps to have the highest number of colony forming heterotrophic bacteria in the soil.</li> </ul>	Ewel <sup>[19]</sup> , Smith and Paul <sup>[10]</sup> , Lal <i>et al.</i> <sup>[11]</sup> , Dalal <sup>[12]</sup> , Chowdhury <i>et al.</i> <sup>[13]</sup> , Friedel <i>et al.</i> <sup>[14]</sup> , Peacock <i>et al.</i> <sup>[15]</sup> , Sparling <i>et al.</i> <sup>[16]</sup> , Poulsen <i>et al.</i> <sup>[17]</sup> and Mattana <i>et al.</i> <sup>[18]</sup> .
Crop Rotation	Physical	<ul style="list-style-type: none"> <li>• Architectural form of different root systems of several crops included in crop rotation and which influences the physical</li> </ul>	Clement and Williams [19], Chan and Heenan [20]





INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

		structure of soil.	and Grace <i>et al.</i> <sup>[221]</sup> .
	Chemical	• Crop rotations significantly increased soil pH, available phosphate, exchangeable K and Ca in soil.	FAO <sup>[222]</sup> .
	Biological	• Crop rotation decreases the incidence of soil-born pathogen by increasing soil chemical properties and soil microbial biomass.	Dick <sup>[223]</sup> and FAO <sup>[224]</sup> .
Mulching	Physical	<ul style="list-style-type: none"> <li>• It makes the soil softer, pulverized and humid that ultimately helps to maintain bulk density and porosity in the soil.</li> <li>• It increases soil fertility, crop production and control soil erosion; residues become decomposed and add organic matter to the soil.</li> <li>• Better absorption and less run off-of water in the field.</li> <li>• Mulch materials improve soil physicochemical properties, suppress soil temperature, reduce evaporation and increase the soil moisture.</li> </ul>	Lampkin <sup>[225]</sup> , Pinamonti <sup>[226]</sup> , Naeini and Cook <sup>[227]</sup> , Lotter <i>et al.</i> <sup>[228]</sup> , Garcia-Moreno <i>et al.</i> <sup>[229]</sup> , Inyang <sup>[230]</sup> and Gbadebor <sup>[231]</sup>
	Chemical	• The mulching materials become decomposed and add organic matter and other nutrients to the soil.	Agbede <i>et al.</i> <sup>[232]</sup>
	Biological	<ul style="list-style-type: none"> <li>• Mulching helps to increase the population, species diversity and activity of macro fauna in the soil.</li> <li>• It improves biological activities in the soil and after decomposition it adds nutrients to the soil.</li> </ul>	Lal <sup>[233]</sup> , Ojeniyi and Adetoro <sup>[234]</sup> , Awodun and Ojeniyi <sup>[235]</sup> .

Source : Journal of Food, Agriculture and Environment, 2014

**Conclusion**

For achieving sustainable livestock production and crops, its basic need is maintaining soil health and its fertility. Good soil health can be maintained by organic farming but since it is highly complex, a integrated biological systems can be maintained. Organic practice has both direct and indirect effect on the properties of the soil because simultaneously it has effects on more than one components of the system. The prior studies on the impact of organic practices on different characteristics of soil health, environment and crop production foresee the potentiality of organic farming in maintaining the soil fertility and soil health.



INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

Reference

1. Plummer, R., Crona, B., Armitage, D. R., Olsson, P., Tengö, M. and Yudina, O. (2012) *Adaptive comanagement: A systematic review and analysis. Ecol. Soc.* 7(3), p.11
2. Sudarsan Biswas, Md. Nasim Ali\*, Rupak Goswami and Somsuhra Chakraborty(2014) *Journal of Food, Agriculture & Environment Vol.12, p. 237 – 243*
3. Sudarsan Biswas, Md. Nasim Ali\*, Rupak Goswami and Somsuhra Chakraborty(2014) *Journal of Food, Agriculture & Environment Vol.12, p. 237 – 243*
4. Altieri, M. and Nicholls, C. (2005) *Agroecology and the Search for a Truly Sustainable Agriculture. UNEP Environ. Train. Netw. Lat. Am. & Caribb., Mexico, p. 29*
5. Papadopoulos, A., Bird, N., Whitmore, P. A. and Mooney, J. S. (2014) *Does organic management lead to enhanced soil physical quality?. Geoderma* 213: p. 435–443
6. Jannoura, R., Joergensen, G. R. and Bruns, C. (2014) *Organic fertilizer effects on growth, crop yield, and soil microbial biomass indices in sole and intercropped peas and oats under organic farming conditions. Eur. J. Agron.* 52(B): p. 259-270
7. Bhradwaj, K. K. and Guar, C. A. (1985) *Recycling of Organic Wastes. ICAR, New Delhi.*
8. Parthasarathy, V. A., Srinivasan, V., Devasahayam, S. and Anandaraj, M. (2004) *Organic farming in spice crops. In Souvenir, 'The International Conference on Organic Food', ICAR Research Complex for NEH Region, Umiam, Meghalaya, p. 24-34*
9. Ewel, J. (1986) *Designing agricultural ecosystems for the humid tropics. Annu. Rev. Ecol. Syst.* 17: p. 245-271
10. Smith, J. L. and Paul, E. A. (1990) *The significance of soil microbial biomass estimations. In Bollag, J. M. and Stotzky, G. (eds). Soil Biochemistry. Marcel Dekker, Inc., New York, N.Y., p. 6:357–396*
11. Lal, R., Blum, W. E., Valentin, C. and Stewart, B. A. (eds) (1998) *Methods for assessment of Soil Degradation. Vol. 9. CRC Press, USA.*
12. Dalal, R. C. (1998) *Soil microbial biomass—what do the numbers really mean? Aust. J. Ex. Agr.* 38: p. 649–665
13. Chowdhury, M. A. H., Kouno, K., Ando, T. and Nagaoka, T. (2000) *Microbial biomass, S mineralization and S uptake by African millet from soil amended with various composts. Soil Biol. Biochem.* 32: p. 845–852
14. Friedel, J. K., Gabel, D. and Stahr, K. (2001) *Nitrogen pools and turnover in arable soils under different durations of organic farming: Source- and -sink function of the soil microbial biomass or competition with growing plants? J. Plant Nutr. Soil Sci.* 164: p. 421–429
15. Sparling, G., Parfitt, R. L., Hewitt, A. E. and Schipper, L. A. (2003) *Three approaches to define desired soil organic matter contents. J. Environ. Qual.* 32: p. 760-766
16. Poulsen, B. H. P., Magid, J., Luxhøj, J. and Neergaard, A. (2013) *Effects of fertilization with urban and agricultural organic wastes in a field trial – waste imprint on soil microbial activity. Soil Biol. Biochem.* 57: p. 794–802
17. Mattana, S., Petrovičová, B., Landi, L., Gelsomino, A., Cortés, P., Ortiz, O. and Renella, G. (2014) *Sewage sludge processing determines its impact on soil microbial community structure and function. Appl. Soil Ecol.* 75: p. 150-161



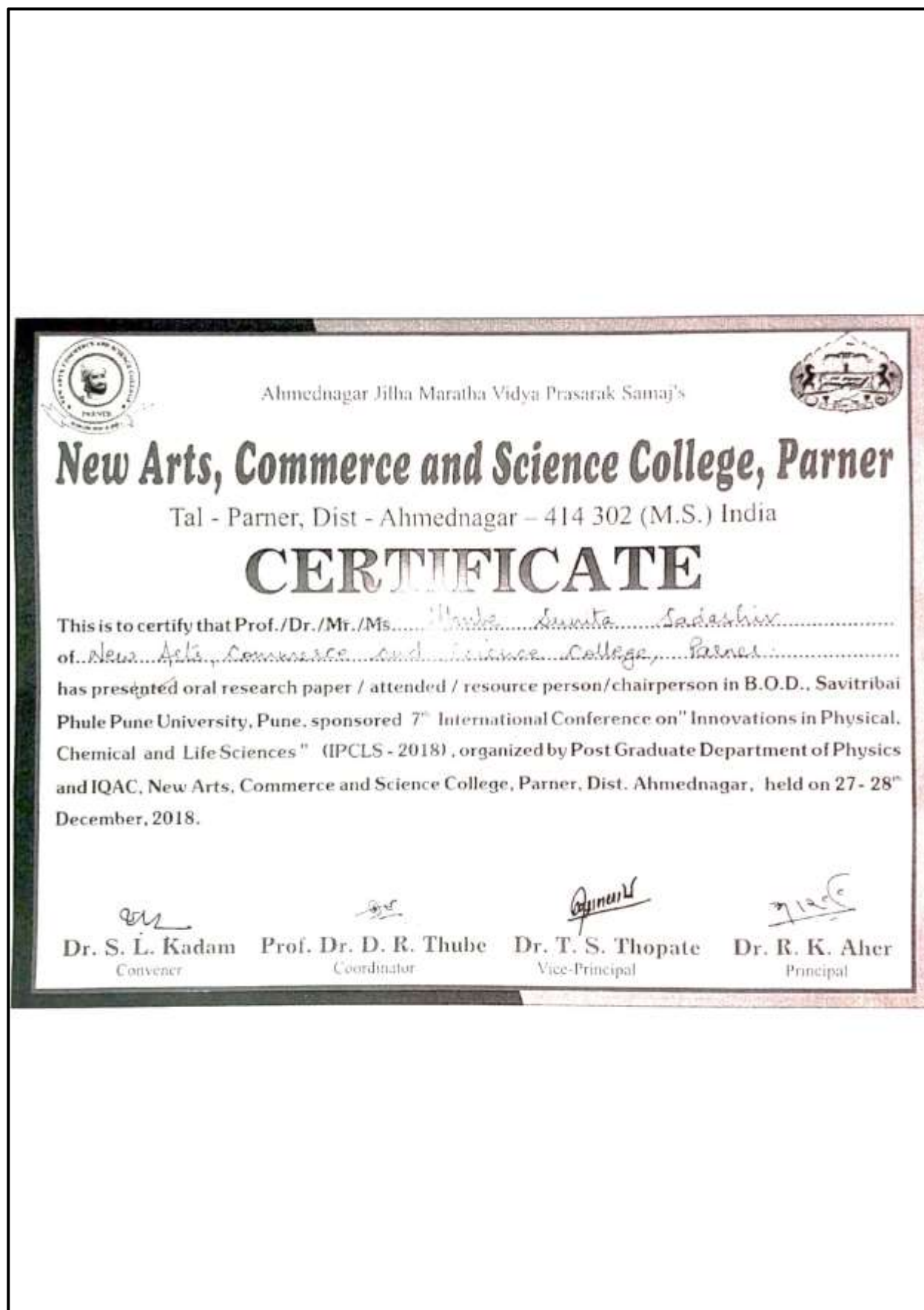
INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY  
STUDIES

Vol. IV, Special Issue -I, October, 2018 ISSN (Online): 2454-8499  
Impact Factor: 1.3599(GIF), 0.679(IIFS)

18. Clement, C. R. and Williams, E. T. (1967) Leys and soil organic matter II. The accumulation of nitrogen in soils under different leys. *J. Agr. Sci.* 59: p. 133-138
19. Chan, K. Y. and Heenan, D. P. (1991) Differences in surface soil aggregation under six different crops. *Aust. J. Ex. Agr.* 31: p. 683-686
20. Grace, P. R., Oades, J. M. Keith, H. and Hancock, T. W. (1995) Trends in wheat yields and soil organic carbon in the permanent rotation trial at the Wain Agricultural Institute, South Australia. *Aust. J. Ex. Agr.* 35: p. 857-864
21. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
22. Dick, P. R. (1992) A review: Long-term effects of agricultural systems on soil biochemical and microbial parameters. *Agr. Ecosys. Environ.* 40: p. 25-36
23. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
24. FAO (2012) Effects of crop rotations on potato yield, soil chemical and microbiological properties in organic farming system. Available online <http://agris.fao.org/agris-search/search.do?recordID=KR2013001932>
25. Lampkin, N. (1990) *Organic Farming* Farming Press Books, Ipswich, UK.
26. Pinamonti, F. 1998. Compost mulch effects on soil fertility, nutritional status and performance of grapevine, *Nutr. Cycl. Agroecosys.* 51: p. 239-248
27. Naeini, S. A. R. M. and Cook, H. F. (2000) Influence of municipal compost on temperature, water, nutrient status and the yield of maize in a temperate soil. *Soil Use and Manage.* 16: p. 215-221
28. Lotter, D. W., Seidel, R. and Liebhardt, W. (2003) The Performance of organic and conventional cropping systems in an extreme climate year. *Am. J. Alternative Agr.* 18(3): p. 146-154
29. Garcia-Moreno, J., Zavala, M. L., Jordán, A. and Perciva, P. (2013) Mulch application in fruit orchards increases the persistence of soil water repellency during a 15-years period. *Soil. Till. Res.* 130: p. 62-68
30. Inyang, E. U. (2005) An evaluation of tillage and storage systems applied by traditional root crop farmers in Cameroon. *Agr. Envir. J.* 7(2): p. 15-22
31. Gbadebor, P. U. (2006) The climate, the soils and the West African traditional farmers. *Agroecosys. Bull.* 4 p.12-17
32. Aghede, M. T., Adekoya, O. A. and Ogeh, S. J. (2013) Effects of chromolaena and tithonia mulches on soil properties, leaf nutrient composition, growth and yam yield. *West Afr. J. Appl. Ecol.* 21(1) p. 15-29
33. Lal, R. (1988) Effects of macrofauna on soil properties in tropical ecosystems. *Agr. Ecosys. Environ.* 24: p. 101-116
34. Ojeniyi, S. O. and Adetoro, A. O. (1993) Use of chromolaena mulch to improve yield of late season tomato. *Niger. J. Tech. Educ.* 10: p. 144-149
35. Atkinson, D. and Watson, C. A. (2000) The research needs of organic agriculture: distinct or just part of agricultural research? The BCPC Conference - Pests & Diseases 2000. p.151-158

Web: [www.irjms.in](http://www.irjms.in) Email: [irjms2015@rajawade.com](mailto:irjms2015@rajawade.com), [irjms\\_in@yahoo.com](mailto:irjms_in@yahoo.com)

Page No: 266



**54. The Use of ICT in Physical Education**

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

**29. The Use of ICT in Physical Education**Prof. Shinde Ranjit Arun<sup>1</sup>, Prof. Sunita Sadashiv Thube<sup>2</sup><sup>1</sup>New Arts Commerce and Science College, Parner.<sup>2</sup>New Arts Commerce and Science College, Parner.**Abstract**

*This decade is characterised by rapid technological advances. Being in the digital era technology has accounted for many changes in the educational sector. These changes range from the method instruction is delivered, to the attitudes on how learning occurs to the amount of collaboration and knowledge sharing between not only students, but also between teachers, managers and administrators.*

**Keywords:**

ICT, PE, Technology, Educators, Media

**1.0 Introduction**

This decade is characterised by rapid technological advances. Being in the digital era, technology has accounted for many changes in the educational sector. These changes range from the method instruction is delivered, to the attitudes on how learning occurs to the amount of collaboration and knowledge sharing between not only students, but also between teachers, managers and administrators. ICT represents one of the most useful tools to enhance curriculum if used correctly. According to Waxman H.Lin & Mitchko (2003), teaching and learning with technology has had a significant impact on students' outcomes when compared to traditional instruction.

In the future, P.E will need to undergo radical changes. If technology had an impact in learning in general education, could it also enhance teaching and learning in P.E? New developments in the field of technology will positively affect the P.E curriculum. For example, the use of technological advances will prepare physical educators for the future demands and expectations of the society. Furthermore, the Ministry of Education is laying much emphasis on integrating ICT in the teaching and learning process in secondary schools. As students perform exercises and skills in their PE classes, PE teachers can use technological tools and systems to quantify processes and results to help them learn more about themselves (Kirkwood, Manon.

---

Modern Trends in Physical Education & Sports Sciences

142

NATIONAL CONFERENCE - 2018  
AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

2002). However, before using ICT in our schools as a teaching tool, these important questions must be addressed. What technological options are available for our PE educators? Do using technological tools in the PE classes motivate the students? What is the role of technology as an assessment tool and how it is linked to performance?

According to Green (2002), with the rapid developments in technology, ICT has made a significant impact on a number of P.E departments, and has the potential to enhance teaching and learning in P.E. Cummings (2002) further suggests that the pervasion of ICT in education is now impacting on P.E as much as on any other subjects. Many P.E departments in the U.K are currently using ICT for administration and management tasks. Computers allow us to continuously modify and update our schemes of work and lesson plans. The creation of a database of all students in the schools enable school administrators to maintain detailed records of assessments, key stage grades, sports awards and extra-curricular achievements.

#### **General Contribution/Benefits Of Ict In Physical Education**

The use of ICT in PE makes the science of sport come to life by linking both physical and mental activity. It also helps to create full-fledged students who are able to concentrate better on both practical and theoretical work. Besides, it helps students to develop a better understanding of their own body parts and that of the human body in general. It also raises the profile of P.E within the establishment by making the subject not only interesting, but also attractive and effective. Furthermore, it brings enthusiasm and motivation for both PE teachers and students.

ICT is also very important with regards to school administrative work. In fact, data can easily be collected and shared for analytical purposes, e.g. electronic records of performance of athletes. ICT also promotes teaching and learning within the school organization by changing the nature of learning itself. Students are motivated and are able to grasp essential concepts that previously eluded them. By developing their abilities to think in different ways students can select and apply skills, tactics and ideas, to evaluate and increase performance.

Moreover, with the infusion of ICT in PE, life-long learning can be supported through the collection of resources via the internet. According to Mike Rimmer, Head of Physical & Social development at the Buttershaw upper school in Bradford: "It's the excitement of learning in a different way."

In addition, with ICT, pupils are able to get access, select and interpret a wide range of information more easily. They are also able to recognise patterns, relationships and behaviours using appropriate technological software. Furthermore, models, predictions and even hypothesis

Modern Trends in Physical Education & Sports Sciences

143

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

can be made by students with the advent of ICT. Access to images of quality performances can be obtained through video filming. Hence, students are able to review their work and modify it to improve the quality. Through ICT tools reliability, evaluation and accuracy of actions can also be done. ICT further provides a very reliable source of communication among people within the organisation. The use of email, fax, facebook or even skype will enable quick and direct communication among P.E staffs and even students in other schools on fixtures, meetings and many other relevant matters. Therefore, accuracy of information does not depend only on the busy school secretary.

Throughout ICT tools, pupils can benefit from immediate feedback to improve their observational and analysis skills. As they familiarise with the software, they are able also to point out the relevant points for positive technique. The main advantage, however, remain the general improvement in the performance level of the majority of the pupils' work, as they struggle their way to look impressive especially if their performance will be analysed on digital video system.

There are many good options available to physical educators in regards to technology. Many of these technologies are easily accessible and are easily incorporated into the curriculum.

### **Some Technological Tools**

#### **Pedometers**

Theses apparatus also called step counters are mechanical sensors used to count steps and can easily be incorporated in PE classes. They address motivation, assessment, and advocacy. Furthermore, they are portable and can be worn under the belt and be kept the whole day. Today, it can be said that the pedometer has become a recognized acceptable tool for measuring physical activity. Students can wear a pedometer and receive immediate and continuous feedback regarding their activity level (Beighle, Pangrazi, Vincent, 2001). Using pedometers at school can also demonstrate to parents that students are achieving a certain level of physical activity. By using the pedometers students will be able to see progress towards set goal and consequently will be more motivated in the classes.

#### **Heart Rate Monitors**

Based completely on the student ability level and current level of fitness, the heart rate monitor makes learning more studentcentered. It also provides immediate feedback that can make students work harder (Bian, Partridge, King, Andon, Boyer, 2007). As fitness level increases, student feel that their cardiovascular system is working and can set individualized goal to work

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

more effectively. The Heart rate monitor will also provide real time data that will allow students to see how different exercises and activities affect the heart rate. Hence the heart rate monitor is a convenient apparatus that allows students to use up to date technology (Kirkwood, Manon 2002). Charts of maximum heart rate can be made for each student and track increase or decrease in their heart rate.

#### **Digital Video camera and visual analysis software**

The use of the motion analysis system will surely enhance many areas of the physical education curriculum both in research and teaching. Using digital video camera has indeed simplified the collection of data. These results can then be imported to carry out interactive multimedia presentation to provide students with a better understanding of the importance of breaking skills into components and the consequences of subtle variation in techniques ( Ladda, Keating, Adam, Toscana, 2004). The visual analysis software allows students to view captured movement and to analyse them. This particular technology can help teachers to control student's progress towards motor skills goals; provide feedback opportunities and assessing students learning (Fiorentino and Castelli, 2005).

Using digital video camera to record pupils' performance in table tennis for example, can be a useful tool to help students improve their techniques. With the addition of motion analysis software, pupils have a professional supportive tool. For instance during a training session, a 'robot - pong', which is a special technological tool that distribute ping pong balls at varying direction and speed, is used to face a student. The P.E teacher can then use the Digital video camera to analyse the actions more closely. This is done with a view to improve the teaching and learning of table tennis. Digital video clips were used weekly to stress on proper and improper techniques and then the pupils were given the opportunity to evaluate their own techniques and the technique of others via the 'déjà vu' resource. In the Mauritian context, some state colleges which are actually working on a pilot project set up by the ministry of education are presenting candidates for the Cambridge O level Examination. Teachers involved in this project will have to make use of video cameras during the practical examination to record students' performance and then send them to Cambridge University. Each college involved in the pilot project have already received a laptop, an overhead projector and its respective screen. Digital video cameras and internet connection facilities will soon be available in these schools.



NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

### Simulation and Games

Games such as Dance, Dance revolution, Fx cycles and Nintendo Wii Fit provide opportunities for students to be physically active and simultaneously enjoying themselves. These games can also be combined to other technologies to enhance the experience (Di Giorgio, 2004). Concerning the Nintendo Wii Fit, work outs are done on a small balanced board that gamers stand on. The players receive instructions from screen and mimic the stretching and muscle building exercises. The Wii Fit tracking feature shows progress using the system. Therefore, it can be a valuable PE tool. However, teachers should not consider gaming system equivalent to traditional exercises. It should be considered as a supplement and not a replacement of traditional exercises.

### 3.0 Methodology

Methodology refers to a systematic investigation of an issue to collect important data. When analyzing data, valuable evidence may be obtained by using several indicators. A survey method seemed to be most appropriate rather than an Action research to us due to factors like time constraints, cost of implementation, high rate of absenteeism during 3rd term and unrealistic expectations.

### 3.1 Sampling

The quality of an efficient survey is not only based on appropriate instrumentation but also on a suitable sampling strategy that has been selected. The selection of sampling strategy was governed by the criterion of suitability. The choice for this strategy adopted were related to the goals of the survey- the time constraints, the data collection methods, and the methodology. All these factors have been considered to ensure validity. The non-probability sample of 378 students of Form 4 was chosen for our survey which satisfied the minimum sample of Form 4 students. The estimated total population of Form 4 students was 19,179 which represent the number of students sitting for SC this year. We chose particularly Form 4 students because the survey had to be carried out during term 3 and during this period Form 5 and 6 students usually shine by their high absence rates. Hence, 66 students of Form 4 were randomly selected from 5 Form 4 classes in each school.

PE teachers were also targeted for our survey to be meaningful. For a total population of 325 PE Teachers, we selected a minimum sample of 176 according to the given software for sampling calculation. P.E. teachers who were selected to fill questionnaires were from respective schools where members of our group work and PE educators who are following Diploma, B.Ed, M.Ed and PGCE courses at the MIE.

Modern Trends in Physical Education & Sports Sciences

146

### 3.2 Methods And Tools For Data Collection

The survey has been based on quantitative observations. The methods and tools for data collection were:

Survey questionnaires

Documentation

#### 3.2.1 Survey Questionnaires

Two distinct survey questionnaires were designed one for the students and the other one for P.E teachers in respect to the objectives and opinions on using ICT to enhance P.E. The questionnaires included profile of the student/teacher, knowledge in ICT, opinions if ICT is integrated in P.E. A structured questionnaire was designed to reduce time for filling questionnaire and simplify data analysis.

#### 3.2.2 Documentation

Our investigation to gain required information regarding number of P.E. teachers in Mauritius and approximate form 4 student's population included consultation of various records and statistics.

### 3.3 Data Collection Strategies

The questionnaires were distributed in four secondary schools and two MITD schools that is in the six institutions where six members of our group work. Respected teachers in our group briefed respondents before answering questionnaires about our objectives in the research. Record of number of questionnaires being circulated was kept. As for teachers, questionnaires were distributed to PE teachers around the island.

### 3.4 Selected School Profile

1. Three State colleges SSS, one from urban and two other from rural areas. One of them is a Girls college and two others are Boys College. 2. A private mixed college situated in an urban area. 3. Two MITD mixed Schools were chosen, one from rural and the other from urban area.

PE and IT facilities available in almost all selected schools: P.E. room/gymnasium, audio visual room(PowerPoint presentation and theory classes), Laptop, playground, audio visual room, Lecture theatre (PowerPoint presentation and theory classes), Laptop, playground, Internet facilities in the computer lab.

Pupils from different type of schools were selected for the survey to check students' attitude in P.E., to collect different perspectives of using IT in PE and to seek their views on ICT integration in P.E. from different types of schools and regions in order to meet our objectives.

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

### 3.41 questionnaire Design

#### The purpose of the questionnaire:

To make a survey on PE Teachers, and students' questionnaire to seek their views on the possibility of enhancing P.E. classes with ICT.

To meet our objectives and to be linked to the literature review.

The students questionnaires include three sections-

section1: Knowledge in ICT, section2: Physical education and section 3 included questions relating P.E. to Technology.

Age-appropriate type of questions was included for mixed ability students like multiple choice questions. Different sections were designed to measure knowledge, attitude towards ICT integration in PE, interest in PE, level of importance now given to PE, level of IT literacy, willingness of students to adopt ICT in PE for self improvement and better learning, to seek pupils' views in using ICT as a P.E. assessment tool.

### 3.42 Piloting The Questionnaire

A sample of 20 students was selected in Form 4 in two secondary schools in view of piloting the questionnaire. We took feedback from students after completion of questionnaire in order to reframe ambiguous questions.

### 3.43 Questionnaires Administration

Permission was sought from Rectors of respective schools. Students' confidentiality has been assured. The questionnaires were delivered during 2 consecutive PE periods and collected at the end of class.

### 3.5 Reliability And Validity

To ensure validity and reliability quantitative data has been used. Investigations were carried out from reliable sources to compile relevant data. The required minimum sample of students and PE teachers were selected for validity and all questionnaires were directly collected by Teachers concerned from our group thus ensuring greater validity and reliability.

### 3.6 Data Analysis And Interpretation

Information obtained through questionnaire was captured digitally using an application developed in SPSS software. The data was verified, cleaned and validated before proceeding to analysis. Data obtained was analysed using SPSS where necessary. Analysis comprised of categorical tables, spider graph, clustered pyramid, and count of responses and cross tabulations.

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

Comparative analysis was also made in respect to correlated variables and basic classification criteria. An EFA was also carried out to have a reliable comparison of the variables in the students' questionnaire. Estimates were made wherever required, according to recommended statistical procedures. Results obtained were interpreted in relation to research findings in documentations.

#### 4.0 Results And Discussion

This particular research on ICT enhancing Physical Education has raised several pertinent questions. For our analysis we have focused on three key questions that seem to be relevant in our Mauritian context. To address the main research questions in our project, both students and teachers from the state, private and vocational institutions were targeted.

#### 5.0 Conclusion

It can be deduced from our analysis that in school ICT will help students to develop their ability to work in team. Students accept that technological tools will be a valuable asset that PE teachers can use to enhance their interest in classes. These students also believe that during their assessment technological tools will be advantageous to them. Effective communication between PE teachers and students. Using ICT to boost up participation of students and teachers.

#### 6.0 Recommendations

Proper training should be provided to teachers and students in relation to the use of ICT tools through workshops, seminars or other courses.

Specific equipments like digital video camera and visual analysis software should be provided to the P.E department in all school.

Such equipments are costly. So the P.T.A and other sponsors must contribute to raise funds to buy such equipments.

Internet facilities should be given to both teachers and students for good communication between departments, between teachers and students to raise standards of P.E, and also access to modern up to date technologies related to rules and regulations of sports.

Heart rate monitors and pedometers are useful apparatus which are directly related to the health conditions of students. These instruments represent a source of motivation as students can check their own performance. Digital multi exercises allow students to practice their weight training safely in the gym especially during rainy days at school.

Internet is a rich source to reach students and exchange meaningful information via email, face book and newsletter. Lesson plans can be given to students via on line for better assimilation.

Modern Trends in Physical Education & Sports Sciences

119

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

of concepts. Students should be authorized to use their mobile phones with camera options to view their own or others' performances while performing a particular skill.

Each zone should be provided with specialised equipments to calculate the maximum volume of oxygen [VO<sub>2</sub> max], that a student can consume during an endurance activity. This is very important for those athletes who represent schools or inter-colleges competitions.

This exercise will give an indication to all PE departments in general of the progress made by our pupils or participants. Pupils taking part for the Sc should be given the possibility of using these facilities and this should be extended to other schools as well. For example, in primary schools and special educational-need institutions.

Thus, we can see how valuable this digital video camera in teaching and learning of P.E. is. This can further enhance our cognitive domain as well as our psychomotor skills. Furthermore, students will not drop this subject in Form IV as they do for other purely academic subjects. In fact, they will be more likely to choose this subject as they will be assessed for 'playing' and doing exercises.

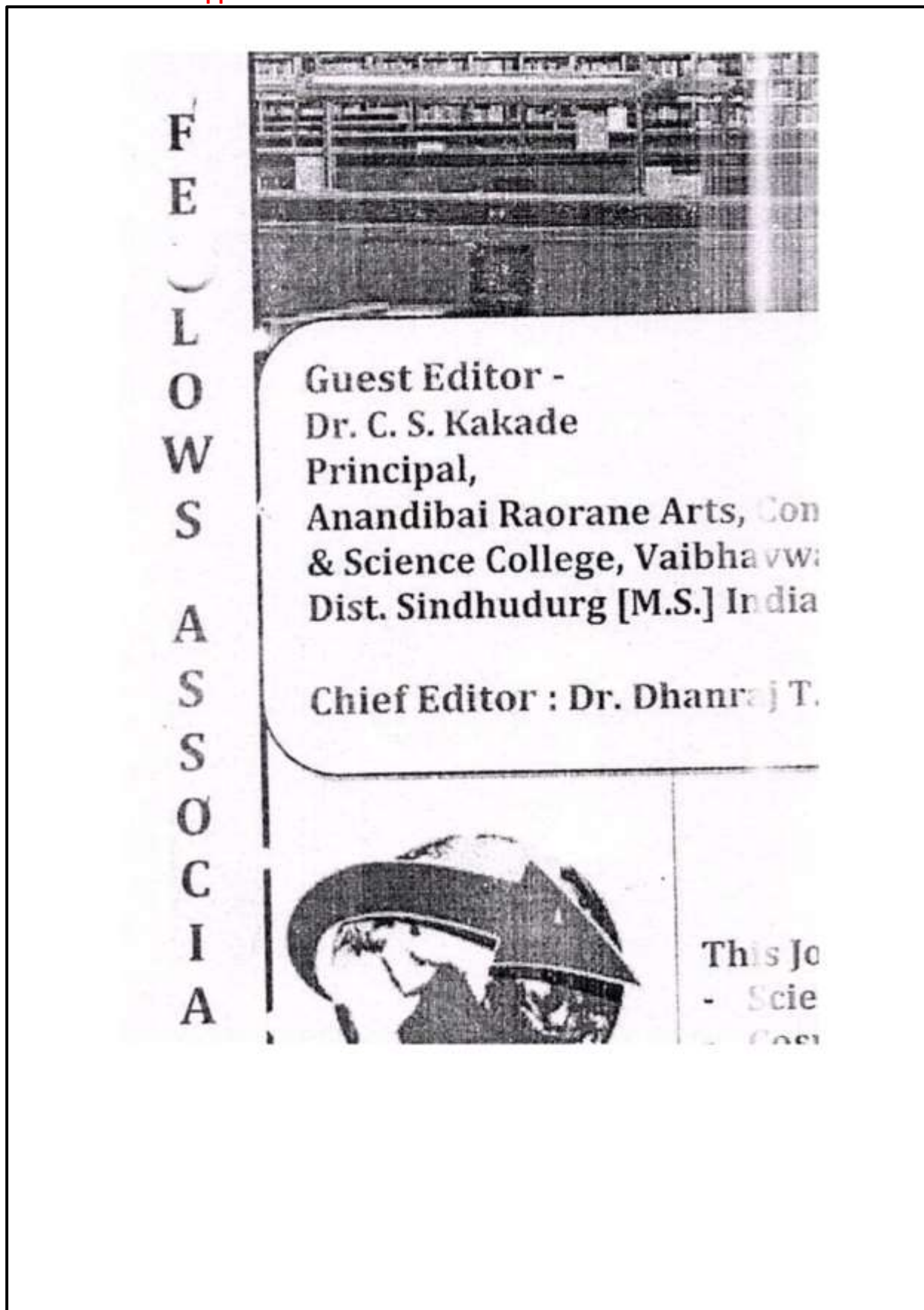
**References:-**

- 1) [www.ukessays.com](http://www.ukessays.com)
- 2) [www.google.co.in](http://www.google.co.in)
- 3) [www.en.wikipedia.org](http://www.en.wikipedia.org)
- 4) [www.tandfonline.com](http://www.tandfonline.com)
- 5) [www.researchgate.net](http://www.researchgate.net)





55. Application of ICT in Academic Libraries




**F  
E  
L  
L  
O  
W  
S  
A  
S  
S  
O  
C  
I  
A**

**Guest Editor -  
Dr. C. S. Kakade  
Principal,  
Anandibai Raorane Arts, Com  
& Science College, Vaibhavwa  
Dist. Sindhudurg [M.S.] India**

**Chief Editor : Dr. Dhanraj T.**

**This Jo  
- Scie  
- Cos**




**RESEARCH JOURNEY** *International Multidisciplinary E-Research Journal* | ISSN :  
 Impact Factor - (CJ) - 3.452, (SJIF) - 3.009, (GIF) - 0.676 (2013) | 2348-7143  
 Special Issue 51 | February  
 UGC Approved No. 40705 & 44117 | 2018

Impact Factor - 3.452

ISSN - 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

## RESEARCH JOURNEY

Multidisciplinary International E-Research Journal

PEER REFREED & INDEXED JOURNAL

February-2018

SPECIAL ISSUE-LI

**Guest Editor**  
 Dr. B. S. Yadav  
 K. J. Somaiya College of Arts, Commerce & Science,  
 Kopargaon, Tal. Kopargaon,  
 Dist. Ahmednagar (MS) India.

**Chief Editor**  
 Dr. Dhanraj T. Dhangar  
 Dept. of Marathi,  
 MGV's Arts & Commerce College,  
 Yeola, Dist. Nashik (MS) India.

**Executive Editors of the Issue :** Prof. S.R. Pagare, Dr. G. K. Chavhan & Prof. Mrs. N. B. Shinde  
 K.J. Somaiya College of Arts, Commerce & Science, Kopargaon

**SWATIDHAN INTERNATIONAL PUBLICATIONS**

For Details Visit To : [www.researchjourney.net](http://www.researchjourney.net)

© All rights reserved with the authors & publisher

Price : Rs. 600/-

1

Website - [www.researchjourney.net](http://www.researchjourney.net)

Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

## INDEX

Sr. No.	Title of the paper	Authors' Name	Page No.
1	<i>Important Role of an Embedded Technology in 21<sup>st</sup> Century</i>	Prof. Anil Bansode	07
2	<i>ICT In Academic Libraries</i>	Dr. Abhay Bhakte	11
3	<i>Open Source Software's for Library</i>	Mr. P. P. Kokane	16
4	<i>Use of IT in Information Gathering of Schedule Tribe Students in Vidarbha Region : A Study</i>	Mrs. Sarika Choudhary	21
5	<i>Mobile Based Services : Applications and Challenges</i>	Prof. K. D. Guldagad	26
6	<i>Impact of ICT on Academic Library Services in Digital Era</i>	Mrs. Samina Sayyed	32
7	<i>Knowledge Society</i>	Prof. Vishal Jadhav	35
8	<i>Stress Management in the ICT Environment in LIC's</i>	Ms. Ch. Ratna Kumari	40
9	<i>Challenges in Librarianship</i>	<b>Dr. Bhausaheb Shelke</b>	44
10	<i>Innovative Library Services In ICT For Academic Libraries</i>	Dr. S. P. Nimbhorkar	46
11	<i>Changing Dimensions of Librarianship : From Historical to Digital Era</i>	Nilesh Nagare	50
12	<i>Information Technology : A Recent Trend in Library and Information Centers</i>	Dr. Rajendra Marwade	54
13	<i>ICT and Its Impact on Library and LIS Professionals</i>	Bhagwan Gavit	61
14	<i>Green Library : The Perforation of the Future</i>	Mr. Avinash Salunkhe	72
15	<i>E-Journal Consortia and Role of UGC-Infonet</i>	Mohammed Mudassir Ahmed	79
16	<i>ICT Based Library Services in New Age</i>	Dr. Rajkumar Ghule	85
17	<i>Digitization: Tools and Techniques</i>	Archana Vanikar	89
18	<i>Use of ICT in Academic Libraries</i>	Mr. Avinash Sonawane	93
19	<i>Impact of ICT on Library Users and Library Services</i>	Mrs. Sumedha Saundankar	97
20	<i>Use of ICT in Academic Libraries : Impact of ICT on Librarians</i>	Dr. Anil Chandhari	105
21	<i>Information and Communication Technology (ICT) and Academic Libraries</i>	Dr. Sunita Mane (Saware)	109
22	<i>Use of Library Automation Software in Academic Library</i>	Jayshila Khundare & Dr. Parvin Shaist	113
3	Website – <a href="http://www.researchjourney.net">www.researchjourney.net</a> Email - <a href="mailto:researchjourney2014@gmail.com">researchjourney2014@gmail.com</a>		



UGC Approved No. 40705 & 44117

## Challenges in Librarianship

**Dr. Bhausaheb B. Shelke**  
(M.Com., M.Phil., M.Lib&I. Sci., M.Phil., Ph.D.)  
Librarian  
New Arts Commerce and Science College, Parner  
bhausaheb1shelke@gmail.com (9421331827)

### Introduction –

2018 was a very, very exciting year for our profession; we have seen many changes in our daily routine of library work and LIS schools. In current practice, we all of us there are more important questions about information than any of us can answer, and there to be some weighting of options. Indeed, it is a view that there are more questions in the field can hope to answer. But even allowing for this, we might all agree generally that information retrieval, information quality and data mining, raise at least some big questions for information research to study. Certainly, these areas are part of current LIS research, and one looks closely at how such research activities play out in practice, an interesting insight into our field is gained.

### Focus Areas

1. Managing resources:- Human, financial, informational resources, library development
2. Managing process:- Organizational culture, Library services, strategy and automation, digitization, professional ethics, Marketing of information, customer service

### Emerging Areas –

- Resource sharing and consortiums
- Digitizing of heritage material (archiving, imaging and preserving)
- Website design and development
- Information maintenance and security
- Integrating library processes with distance education.

### Best Practices-

The concept of best practices is not new to the libraries, the Five Laws of Library Science, endowed with the philosophy of best practice and the catalogue code for libraries, can be considered as one of the areas of best practices in Library and Information Science. Best practices, its tools like Benchmarking are more commonly employed in other areas of library and information science in one of them. The Academic Libraries in the country are at the threshold of facing big challenges more changes are due to globalization and liberalization in higher and professional education.

### Challenges before libraries –

Presently libraries are the central support services of their respective organizations. They provide dynamic support for achieving the goals and vision of services to the users. Librarians are professionally committed to update the collections continuously to reinforce and enrich the knowledge base for assisting the end users to achieve their academic, research, development, consultancy and interaction with the external environment.

Now information is everywhere available through community agencies, special interest groups, the media and of the course internet. The current explosion of information

**'RESEARCH JOURNEY'** *International Multidisciplinary E- Research Journal*  
 Impact Factor - (CIF) - 3.452, (SJIF) - 3.009, (GIF) - 0.676 (2013)  
 Special Issue 51  
 UGC Approved No. 40705 & 44117

ISSN :  
 2348-7143  
 February  
 2018



through in unfiltered formats, which raises questions about the authenticity, credibility and validity of that information. People and information seekers are then relied on librarians to provide access to authoritative and reputable sources of information through carefully selected collections and the provision of reference services.

To cope with the situation and considering the needs of the society and research community Library professionals have many challenges before them.

**These challenges are:-**

1. Shift from paper based resources to electronic resources.
2. Shift from acquisition to accessing the resources anywhere, anyone and anytime.
3. Media convergence in digital resources with seamless access to global resources.
4. Web page designing and electronic publishing issues.
5. User demands for access facilities at their desk tops
6. Resource sharing and shrinking budgetary provisions to the libraries.
7. Consortia arrangements for journal subscriptions or e-journals access.
8. Improving the bandwidth for internet access facilities.
9. Building and maintaining campus-wide network facilities with faster access.
10. Creating and maintaining large storage facilities and multi- processing systems.
11. Wider and Multi – user access to CD/DVDs using the large storage devices.
12. Hardware raid for data security and auto back-up facilities.
13. Database creation and maintain quality in database.
14. Acquiring access rights to e-books and e-journals with proper licensing agreements.
15. Working with RFID technology for self check out facilities.
16. Email, Internet browsing and access to online resources apart from OPAC with 24 hours access facilities to all resources.

To face and implement the above challenges before library professionals, Library professionals have to acquire certain skills to fulfil these challenges. They have to work hard and take more responsibilities to develop libraries.

Librarianship is certainly a long way from deteriorating into a second rate profession. It is necessary to look at ourselves and repair own professional faults in order to make sure that our libraries continue to serve effectively that society which supports them and of which they are important part.

University Grants Commission under the umbrella of INFLIBNET has introduced N-List program to all colleges which are comes under 2F and 12B section of the UGC. In this program college libraries are getting online access of 31,35,000+ e-books and 7500+ e- journals to improve the quality of teaching and research in colleges. It is very useful for library professionals will take benefit of this extremely good facility provided by UGC.

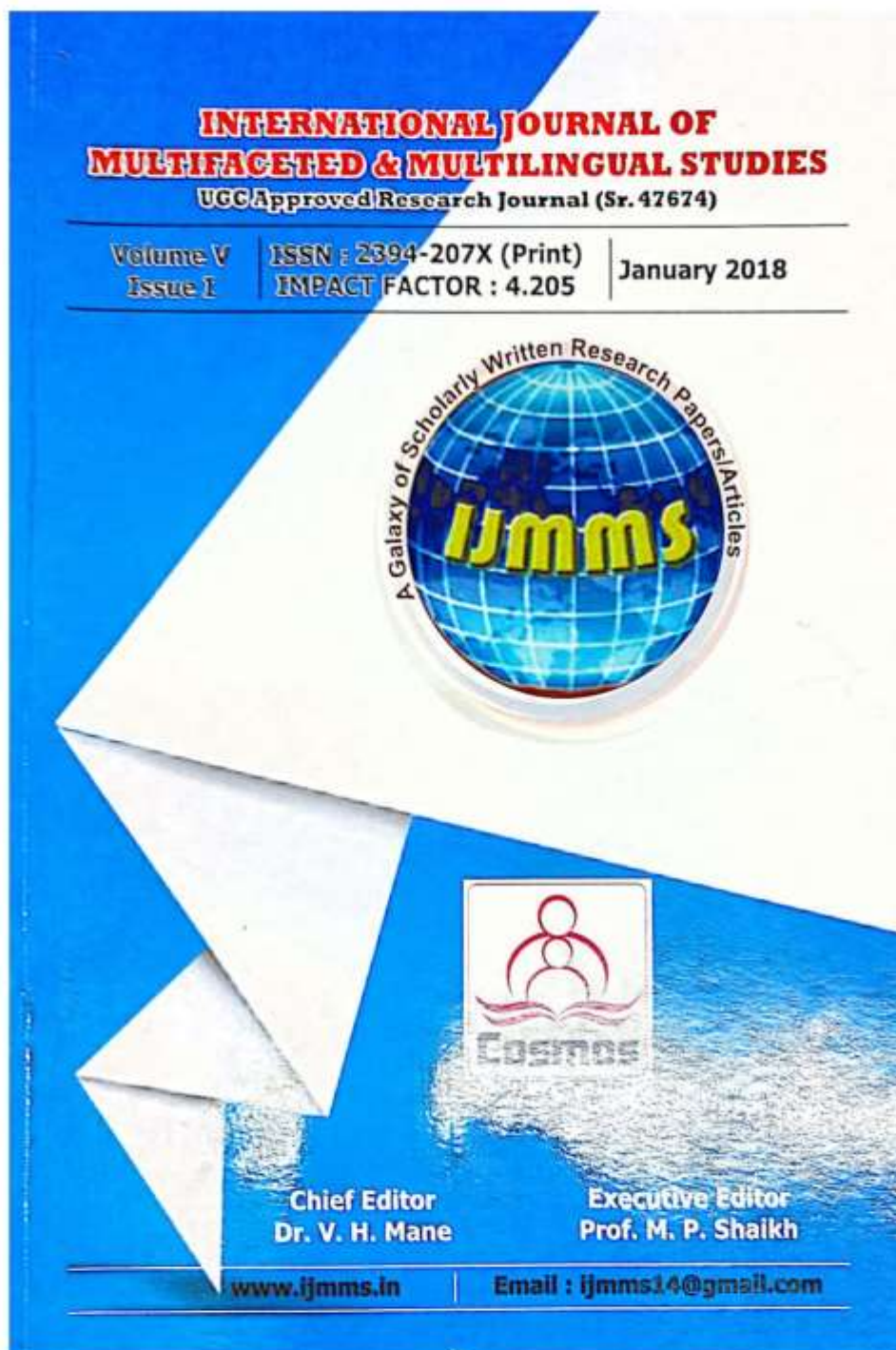
It is very essential that all library professionals will accept these challenges and do something for the society and building the image of the library.

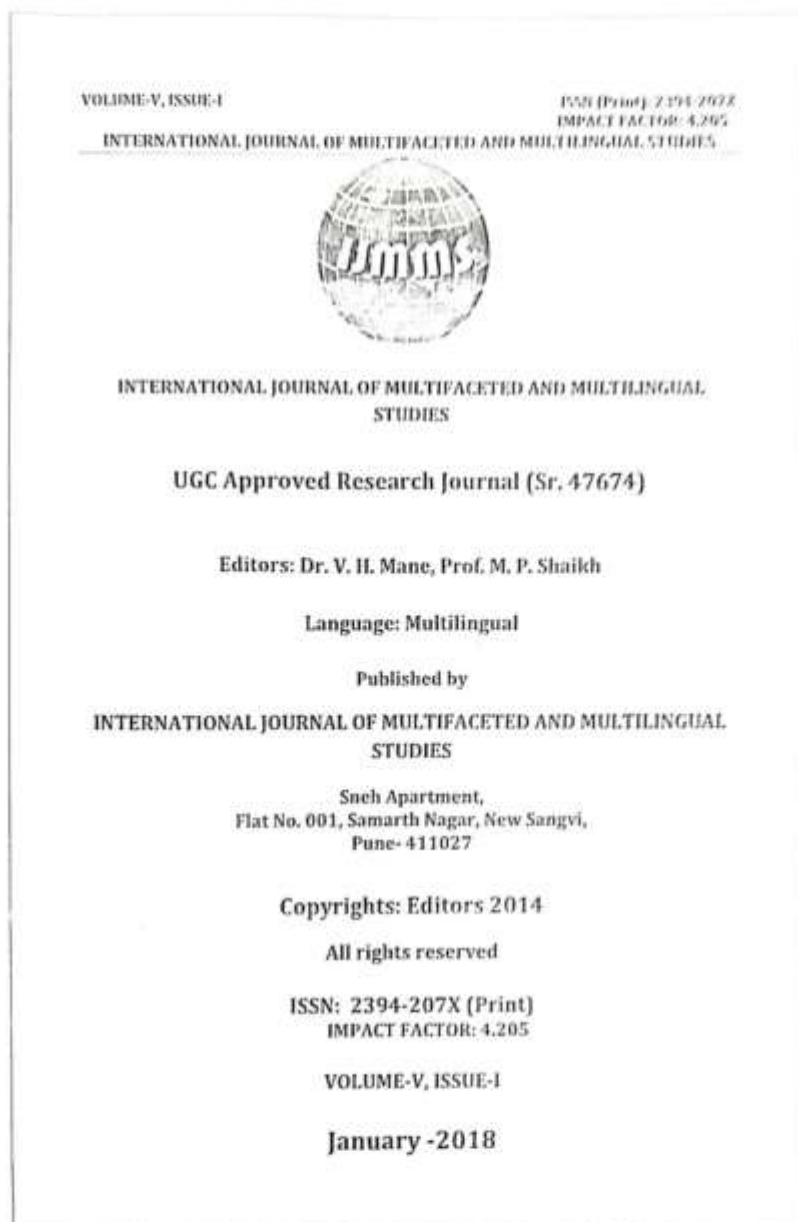
**References: –**

- V.Rajaraman,(2003), Introduction to Information Technology, Prentice Hall of India, New Delhi. ESS, ESS
- Kumar, P.S.G, (2002) A Students manual of Library and information science. Delhi, B.R , Publishing
- Phadake D.N, Computerizes Library and modernization, universal publication, pune

Website – [www.researchjourney.net](http://www.researchjourney.net) Email - [researchjourney2014@gmail.com](mailto:researchjourney2014@gmail.com)

## 56. Use of ICT in modern Libraries





VOLUME-V (I) Impact Factor: 1.705 Year (Print): 2017-18  
 INTERNATIONAL JOURNAL OF MULTIMEDIA AND MULTIMEDIA STUDIES

**Index**

Sr.	Name of the Paper	Name	Page No.
✓ 1.	Smart Libraries and Inspired Librarians	Dr. Bhansabeh R. More	1-3
2.	Case Study of Library of Rasiklal Manikchand Dhariwal Institute of Technology, Chinchwad	<sup>1</sup> Sandeep Babul Chougale <sup>2</sup> Thite Anil B	4-8
3.	Digital divide: Bridging a Gap between the Diverse in habitants	<sup>1</sup> Chandrashtee S.B <sup>2</sup> Chandrasvandan A.B	9-11
4.	Investigation on Personal Characteristics of Engineering Students for Improving Result in University Exam: A Case Study	<sup>1</sup> Shobha Kumbhar <sup>2</sup> Kantilal Tambhane <sup>3</sup> Santosh Tambhane	11-16
5.	Evaluation of Reading Hall Facility in Professional College Libraries of Solapur District	PravinBhansabeh Mane	19-21
6.	Knowled Repositories: Open Source of Knowledge	Anil Chougale Hansole	24-27
7.	Social Media and Its Applications to Library Services	<sup>1</sup> Manisha Nimraj Jadhav <sup>2</sup> Prof. Gokulad Manisha R	29-31
8.	Suitable Facilities in Academic Library	Mr. Chakradhar V. Bhore	32-34
9.	Barcode Technology is the Main Part of University Library Computerization and Automation in Modern Digital Cutting Age	Mr. Boudhe Rajkumar Gangaram	35-38
10.	Designing Library web page: A Technical Parameter	Dr. Sheldhar Dongre	39-45
11.	Changing Role of Libraries and Librarians in Digital Era	Mr. Pulari Arjun Ramdas	46-49
12.	Knowledge Management is Key of Success	<sup>1</sup> Ms. Neeta S Dhawale <sup>2</sup> Ms. Meghna Desai	50-52
13.	Digital Library, Librarianship and Future	Prof. K.D. Goddagad	53-56
14.	Libraries and Librarians Role in Digital Era	Amar K Kulkarni	57-61
15.	The Changing Role of Library Professionals in Modern Era	Prof. Vanita Soteyawan Mane	62-65
16.	Resource sharing in networking	Rishori M. Marathe	66-70
17.	Knowledge Management in Libraries: Competencies and Challenges of Knowledge Management in 21st Century	Dr. S. P. Nimbhorkar	71-76

January-2018

Website: [www.ijmms.in](http://www.ijmms.in)

Email: [ijmms14@gmail.com](mailto:ijmms14@gmail.com)

VOLUME-V (I) ISSN (Print): 2394-207X  
INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

### Smart Libraries and Inspired Librarians

Dr. Bhansabeh B. Shelke  
Librarian

New Arts Commerce and Science College, Parner Dist- Ahmednagar

**Abstract:**

*The advancement of ICT has made a major influence in the global information society, smart phones and hand held information and communication technology devices are pervasive in every walk of life, throughout the world in all countries and at all levels of societies. Now, it has become very important to develop necessary professional skills in order to harness these challenge. Library and information science is an amalgamation of various subject and libraries are one of the most important units of all organization. Not only the Academic Libraries but public Libraries, Research Libraries and corporate Libraries are facing new challenges everyday to satisfy the user community by providing required information in least possible time. Libraries are now adopting new technologies in order to move towards digitization of library resources and to provide services to the user community in more effective and efficient manner.*

**Key words:** – Librarian Skill, Smart libraries, Inspired Librarians

**Introduction:** Libraries are now becoming an integral part of Information – based society. Because of the increasing awareness among the users, availability of new resources and advanced application of Information communication technology, the library is changing its traditional concept rapidly. Now Librarian are facing technological pressure, due to new technologies, software electronic security system, virtual libraries, online libraries implemented all over the world on regular basis. Librarians are expected to cope up with all these changing circumstances, to render effective library services.

**Librarian Professional Skill –**

1. Basic skills – Basic skill, which are necessary for running and operating a general traditional Library Skill for classification and cataloguing of documents, method of indexes and abstracting etc. are also requires for the Librarian walking in the web environment.
2. Technological Skills – Technological skills means those skills which are required to handle information technology and its other related fields such as computer operation, telecommunication medias, creation of online database, designing of websites searching & give online information through internet etc.
3. Cataloguing and metadata- Identifying the resources for future access.
4. Indexing and database Technology – Building search system or supporting finding aids.
5. Internet & computer communication – Computer communication networking architectures and systems LAN, MAN, and, WAN as well as using of internet and other library related networks like INFLIBNET, DELNET and CALIBNET including n-list program.
6. Managerial skills – Librarian is manager of Library & Information Centre, so Librarian become Librarian. Librarian have some basic managerial skills for managing different section like Finance, Human resources, Staff co-relation with among & the users, Staff & users meet etc. They should have applied managerial skill & technique like POSDCORB. Librarians define their strength, weakness, opportunity & threats by using SOWT technique.
7. User interface skills – librarian must be adopt user interface skills.
8. Web Technology – many librarians and 2 integrated Library systems use these exciting tools to bridge the gap between the user and the information. The age old reference services are now being enhancer using web 2.0 tools to have instant messes is service.
9. Wikis:- A wikis collection of web pages designed to enable anyone who access it to contribute or modify content using a simplified markup language. Libraries can use wikis as a communication tool to enable social interaction among librarians.



VOLUME-V (I)

ISSN (Print): 2394-2028

## INTERNATIONAL JOURNAL OF MULTIFACETED AND MULTILINGUAL STUDIES

10. Blogs- A blog is a website where people can share their thoughts, ideas, suggestions, comments. Today there will be thousands of blogs written by librarians on professional matters. All these are available free of charge on web for others to take benefit.

**Librarian Skills**

- Good communication and interpersonal skills, Excellent organisational skills, To be comfortable using computers, The ability to work as part of a team, An interest in books and other information sources.

**SMART Libraries**

**S** - Sustainable (e.g., maintains its financial viability)

**M** - Material variety rich (e.g., provides information in different formats)

**A** - Access-friendly (e.g., gives continuous access through various ICT and other means)

**R** - Reliable and relevant information source (e.g., ensures trustworthiness)

**T** - Time-bound service provider (e.g., delivers the output as promised)

**For SMART Library making**

- To create multi-functionality library spaces.
- To address the needs of the differently-abled library patrons.
- To ensure that all the library processes are compatible with the green library concept.
- To create a separate digital corner.

**Role of Librarian:** It is very important role or duty of the Information professional is, getting the *right* information, from the *right* source, to the *right* client, at the *right* time, in the *right* form, for the *right* use, with the *right* cost.

**Inspired Librarian**

- I** - Innovator (new services designer)
- N** - Negotiator (skilful in bargaining)
- S** - Sympathiser (serves individually)
- P** - Performer (delivers as scheduled)
- I** - Integrator (seamless service provider)
- R** - Reflective thinker (pre-empts the problems)
- E** - Exemplar (leads with own actions)
- D** - Director (retains the control)

**Conclusion:** To keep pace with the fast changing modern time the college librarian need reorganization the application of computers in information retrieval is catching rapidly. The problem associated with computerization should be identified objective defined in view of the resources and needs. A well-organized information system, need to be provide to academic communities. In this way the resources of Libraries will be used in an effective way. It will also be helpful in resource sharing & networking project like INFLIBNET. In this manner college libraries may be in a position effective teaching learning information support to college in future

**References:**

- Lancaster, E.W., and Sandore, Beth (2001) Technology and management in Library and Information services. London, Library Association
- Nigeria, Umanakwe, E., Onyawa, O, and UK pong, Eche A, Ibadan: Sibon Books, P.55
- V.Rajaraman, (2003), Introduction to Information Technology, Prentice Hall of India, New Delhi. ESS. ESS
- Kumar, P.S.G, (2002) A Students manual of Library and information science. Delhi, B.R Publishing
- Krishnan, Gopal., (2005), Digital Libraries in electronic information era. Dehli, Author press
- Phadake D.N, Computerizes Library and modernization, universal publication, pune

## 57. Synthesis and Characterization of Bismuth Ferrite by Chemical Route



Int. Res. J. of Science & Engineering, 2018; Special Issue A2: 83-88  
ISSN: 2322-0015

SJIF Impact Factor 4.11  
UGC Approved Journal No. 63628

RESEARCH ARTICLE

OPEN ACCESS

## Effects of Short-term Magnetic Field on Germination and Growth of Plants

Ashutosh Khade and Mancharkar Avinash

P.G. Department of Physics, New Arts, Commerce & Science College, Parner, 414302, India

Email: [ask16590@gmail.com](mailto:ask16590@gmail.com)

### Manuscript Details

Available online on <http://www.irjse.in>  
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

### Cite this article as:

Ashutosh Khade and Mancharkar Avinash.  
Effects of Short-term Magnetic Field on  
Germination and Growth of Plants, *Int. Res.  
Journal of Science & Engineering*, January 2018;  
Special Issue A2: 83-88.

© The Author(s). 2018 Open Access

This article is distributed under the terms  
of the Creative Commons Attribution  
4.0 International License

(<http://creativecommons.org/licenses/by/4.0/>),  
which permits unrestricted use, distribution, and  
reproduction in any medium, provided you give  
appropriate credit to the original author(s) and  
the source, provide a link to the Creative  
Commons license, and indicate if changes were  
made.

### ABSTRACT

The Numerous studies have been carried out to investigate the effect of short-term magnetic field exposure on plants, where seedlings (4–5 days old) were continuously exposed and grown under short exposure condition. Here, we have used a novel 'short-term magnetic field exposure experimental method' where imbibed seedlings were exposed to higher gauss values ranging from 300 gauss to 0.2 Tesla for a short interval time of 10 minutes. Changing patterns in peas and chick-peas germination and growth, along with various photo-synthetic and biochemical parameters were studied. Results revealed the significant inhibition of germination and growth in short-term magnetic field exposure treated seeds over control. Photosynthesis parameters such as chlorophyll content were found to be affected significantly in 5 days old seedlings exposed to short-term magnetic field exposure treatment. In order to investigate the cause of observed inhibition, we examined the  $\alpha$ -amylase activity and antioxidative enzyme activities.  $\alpha$ -amylase activity was found to be inhibited, along with the reduction of sugars necessary for germination and earlier growth in short-term magnetic field exposure. In addition, the health status was measured by leaf color, spots and the stem curvature and the death rate. The result showed the magnetism had a significant positive effect on plant growth. Plant seeds under the influence of magnetic field had higher germination rate and these plants grew taller, larger and healthier.

**Keywords:** Hall-probe Instrument, Pisum-sativum, Cicer-arietinum, Chlorophyll content, Photosynthesis, Short-term magnetic field

State level Seminar on "Advanced Methods for material Characterization" (SCAMMC -2018)

© 2018 | All right reserved

|83

## INTRODUCTION

Plants have adapted themselves to the ever existing force of gravity (1 g) on earth for eons of years. Any change in the magnitude of gravity as result in magnetism therefore affects the plant growth and development. In recent years, gravity as well as magnetism driven changes in plant productivity has remained an exciting research area in the mainstream of plant physiology research. To understand the role of changing magnetism on plant behavior various systems have been developed. In most of the earlier reports, three to five days old seedlings were exposed to higher gauss values up to 3000 gauss for longer durations and effects were studied. For instance, suppression in elongation of both epicotyls and roots as well as inhibition in lateral root growth was observed in peas centrifuged at 140 gauss, 370 gauss and 1050 gauss for five days continuously. The decrease in percentage germination and growth was observed in wheat exposed to basipetal magnetic field for three days at 25 °C in the dark. Stem elongation in 5 mm *Arabidopsis thaliana* inflorescence stems was suppressed, while dry weight of the inflorescence stems increased, when exposed to 300 gauss for 24 hrs in dark at 25 °C. Such approach does not provide any information about the magnetic field effect on germination. Moreover, the duration of field exposure were considerably high ranging from 12 hrs to 21 days. Many studies have reported a reduction in percentage germination under field exposure environment, which has been maintained for a longer duration, but none have explained the possible cause for such reduction. Also, the influence of higher gauss values on important aspects of photosynthesis process such as chlorophyll pigment content, net photosynthetic rate, efficiency of photosystem PSII etc. have not been reported.

This showed that the growth and yield of lettuce could be improved by treatment of its seeds before they were grown, using rectified sinusoidal non-uniform electromagnetic fields. It was observed that magnetism has effects on lettuce at the nursery, vegetative, and maturity stages, including a significant increase in root length and shoot height, a greater growth rate, and a significant increase in plant height, leaf area, and fresh mass. Positive biological

effects of magnetism on sunflower and wheat seedlings weights were reported. Further data show that the magnetic field induced by the voltage of a specific waveform enhanced or inhibited mung bean growth, depending on the frequencies, which suggests that the magnetic field on plant growth may be sensitive to the waveform and frequency of the source electrical voltage. The effect of static magnetic field on plant growth has also been studied. We have found that static magnetic field accelerated germination and early growth of wheat and bean seeds, obtained similar results with chickpeas; furthermore, they found that the responses of the plant to static magnetic field varied with field strength and duration of exposure with no particular trend. However, as indicated by a literature review, weak magnetic field exhibited negative effects on plant growth, such as inhibition of primary root growth, in some cases. For instance, exposure to magnetic field inhibited early growth of radish seedlings with decrease in the weight and leaf area. An interesting result is that the biological effect of a magnetic field is different between the south and north poles, as illustrated by a study, which showed that radish seedlings had a significant tropic response to the south pole of the magnet, but insignificant response to the North Pole. It is theorized that the south pole of the magnet enhances plant and bacterial growth by conferring energy, whereas the north pole retards their growth. Thus, it is possible to utilize the magnetic north pole against infections or tumor growths. Morphological anomalies in pollen tubes of a particular plant exposed to magnetism were observed, which raises an important question of whether magnetism can cause gene mutation and cancer. This issue is still controversial and demands more research evidence before any conclusion can be drawn.

Therefore, the aim of the present study was to analyze the effect on the germination and various physiological parameters, when seeds were exposed to short-term magnetic field. Various physiological and biochemical parameters such as germination, growth, chlorophyll content, photosynthesis, chlorophyll fluorescence as well as antioxidative response were studied. As per our knowledge such kind of work has not been carried so far.

## METHODOLOGY

*Seeds Selection and Short-term magnetic field exposure Treatment* Pea seeds (*Pisum sativum*) and chick peas (*Cicer arietinum*) were procured from the local market of Parner city (MH). They were treated with 0.5 % systemic fungicide (Uthane M-45, United Phosphorus Limited), washed thoroughly and imbibed in distilled water (D.W) for 24 hours. After imbibition these seeds were subjected to short-term magnetic field treatment viz. 1000 gauss, 1500 gauss, 2000 gauss for 10 min each at 25 °C, using a Hall probe Method. Light intensity was maintained as 15  $\mu\text{E m}^{-2}\text{s}^{-1}$ . All the measurements were carried out on 5<sup>th</sup> day post sowing with emerged out shoots.

### Estimation of Embryo Viability

Immediately after 10 min of short-term field treatment, control and treated seeds were stained with 1 % tetrazolium solution to check the embryo viability.

### Seed Germination, Growth and Vigor Index Measurement:

Percentage germination, root length, shoot length, fresh weight of shoot and root were measured for both control and short-term magnetic field treated samples on fifth day from sowing. Vigor index of the seedlings was calculated by using the relation,

$$\text{Vigor Index} = \text{Average total height of seedlings} \times \% \text{ seed germination}$$

### Enzyme Extraction and Assays

Five days post short-term magnetic field exposure, control and short-term field treated seeds without leaf blades were homogenized in ice cold 0.05 M phosphate buffer (pH 6.8) containing EDTA (0.5 mM). Each homogenate was centrifuged at 10,000  $\times g$  for 10 min at 4 °C. The supernatant was used for enzyme assays.

$\alpha$ -Amylase activity, catalase activity (CAT) and guaiacol peroxidase (GPX) activity were determined as described by Sadasivam and Manickam with some minor modifications. One unit of Amylase activity was defined as the amount of enzyme required for liberating 1 mg of maltose per min at 37 °C. Catalase activity was measured by the decrease in  $\text{H}_2\text{O}_2$

concentration in a reaction mixture containing 0.05 M phosphate buffer (pH 7.0), enzyme extract &  $\text{H}_2\text{O}_2$  at 430 nm. Guaiacol Peroxidase activity was determined as the rate of oxidation of guaiacol to tetraguaiacol that is being monitored by recording the absorbance change at 436 nm for one min. Protein concentration was determined according to using bovine serum albumin standard.

### Biochemical Quantification of Non Structural Carbohydrate Reserve:

Starch content and total reducing sugars were estimated from caryopses of five-days old seedlings raised from short-term magnetic field and control as described by Sadasivam and Manickam

### Estimation of Chlorophyll Content

Chlorophyll was extracted from shoots of five days old seedlings raised from control and short-term magnetic field exposed seeds according to the method of Absorption spectra of total chlorophyll were recorded by using UV-Visible spectrometer. Chlorophyll a, b and total chlorophyll contents were calculated using Arnon's formula.

### Photosynthesis and Chlorophyll Fluorescence Parameter

Photosynthesis parameters were recorded with the help of TPS-2, a portable photosynthesis system (PP systems, USA). Shoots of five days old peas seedlings were placed in the leaf cuvette (PLC4-B type, area 2.5  $\text{cm}^2$ ) and photosynthesis rate ( $P_n$ ), transpiration rate (Evap), stomatal conductance ( $G_s$ ) and intracellular  $\text{CO}_2$  concentration ( $C_{int}$ ) were measured at PAR intensity of 600  $\mu\text{mol m}^{-2}\text{s}^{-1}$ .

Before recording chlorophyll fluorescence, shoots were dark adapted for 15 minutes. The chlorophyll fluorescence transient was induced by applying a pulse of saturating red light (peak at 650 nm, maximum intensity  $> 3000 \mu\text{mol m}^{-2}\text{s}^{-1}$ ) at the sample surface. The LEDs are focused via lenses onto the leaf surface to provide even illumination over the area of leaf exposed by the leaf clip (4 mm diameter). Fluorescence parameters defining the photochemistry of PSII such as maximum quantum efficiency of PSII photochemistry (Fv/Fm), performance index on the basis of absorption (PI) and maximal photochemical

efficiency of PSII (Fv/Fo) were measured using Handy PEA (Hansatech Instruments Ltd, England).

**Statistical Analysis**

Each experiment was done in triplicates. For each measurement, the mean values and the standard error of the means (SE) were calculated. The significance of differences between control and treatment was analyzed by the Student's t-test.

**RESULT AND DISCUSSION**

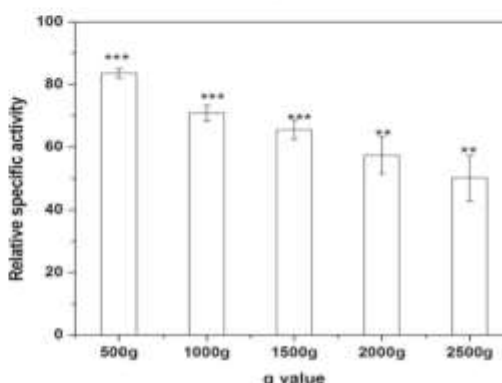
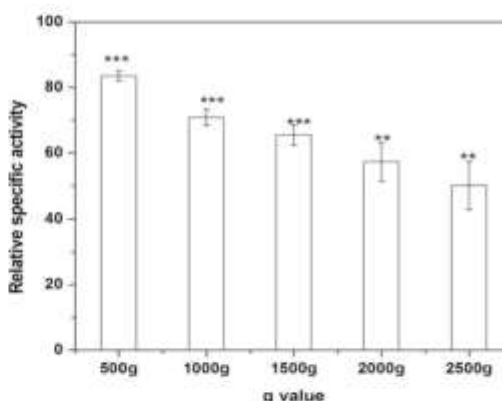
In the present study we have analyzed the post effects of short-term magnetic field exposure on peas and chick peas germination and growth parameters. The results provide physiological and biochemical evidences suggesting that seeds are able to perceive magnetic field stress within short duration interval of 10 min, can memorize and respond to it upto five days.



**Fig 1:** The unhealthy changes in control and experimental groups at the end of the fourth week. *Embryo Viability, Caryopses Germination, Growth and Vigour Index.*

Embryo viability test was performed to rule out the possibility of physical damage to the seeds exposed to field values. Result showed that seeds were 100 % viable even after exposure to field value and have ability to grow. Fig.1 shows the growth of five days seedlings raised from control and short-term magnetic field exposed seeds. No germination was observed in 2500 gauss. Any change in the magnitude of field is

thus expected to affect seed physiology. In the preliminary experiments it was found that germination and growth was resistant to the inhibitory effect of short-term magnetic field up to 400 gauss. This could be due to the relatively harder seed coat which might be shielding the effective magnetic force experienced by the embryo. It is only after 500 gauss, that the inhibitory effects on germination and growth related parameters were observed.



**Fig 2:** Effect of short-term magnetic field on relative *α*-amylase activity in seeds (U g<sup>-1</sup> of seed). Percent relative activity was calculated with respect to control Chlorophyll Content.

After germination, degreening, a major event occurs in seedlings, where etioplasts get converted to chloroplast. At this stage, chlorophyll is synthesized with a greater rate.

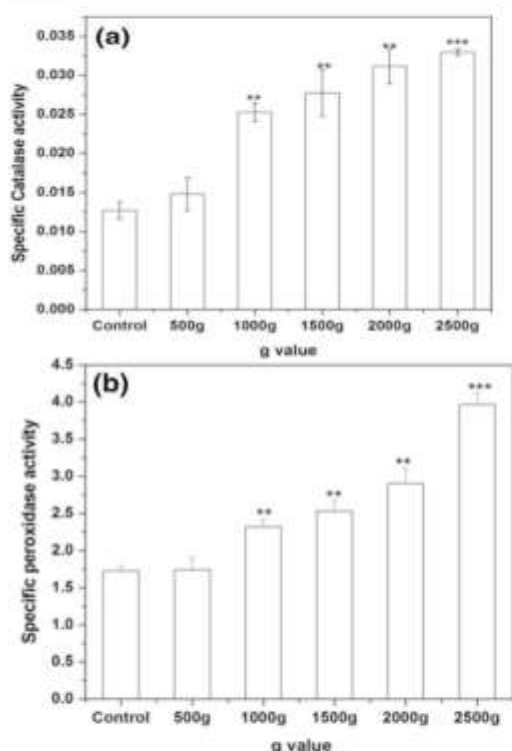


Fig. 3 a. Effect of short-term magnetic field exposure on Catalase specific activity ( $U\ g^{-1}$  of seed) in pea seeds. b Effect of short-term magnetic exposure on Guaiacol peroxidase specific activity ( $U\ g^{-1}$  of seed) in chick pea seeds.

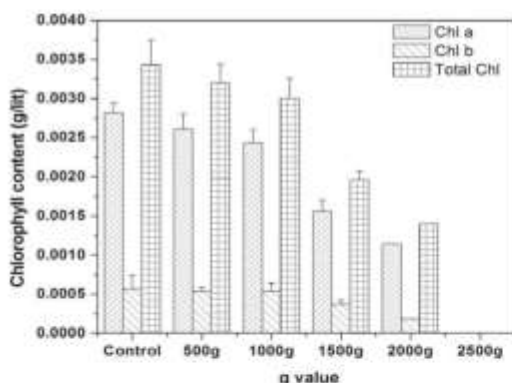


Fig. 4 Chlorophyll contents (Chl a, Chl b and total Chl, g/ltr) in shoots of 5 days old seedlings raised from control and short-term magnetic field exposed seeds.

Therefore, inhibition at the stage of germination can have adverse effect on the greening process of plants. Moreover, oxidative stress is responsible for the inhibition of chlorophyll biosynthesis.

We therefore investigated the chlorophyll concentration in short-term magnetic field treated seedlings with control. Major photosynthetic pigments, chl-a and chl-b, were significantly decreased in seedlings raised from short-term magnetic field exposed. Decrease in chlorophyll content was 7 %, 14 %, 45 % and 60 % in 500 gauss, 1000 gauss, 1500 gauss and 2000 gauss, respectively as compared to the control.

### CONCLUSION

Present study has shown for the first time that imbibed seeds could sense and respond to magnetic field exposure given for a very short period of 10 min, without any physical damage. Further, they can retain this memory even while growing less than 1 gauss conditions post short-term hyper-gravity treatment. In conclusion, short-term magnetic exposure of 10 min might disrupt the  $\alpha$ -amylase activity of germinating peas, which probably restricts the supply of sugars necessary for the embryo growth and development. Further, short-term magnetic field exposure reduced chlorophyll content and thus, the photosynthetic activity of growing peas seedlings. This can be related to the enhanced antioxidative enzyme activity in short-term magnetic field exposed seeds. Though such high gauss values used in the experiments do not exist in nature, situations may occur where hydrostatic forces of this order may exist. Moreover, without any special modification in the instrument design of centrifuge, it is possible to study the effect of short-term magnetic field on plants. This method in itself provides a simple and novel approach to study magnetic field effects on plants. As per our knowledge, this kind of study has not been reported previously.

**Conflicts of interest:** The authors stated that no conflicts of interest.

## REFERENCES

1. Belyavskaya NA. Biological effects due to weak magnetic field on plants. *Adv Space Res.*,2004; 34: 1566-74.
2. Dattilo AM, Bracchini L, Loisel SA, Ovidi E, Tiezzi A, Rossi C. Morphological anomalies in pollen tubes of *Actinidia deliciosa* (kiwi) exposed to 50 Hz magnetic field. *Bioelectromagnetics.* 2005; 26: 153-6.
3. De Souza A, Sueiro L, González LM, Licea L, Porras EP, Gilart F. Improvement of the growth and yield of lettuce plants by non-uniform magnetic fields. *Electromagn Biol Med.*,2008; 27:173-84.
4. Fischer G, Tausz M, Kock M, Grill D. Effects of weak 16 3/2 Hz magnetic fields on growth parameters of young sunflower and wheat seedlings. *Bioelectromagnetics*, 2004; 25:638-41.
5. Huang HH, Wang SR. The effects of inverter magnetic fields on early seed germination of mung beans. *Bioelectromagnetics.* 2008; 29:649-57.
6. Vashisth A, Nagarajan S. Exposure of seeds to static magnetic field enhances germination and early growth characteristics in chickpea (*Cicer arietinum* L.). *Bioelectromagnetics* 2008; 29: 571-8.
7. Aarti, D., Tanaka, R., Ito, H., Tanaka, A.: High light inhibits chloro-phyll biosynthesis at the level of 5-aminolevulinate synthesis during de-etiolation in cucumber (*Cucumis sativus*) cotyledons. *Photochem. Photobiol.* 2007; **83**, 171-176.
8. Arnon, D.I.: Copper enzymes in isolated chloroplasts Polyphenoloxi-dase in *Beta vulgaris*. *Plant Physiol.* 1989; **24**(1), 1-15.
9. Barjaktarović Z, Nordheim A, Lamkemeyer T, Fladerer C, Madlung J, Hampp R. Time-course of changes in protein amounts of specific proteins upon exposure to hyper-g, 2-D clinorotation and random positioning of *Arabidopsis* cell cultures. *J. Exp. Bot.* 2007; **58**(15-16), 4357-4363.
10. Beck E, Ziegler P. Biosynthesis and degradation of starch in higher plants. *Annu. Rev. Plant Physiol. Plant Mol. Biol.*1989; **40**, 95-117.
11. Jagtap SS, Vidyasagar PB. Effects of high gravity (g) values on growth and chlorophyll content in wheat. *Int. J. Int. Biol.* BBB10 special issue, 2010; **9**(3), 127-129.

© 2018 | Published by IRJSE

ISSN 2322-0015

<http://www.irjse.in>

## 58. Effect of short term magnetic field on germination at growth of the plants



Int. Res. J. of Science & Engineering, 2018; Special Issue A2: 10-12  
ISSN: 2322-0015

SJIF Impact Factor 4.11  
UGC Approved Journal No. 63628

RESEARCH ARTICLE

OPEN ACCESS

## Synthesis and Characterization of Bismuth Ferrite by Chemical Route

Sherkar VB and Mancharkar AV (Ph.D.)

New Arts, Commerce and Science College, Parner, MS, India  
Email: [sherkarvishal@gmail.com](mailto:sherkarvishal@gmail.com)

### Manuscript Details

Available online on <http://www.irjse.in>  
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

### Cite this article as:

Sherkar VB and Mancharkar AV. Synthesis and Characterization of Bismuth Ferrite by Chemical Route. *Int. Res. Journal of Science & Engineering*, 2018; Special Issue A2: 10-12.

© The Author(s). 2018 Open Access

This article is distributed under the terms of the Creative Commons Attribution 4.0 International License

(<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

### ABSTRACT

In the present work of bismuth ferrite ( $\text{BiFeO}_3$ ) multiferroic Nanoparticles synthesized by Chemical Route followed by thermal treatment at annealed at  $300^\circ\text{C}$ ,  $400^\circ\text{C}$  and  $500^\circ\text{C}$ . It is found that  $\text{BiFeO}_3$  nanoparticles crystallized at annealed  $300^\circ\text{C}$ .  $\text{BiFeO}_3$  nanoparticles with different sizes distributions show obvious ferromagnetic properties, and the magnetization is increased with reducing the particle size. The prepared samples were characterized by X-ray diffraction of powder (XRD), scanning electron microscope (SEM) or extracting their surface morphology and their crystallographic structure and revealed a homogenous size distribution of nanometric Bismuth Ferrite perovskite powders with a grain size of 200 nm which is in well agreement.

**Keywords:** Bismuth ferrite, Nanoparticles, X-ray diffraction, SEM

### INTRODUCTION

Bismuth Ferrite  $\text{BiFeO}_3$  is also commonly referred to as BFO in materials science. It is an inorganic chemical compound with perovskite structure and one of the most promising multiferroic materials. Bismuth ferrite  $\text{BiFeO}_3$  (BFO) is one of the most popular research materials in condensed matter physics at present. The room temperature phase of  $\text{BiFeO}_3$  is classed as rhombohedral belonging to the space group  $R3C$ . It is synthesized in bulk and thin film form and both its antiferromagnetic (G type Ordering) Neel Temperature and ferroelectric Curie

State level Seminar on "Advanced Methods for material Characterization" (SCAMMC -2018)  
© 2018 | All right reserved

|10



Sherkar VB and Mancharkar AV, 2018

11

temperature are well above room temperature. BFO is much important for novel applications as sensors as well as actuators due to the coupling between magnetic and electric domains above room temperature and accepted high polarization in single crystal.

## METHODOLOGY

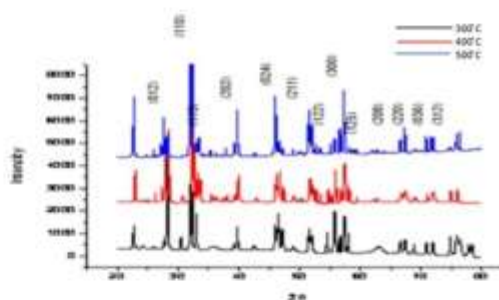
- (i) Chemicals Used: Bismuth nitrate, Ferric nitrate, Citric Acid
- (ii) Preparation of BiFeO<sub>3</sub> materials by chemical route. A stock solution of 0.2 M Bismuth nitrate in aqueous medium was prepared. The 0.2 M Ferric nitrate solution and 0.2 M

Bismuth nitrate solutions were mixed in a 500 mL beaker under stirring condition. Citric acid was added cautiously. The ammonia solution was then added drop-wise into the mixed solution under continuous stirring condition and a light brownish gel was obtained. The powders obtained from the above procedures were annealed at 300°C, 400°C and 500 °C so that the volatile matters like moisture and other unwanted components were removed. After the complete chemical synthesis and heat treatment of the synthesized products, the sample were characterized using X-ray diffraction (XRD) with a X-ray diffractometer with CuK $\alpha$  radiation ( $\lambda=0.154178$  nm) and Scanning Electron Microscope (SEM) for extracting their surface morphology and their crystallographic structure.

## RESULT AND DISCUSSION:

The synthesized bismuth ferrite nanoparticles were characterized by using the room temperature powder X-ray diffraction with filtered 0.154 nm CuK $\alpha$  radiation for their phase analysis studies at different annealed temperatures of annealed 300 °C, 400 °C and 500 °C. The prominent peaks in XRD plot are indexed to various hkl planes of BFO, indicating formation of BFO. Besides these prominent peaks, some other peaks of low intensity are also observed, which do not belong to BFO. The sample annealed at 500 °C is

having many extra peaks other than BFO whereas that prepared at 300 °C is less impurity peaks. The literature survey of BFO synthesis relates these impurity peaks to be that of BFO. The appearance of these extra phases at 500 °C could be due to large bismuth loss at higher temperature. Powder annealed at 400 °C is having less impurity phase of BFO, as is evident from the lesser peak height than 500 °C. The synthesized bismuth ferrite nanoparticles were characterized by using the SEM for revealing their



The proportional increase in particle size is also confirmed by their surface morphology studies

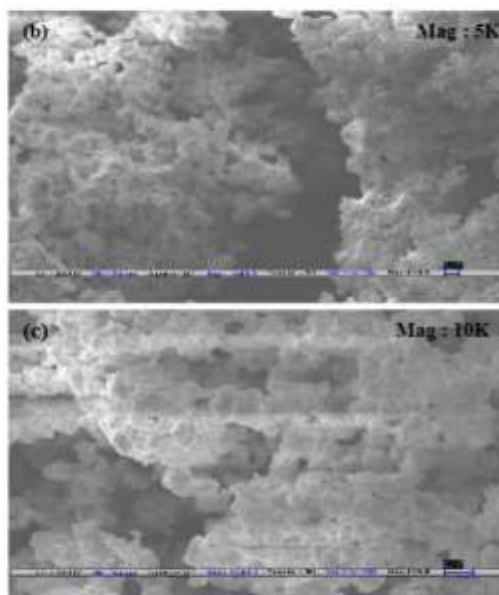


Figure: SEM image of BFO of nanoparticle size of 200nm

*Int. Res. J. of Science & Engineering, Special Issue A2, January, 2018:*

surface morphology at different annealed temperatures of 300 °C, 400 °C and 500 °C. The particle size estimated from SEM images for the BFO sample is about 200 nm for the annealed temperature 300 °C, 400nm for the annealed temperature of 400 °C and 500 nm for the annealed temperature of 500 °C.

In the reported experiment, bismuth ferrite nanoparticles are successfully synthesized by chemical route method using citric acid. The synthesized bismuth ferrite nanoparticles were characterized by X-Ray Diffraction (XRD) and Scanning Electron Microscope (SEM). The XRD characterization results indicates the rhombo centered structure of bismuth ferrite nanoparticles and the SEM analysis reveals that the diameter of bismuth ferrite nanoparticles changes with thermal treatment and varies from 200 to 500 nm by increasing the annealed temperature from 300 °C to 500 °C. This method avoids using traditional high temperature and therefore could be easily extended to other systems.

## REFERENCES

1. Glenda Biasotto, A.Z. Simoes, C.R. Foschini, S.G. Antonio, Maria A. Zaghete, Jose A. Varela, "A novel synthesis of perovskite bismuth ferrite nanoparticles", *Processing and Application of Ceramics* 5(3)(2011)171-179.
2. K.Y Yun, M.Noda, M. Okuyama, H.Saeki, H.Tabata, K. Saito, "Structural and multiferroic properties of BiFeO<sub>3</sub> thin films at room temperature", *J.Appl. Phys.*96(2004)3399 -3403.
3. Y.P. Wang, L.Zhou, M.F. Zhang, X.Y. Chen, J.M. Liu, Z.G. Liu, "Room temperature saturated ferroelectric polarization in BiFeO<sub>3</sub> ceramics synthesized by rapid liquid phase sintering", *Appl.Phys. Lett.*,84(2004)1731-1734.
4. S.Ghosh, S. Dasgupta, A. Sen, H. Shekhar, "Low temperature synthesis of nano sized bismuth ferrite by soft chemical route", *J.Am.Ceram.Soc.*,88(2005)1349-1352.
5. C.Chen, J. Cheng, S.Yu, L.Che, Z. Meng, "Hydrothermal synthesis of perovskites bismuth ferrites crystallites", *J.Crystal Growth*, 291(2006)135-139.
6. J.T. Han, Y.H Huang, X.J.Wu, C.L. Wu, W.We, B.Peng, W. Huang, J.B. Goodenough, " Tunable synthesis of bismuth ferrites with various morphologies". *Adv.Mater.*18(2006)2145-2148.
7. X.Qi, M. Wei, et.al., "High Resolution X-Ray diffraction and transmission electrons microscopy of multiferroic BiFeO<sub>3</sub> films", *Appl.Phys.Lett.*,87(2005)71913-71915.
8. Yongming Hu, Lingfeng Fei, Yiling Zhang, Jikang Yuan, YU Wang, and Haoshuang Gu, " Synthesis of Bismuth Ferrite Nanoparticles via a Wet Chemical route at low temperature. " *Journal of Nanomaterials*, 2011(2011), Article I.D.797639, 6 pages.
9. S.M. Selbach, T.Tybell, M.A Einarsud and T. Grande, " Size dependent properties of multiferroic BiFeO<sub>3</sub> Nanoparticles", *Chem. Mater.*, 19(26) 6478-84(2007).

© 2018 | Published by IRJSE

### Submit your manuscript to a IRJSE journal and benefit from:

- ✓ Convenient online submission
- ✓ Rigorous peer review
- ✓ Immediate publication on acceptance
- ✓ Open access: articles freely available online
- ✓ High visibility within the field

Email your next manuscript to IRJSE  
: editorirjse@gmail.com

## 59. Synthesis and characterization of aluminium oxide (Al<sub>2</sub>O<sub>3</sub>) nanoparticles and its application in azo dye decolourisation

International Journal of Environmental Chemistry

2018; 2(1): 10-17

<http://www.sciencepublishinggroup.com/ijec>

doi: 10.11648/ijec.20180201.13



### Synthesis and Characterization of Aluminium Oxide (Al<sub>2</sub>O<sub>3</sub>) Nanoparticles and its Application in Azodye Decolourisation

Vijaya Pandurang Dhawale<sup>1,\*</sup>, Vaidei Balraj Khobragade<sup>2</sup>, Satish Damodar Kulkarni<sup>2</sup>

<sup>1</sup>Post Graduate Department of Physics, New Arts Commerce and Science College, Parner, Ahmednagar, India

<sup>2</sup>Post Graduate Department of Environmental Science, New Arts Commerce and Science College, Ahmednagar, India

#### Email address:

[vijaya.dhawale2009@gmail.com](mailto:vijaya.dhawale2009@gmail.com) (V. P. Dhawale)

\*Corresponding author

#### To cite this article:

Vijaya Pandurang Dhawale, Vaidei Balraj Khobragade, Satish Damodar Kulkarni. Synthesis and Characterization of Aluminium Oxide (Al<sub>2</sub>O<sub>3</sub>) Nanoparticles and its Application in Azodye Decolourisation. *International Journal of Environmental Chemistry*, Vol. 2, No. 1, 2018, pp. 10-17. doi: 10.11648/ijec.20180201.13

Received: March 29, 2018; Accepted: May 4, 2018; Published: May 30, 2018

**Abstract:** The adsorption behaviour of an azodye Methylene Blue (MB) over aluminum oxide nano particles (AONP) generated by sol-gel method has been studied to investigate the physicochemical process involved and explore the potential use of AONP in wastewater treatment. The variables incorporated in the present study are concentration of dye, dosage of adsorbent and contact time. The characterizations of AONPs were carried out using X-ray diffractometry (XRD), Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR), Energy Dispersive Analysis of X-rays (EDAX) and Raman spectroscopy. SEM image showed the distribution pattern of nanoparticles. FTIR spectra revealed that functional groups (O-Al-O) are present. Raman spectra showed the crystalline nature of nanoparticles. Average size of Al<sub>2</sub>O<sub>3</sub> nanoparticle from XRD peak was found to be 25 nm having rhombohedral structure. Chemical composition of AONPs was confirmed from EDAX spectroscopy measurement. The smaller dosage of AONP was tested for the photocatalytic degradation.

**Keywords:** Colour Pigment, Adsorbent, Adsorption, Decolourisation, Sol-gel Method

## 1. Introduction

In recent years, the use of nanotechnology has gained significant attention in environmental applications for wastewater treatment [1]. Nanoparticles in water treatment have been effectively utilized due to their unique characteristics such as high surface area to volume ratio, small size, availability of large number of reactive sites, and high capacity for regeneration [2]. The current water pollution problems, including water quality, can be improved using nano adsorbents, nanocatalysts, nanostructured catalytic membranes, and many other products and processes resulting from the advancement of nanotechnology [3]. During the last few years a large number of nanomaterials have been synthesized and used as adsorbents to remove the pollutants from the wastewater [4]. Inorganic nanomaterials such as iron and aluminium based nano adsorbents were firstly investigated which may be due to low manufacturing cost

and high decontamination efficiency [5-9]. AONP is one of the most important and extensively used ceramic materials as adsorbent for water and wastewater treatment, catalyst supports for chemical reactions, electrical insulators, structural composites for spacecraft, abrasive, thermal wear coatings and membrane applications [10-13]. Aluminium oxide nanoparticle is reported to exist in several phases [14].

It is well known fact that presence of dyes in wastewater is the most undesirable. Dyes are water soluble in nature and most suited in their action in aqueous medium. Nowadays industrial wastewater is the major environmental problem. Many industries like plastics, pharmaceuticals, textiles, leather, cosmetics, paints and varnishes etc. make use of dyes to colour their final products. Subsequently, the wastewater effluents generated from these industries are highly coloured and its disposal in water bodies causes damage to aquatic flora and fauna. These dyes reduce penetration of sunlight which affects the photosynthetic activities of aquatic flora. Number of dyes are xenobiotic and non-biodegradable in

nature [15]. The traditional technologies for wastewater treatment effectively work upon the removal of biological oxygen demand (BOD), but reduction of BOD is ineffective against colour removal. The combination of technologies like adsorption and dye degradation can provide solution to this problem despite these processes are in laboratory stage of development [16]. Chemical oxidation of dyes is very successful for azo dyes as it can initiate the cleavage of azo bond. The problem of secondary pollution due to formation of oxidized amines and chlorine, in case of NaOCl, is incredible [17]. Advanced non-noble metal catalyst for the oxygen reduction reaction (ORR) is Ni/Co-MOF nanoflakes because of its excellent oxygen reduction catalytic activity, good methanol tolerance and good durability [18].

Due to special properties of the nanomaterials, it attracts much more attention. It is a new functional material and most of atoms on the surface of the nanoparticles are unsaturated, therefore can easily bind with other atoms. Nanoparticles have high adsorption capacity, also the adsorption process rapid and the operation is simple. So, interest is growing in the application of nanoparticles as adsorbents [19]. Adsorption is a conventional technology of dye removal having very high efficiency and simple process. Activated carbon is a very efficient adsorbent used mainly for cationic and anionic dyes. The use of carbon as adsorbent in wastewater treatment have become impractical due to competitive adsorption of other organic molecules along with dye molecules, therefore it can be used at end of the treatment process mainly for colour removal. The non-conventional adsorbents are in application due to their easy availability. Adsorption technology is a non-destructive technology involving phase change from aqueous phase to solid surface immobilization. Some techniques involving adsorption along with the catalytic degradation of dye found to be more advantageous [20]. The application of nanoparticles as adsorbents has become an interesting area of research because of their small particle size and high surface area. The more active sites are also capable of interacting with pollutant species [21]. The application of AONP has been evaluated for the removal of hexavalent chromium from aqueous medium [22]. Also study indicates that adsorption capacity remains unchanged after regeneration of nanosized adsorbent [23].

Methylene blue (MB) is one of the most commonly used dyes in different industries such as textiles, printing and rubber [24-26]. The effluents from these industries are a major source of environmental pollution. Not only the water bodies become coloured, but there is decrease in the dissolved oxygen of water and blocking of the sunlight, thereby disturbing the natural growth activity of aquatic life. Therefore, treatment of effluents containing dyes is one of the challenging problems in the field of environmental chemistry [27-31].

In the present study aluminium oxide nanoparticles (AONPs) were prepared by sol-gel method and used for the adsorptive removal of azo dye Methylene Blue (MB) from aqueous medium using batch adsorption technique.

## 2. Experimental

### 2.1. Synthesis of Aluminium Oxide Nanoparticles

The nanoparticles were prepared by the sol-gel technology. All chemicals used were analytical grade, aluminium chloride, AlCl<sub>3</sub> (Molychem), 25% NH<sub>3</sub> solution (Qualigen Fine Chemicals) and polyvinyl alcohol (PVA) (Modern Industries) were used as raw materials for the synthesis of aluminium oxide nanoparticles.

0.1 M alcoholic AlCl<sub>3</sub> solution was prepared, followed by addition of 25% ammonia solution. The resulting solution turned to a white sol. This was followed by the addition of PVA (0.5M). The solution was stirred continuously using a magnetic stirrer until it became a transparent sticky gel. The gel was allowed to mature for 24 hours at room temperature. The resultant gel was heat treated at 100°C for 24 hours which led to the formation of light weight porous materials due to the enormous gas evolution. The dried gel was, then calcined at 1200°C for 4 hours and finally, the calcined powders were crushed using mortar and pestle to get the fine homogeneous dense powder [32]. Figure 1 shows chemical structure of methylene blue (MB).

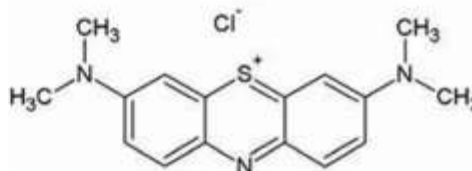


Figure 1. Chemical structure of methylene blue (MB).

### 2.2. Photocatalytic Degradation Studies

Photocatalytic activities of the as-synthesized powder were evaluated by depolarization of Methylene blue dye in aqueous solution. The experiments were carried out in the presence of UV light irradiation without any adsorbent (blank), with adsorbent in daylight and in the presence of UV light with adsorbent. The photocatalytic reactor consists of a glass chamber with an inlet tube for provision of dye solution purging during photo catalysis and outlet tube for the collection of samples. Experimental arrangement is shown in figure 2.

Distilled water was used to prepare all stock solution and stored in dark bottles. From a stock solution of 1000 mg/L of the dye, different concentrations were made. Reaction was set up by adding different dose of the as-synthesized aluminium oxide nanopowder (10, 20, 30 mg) into 1000 mL of MB solution of varying concentration (10, 15, 20, 25mg/L) in the glass chamber. The solution was magnetically stirred in with and without nanoparticle addition into dye solution for 180 minute to obtain adsorption equilibrium after irradiating the internal and external UV light sources in the chamber of the reactor. Sample was withdrawn at 60 minute time interval over contact time for 180 minute. The solution was centrifuged at 3000 rpm for 10 minute and filtered

12 Vijaya Pandurang Dhawale *et al.*: Synthesis and Characterization of Aluminium Oxide (Al<sub>2</sub>O<sub>3</sub>) Nanoparticles and its Application in Azodye Decolourisation

through Whatman filter paperto remove the nano particles before measuring absorbance.



Figure 2. Experimental arrangement.

he absorbance of sample was measured at 580 nm using visible double beam spectrophotometer (Systronics, Model1203). For quantitative analysis percentage degradation of MB dye was calculated using the following formula:% decolourisation= (A<sub>0</sub>- A<sub>t</sub>)/A<sub>0</sub>\* 100.

Where A<sub>0</sub> is absorbance of dye at initial stage, A<sub>t</sub> is absorbance of dye at time t.

$$q_e = ((A_0 - A_t) / W) * V$$

where q<sub>e</sub> is the amount of dye adsorbed at the time of equilibrium(mg/g), A<sub>0</sub> and A<sub>t</sub> are initial and final concentration of dye (mg/L), V (L) is the volume of sample, and W (g) is the mass of adsorbent [33, 41].

### 3. Results and Discussion

#### 3.1. Photocatalytic Degradation Study

The photocatalytic activity of as-synthesized nanomaterial was evaluated by the degradation of MB dye in aqueous solution. The decolourisation of the MB dye was examined under three different conditions (treatments): daylight irradiation with and without nanopowder (blank), in presence of UVlight irradiation without nanopowder (in dark) and in the presence of Al<sub>2</sub>O<sub>3</sub>nanopowder as adsorbent under UVlight irradiation, respectively. For dark experiments (in the absence of the adsorbent) under UV light irradiation, almost insignificant degradation of the dye was observed.

In the absence of adsorbent (AONP), but in presence of UV light irradiation, average 10% decolourisation efficiency was observed throughout the 180 min reaction time. This result confirms that degradation of MB in the absence of the adsorbent, but presence of UVlight irradiation is insignificant. Further, the experimental results showed that when the dye solution is exposed to UVlight irradiation for 180 min in the presence of AONPasa adsorbent, significant degradation ofMB dye was observed. The corresponding plots of percentremovalof MB dye as function of time under UVirradiation in the presence and absence of AONP

adsorbent are as shown in figure3 to figure6. Accordingly, the degradation efficiency of MB dye under the UV light was found to be much larger than the degradation efficiency as compared to dark treatment.

The degradation efficiency of AONP in the presence of UV light increased due to the fact that the Al<sub>2</sub>O<sub>3</sub> nanoparticles prepared by the sol gel method has a high specific surface area, that could give more active surface sites to absorb water molecules and to form active HOOandOH radicals by trapping the photo generated holes.

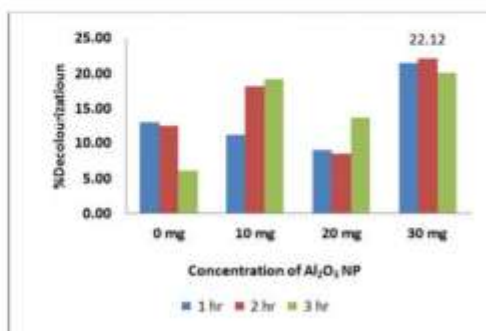


Figure 3. Decolourization of methylene blue Dye (10 mg) using Al<sub>2</sub>O<sub>3</sub> Nanoparticles.

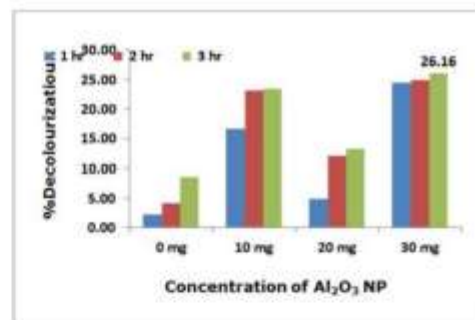


Figure 4. Decolourization of methylene blue dye (15 mg) using Al<sub>2</sub>O<sub>3</sub> Nanoparticles.

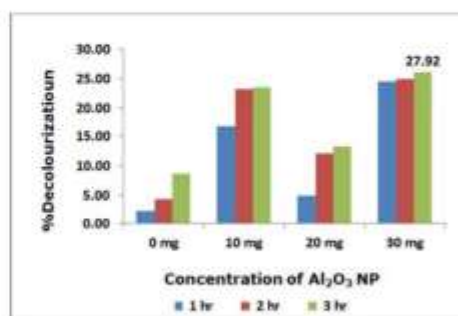


Figure 5. Decolourization of methylene blue dye (20 mg) using Al<sub>2</sub>O<sub>3</sub> Nanoparticles.

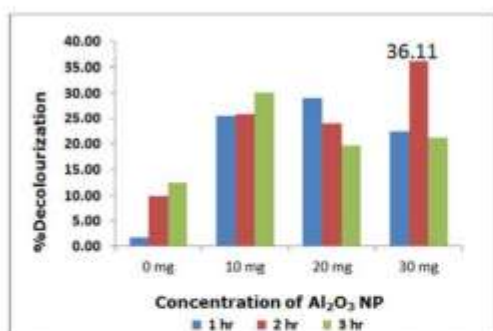


Figure 6. Decolourization of methylene blue dye (25 mg) using Al<sub>2</sub>O<sub>3</sub> Nanoparticles.

Furthermore, these free active radicals drive the photo degradation reactions and leads to the decomposition of

organic pollutants in the aqueous solution [31]. High surface area also facilitates the absorption of dye molecules on the surface of AONP. Under UV light irradiation, MB molecules get absorbed on the surface of nanoparticles and produce electrons. These electrons are captured by the surface adsorbed O<sub>2</sub> molecules to yield HO<sub>2</sub>• and O<sub>2</sub>•- radicals, which gets more chance to come in contact with dye molecules and thus increasing the reaction speed.

The MB molecules thus could be mineralized in time by the super oxide radical ions. Thus it can be said that the smaller crystalline size of nanoparticle are favorable for the reduction of O<sub>2</sub> and oxidation of H<sub>2</sub>O molecules by trapping electrons and holes, which improves the photocatalytic activity of the adsorbent under UV light. The average amount of dye absorbed (%qe) in batch experiment is 23.9 mg/g after 3 hours (Table 1).

Table 1. Amount of dye absorbed (%qe) in batch experiment.

Amount of adsorbent (AONP)	Concentration of Methylene Blue (MB) Dye			
	10 mg	15 mg	20mg	25 mg
10 mg	18.7	34.2	35.4	69.9
20 mg	5.7	7.8	26.1	31.1
30 mg	9.0	14.1	12.8	22.0
Total amount of dye absorbed at each concentration of dye after 3 hours	33.4	56	74.3	122.9
Average amount of dye absorbed after 3 hours (%qe) in Batch Experiment	23.9			

3.2. Effect of Initial Methylene Blue (MB) Concentrations

Effect of initial dye concentration on the degradation efficiency was investigated by varying initial dye concentration. The photo catalytic activity of the AONP is as shown in figure 3 to figure 7. It was found that, photo degradation efficiency increased with increased concentration of MB dye and the adsorbent after 180 minute contact time.

3.3. Effect of Amount of Adsorbent

The amount of adsorbent also affects photo degradation efficiency of the adsorbent. Different amounts of adsorbent were used (10mg to 30mg) for degradation of MB dye under UV light irradiation and the results are as shown in figure 3 to figure 7. It was observed that, as the quantity of adsorbent increased, the rate of photo degradation of dye also increased. This may be due to the fact that, as the amount of adsorbent increases, the number of active sites on the adsorbent and the available surface area also increases. It should be noted that when the concentration of the adsorbent increases above the optimum value, the degradation rate decreases due to the interception of the light by the suspension [34, 35]. The excess adsorbent prevent the illumination thereby a primary oxidant, OH radical, in the adsorbent system also decreases and the efficiency of the degradation reduces accordingly [36]. Also, the

increase of adsorbent concentration beyond the optimum value may result in the agglomeration of adsorbent particles.

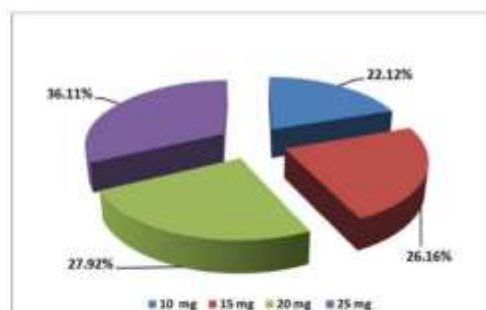


Figure 7. % Decolourisation of Methylene Blue Dye at Various Concentrations Using Al<sub>2</sub>O<sub>3</sub> Nanoparticles.

Therefore more adsorbent surface become unavailable for photo absorption, thus resulting decrease in the degradation rate of adsorbent [37]. Beyond a certain limit of adsorbent amount, the solution becomes turbid which blocks UV radiation for the reaction to proceed and therefore percentage degradation starts decreasing [38, 39]. For all these above reasons optimization of factors affecting the degradation process becomes necessary.

14 Vijaya Pandurang Dhawale *et al.*: Synthesis and Characterization of Aluminium Oxide ( $\text{Al}_2\text{O}_3$ ) Nanoparticles and its Application in Azodye Decolourisation

### 3.4. Effect of Contact Time

The effect of contact time was investigated in the batch experiment at 10, 15, 20 and 25mg/L dye concentration. The adsorption capacity of dye showed varying results with increasing contact time. The rate of dye removal was initially high due to high concentration gradient and more availability of adsorption sites. The rapid transport of dye molecules from aqueous solution to the bulk makes the adsorption fast. The surface of AONPs is charged and the net charge at the surface at a particular pH governs the adsorptive removal of dye from the solution [15].

### 3.5. Characterization

The characterization of aluminium oxide nanoparticles were carried out using XRD, SEM, EDAX, FTIR, and Raman spectroscopy. SEM image gives the distribution pattern and size of the nanoparticles (Figure 8). The FTIR spectra revealed that, there are 410.84, 420.48, 445.56, 491.85, 501.49, 588.29, 636.51, 709.80 (O-Al-O) functional groups (Figure 9). Raman spectra shows the crystalline nature of the nanoparticles. In an amorphous state, the Raman bands are quite broad but often can be derived from one of the crystalline forms of the same material.

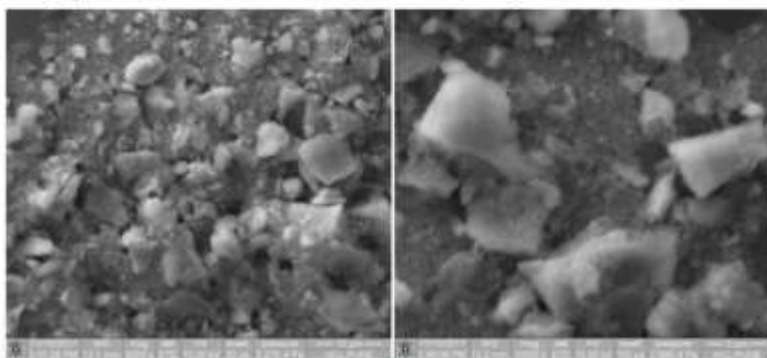


Figure 8. SEM of  $\text{Al}_2\text{O}_3$  Nanoparticles.

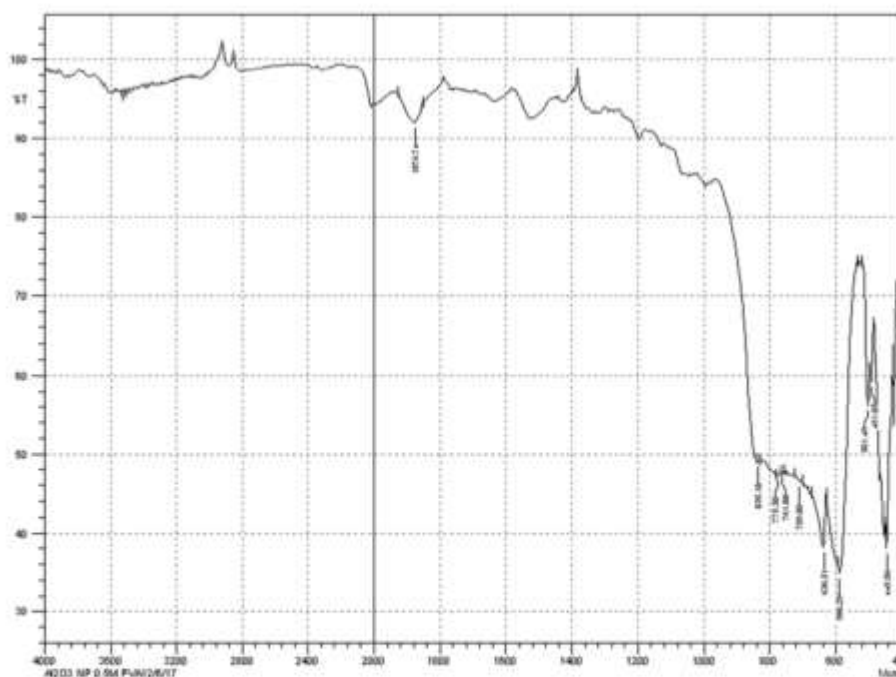


Figure 9. FTIR of  $\text{Al}_2\text{O}_3$  Nanoparticles.

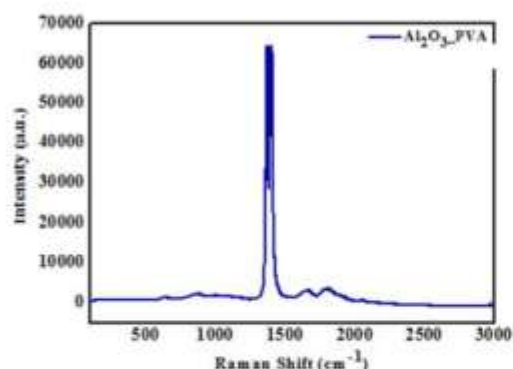


Figure 10. Raman Spectra of  $Al_2O_3$  Nanoparticles.

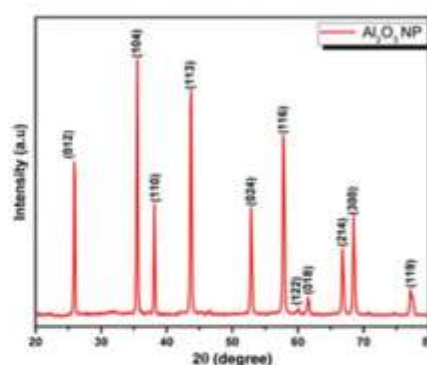


Figure 11. XRD of  $Al_2O_3$  Nanoparticles.

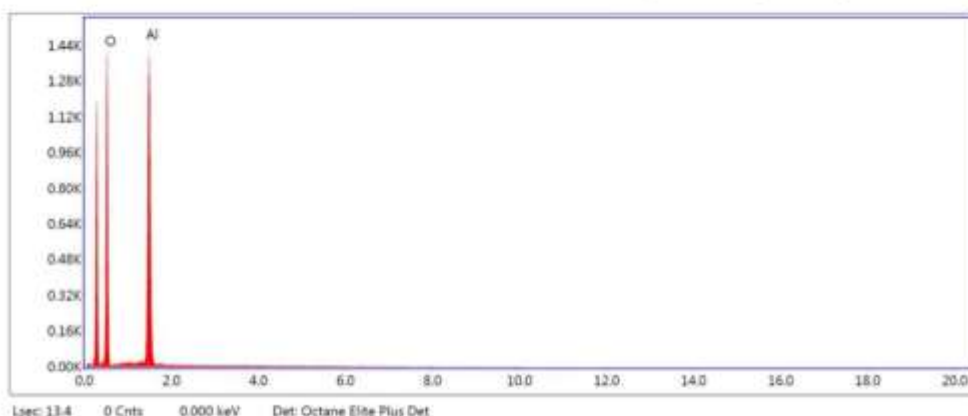


Figure 12. EDAX of  $Al_2O_3$  Nanoparticles.

In fact, in the case of ceramics, the transition from the amorphous to crystalline form (devitrification) can be an important phenomenon in terms of the performance of the ceramic.

The assumption is that in the amorphous form there is a distortion of interatomic bond angles. Long-range order is lost, but nearest neighbour interactions are affected so as to shift a particular vibrational frequency; because there is a population of such distortions, the observed band will be broad (Figure 10). Similar results have been obtained by others also [40]. The peaks in the XRD pattern significantly supported formation of nanosized  $Al_2O_3$  nanoparticles from JCPDS file (71-1683) having rhombohedral structure. Nine reflections were observed at  $2\theta$  angles around  $25^\circ(012)$ ,  $35^\circ(104)$ ,  $43^\circ(113)$ ,  $52^\circ(024)$ ,  $57^\circ(116)$ ,  $61^\circ(122)$ ,  $66^\circ(214)$ ,  $68^\circ(300)$  and  $70^\circ(119)$ . Average particle size was calculated from all peaks and was found to be 25 nm, whereas, the lattice constant 0.614 using Debye Scherrer formula,  $D = 0.9\lambda/\beta\cos\theta$  where,  $D$  is the crystalline size,  $\lambda$  is the wavelength of  $CuK\alpha$  radiation,  $\beta$  is full width half maximum (FWHM) of the diffraction peak and  $\theta$  is Bragg's angle of X-

ray diffraction peak (Figure 11). The quantitative analysis of the  $Al_2O_3$  nanoparticle was done using EDAX spectroscopy measurement and it shows Al and O as the major components of aluminium oxide nanoparticles in the heads as shown in figure 12.

#### 4. Conclusions

Aluminium oxide nanoparticles ( $Al_2O_3$ ) were successfully synthesized via sol gel technique and the average particle size was found to be 25 nm having rhombohedral structure. FTIR spectra of aluminium oxide nanoparticles indicated the formation of aluminium oxide nanoparticles ( $Al_2O_3$ ). X-Ray diffraction patterns confirm the formation of aluminium oxide ( $Al_2O_3$ ) nanoparticles. The formation of aluminium oxide ( $Al_2O_3$ ) nanoparticles was validated from Raman spectra, XRD, SEM and EDAX analysis.

Maximum decolourisation was found to be 36% for 25 mg methylene blue (MB) dye concentration and 30 mg dose of aluminium oxide (AONP) nanoparticles. The average amount of dye adsorbed in the batch experiment was 23.9 mg/g. Thus,



16 Vijaya Pandurang Dhawale *et al.*: Synthesis and Characterization of Aluminium Oxide (Al<sub>2</sub>O<sub>3</sub>) Nanoparticles and its Application in Azodye Decolourisation

the above results support the recommendation that aluminium oxide nanoparticles offer new dimension towards reliable and economically affordable water treatment of coloured industrial effluents. The nanomaterial is very promising and can be effectively used for the removal of azodyes from the aqueous solutions.

### Acknowledgements

Smt. Dhawale V. P. is thankful to University Grants Commission (WRO), Pune, India for providing the Teacher Fellowship. The authors are thankful to Dr. B. H. Zaware, Principal, New Arts, Commerce and Science College, Ahmednagar for providing necessary laboratory facilities.

### References

- [1] Brame, J., Li, Q., Alvarez, P. J. J., (2011). Nanotechnology enabled water treatment and reuse: emerging opportunities and challenges for developing countries. *Trends Food Sci. Technol.*, 22: 618.
- [2] Ali, L., (2012). New generation adsorbents for water treatment. *Chem. Rev.*, 112: 5073.
- [3] Savage, N., Diallo, M. S., (2005). Nanomaterials and water purification: opportunities and challenges. *Jr. Nanoparticle Res.*, 7: 331.
- [4] Mohmood, I., Lopes, C. B., Lopes, I., Ahmad, I., Duarte, A. C., Pereira, E., (2013). Nanoscale materials and their use in water contaminants removal—a review. *Environ. Sci. Pollut. Res.*, 20: 1239.
- [5] Li, L., Fan, M., Brown, R. C., Leeuwen, J. V., Wang, J., Wang, W., Song, Y., Zhang, P., (2006). Synthesis, properties, and environmental applications of nanoscale iron-based materials: a review. *Crit. Rev. Environ. Sci. Technol.*, 36: 405.
- [6] Sharma, Y. C., Srivastava, V., Singh, V. K., Kaul, S. N., Weng, C. H., (2009). Nano-adsorbents for the removal of metallic pollutants from water and wastewater. *Environ. Tech.*, 30: 583.
- [7] Sharma, Y. C., Srivastava, V., Upadhyay, S. N., Weng, C. H., (2008). Alumina nanoparticles for the removal of Ni(II) from aqueous solutions. *Ind. Eng. Chem. Res.*, 47: 8095.
- [8] Hordern, B. K., (2004). Chemistry of alumina, reactions in aqueous solution and its application in water treatment. *Adv. Colloid Interf. Sci.*, 110: 19.
- [9] Giles, D. E., Mohapatra, M., Issa, T. B., Anand, S., Singh, P., (2011). Iron and aluminium based adsorption strategies for removing arsenic from water. *Jr. Environ. Manage.*, 92: 3011.
- [10] Sharma, Y. C., Srivastava, V., Mukherjee, A. K., (2010). Synthesis and application of nano-Al<sub>2</sub>O<sub>3</sub> powder for the reclamation of hexavalent chromium from aqueous solutions. *Jr. Chem. Eng. Data*, 55: 2390.
- [11] Srivastava, V., Weng, C. H., Singh, V. K., Sharma, Y. C., (2011). Adsorption of nickel ions from aqueous solutions by nanoalumina: kinetic, mass transfer, and equilibrium studies. *Jr. Chem. Eng. Data*, 56: 1414.
- [12] Yalamuc, E., Trapani, A., Akkurt, S., (2014). Sintering and microstructural investigation of gamma-alpha alumina powders. *Eng. Sci. Technol. Internat. Jr.*, 17: 2.
- [13] Cai, W., Hu, Y., Yu, J., Wang, W., Zhou, J., Jaroniec, M., (2015). Template-free synthesis of hierarchical c-Al<sub>2</sub>O<sub>3</sub> nanostructures and their adsorption affinity toward phenol and CO<sub>2</sub>. *RSC Adv.*, 5: 7066.
- [14] Shek, C. H., Lai, J. K. L., Gu, T. S., Lin, G. M., (1997). Transformation evolution and infrared absorption spectra of amorphous and crystalline nano-Al<sub>2</sub>O<sub>3</sub> powders. *Nano Struct. Mater.*, 8: 605.
- [15] Khosala, E., (2015). Adsorption of azo dye methyl orange over aluminium oxide nanoparticles. *Internat. Jr. of Basic and Applied Chem. Sci.*, 5 (4): 37-46.
- [16] Chatterjee, D., RajB., Mahata, A., (2001). Adsorption and photocatalytic color removal using fly ash under sunlight. *Catalysis Communications*, 2: 113-117.
- [17] Slokar, Y. M., Lee, A. M., (1998). Marchal Methods of decolorization of textile wastewater. *Dyes and Pigm.*, 37(4): 335-356.
- [18] Xia, C., Zhang, J. N., Yang, Z., Guo, S. Y., Guo, S. H., Xu, Q., (2017). 2D MOF nanoflake-assembled spherical microstructures for enhanced supercapacitor and electrocatalysis performance. *Nano-Micro Lett.*, 9(43): 1-11. doi 10.1007/s40820-017-0144-6.
- [19] Heydartaemeh, M. R., Aslani, S., Doulati, A. F., (2017). Loess soil nanoparticles as a novel adsorbent for adsorption of green malachite dye. *Jr. Chromatogr. Sep. Tech.*, 8(3): 1-6. doi: 10.4172/2157-7064.1000366.
- [20] Chen, J., Chen, W., Zhu, D., (2008). Adsorption of nonionic aromatic compounds to single walled carbon nanotubes: Effect of aqueous solution chemistry. *Environmental Sci. and Tech.*, 42(19): 7225-7230.
- [21] Khaled, A., Kapoor, P. N., Klabunde, K. J., (1999). Nanocrystalline metal oxides as new adsorbents for air purification. *Nanostructured Materials*, 11(4): 459-468.
- [22] Sharma, Y. C., Srivastava, V., Mukherjee, A. K., (2010). Synthesis and application of nano Al<sub>2</sub>O<sub>3</sub> powder for the reclamation of hexavalent chromium from aqueous solutions. *Jr. of Chem. and Eng. Data*, 55(7): 2390-2398.
- [23] Khosla, E., Kaur, S., Dave, P. N., (2013). Mechanistic study of adsorption of Acid Orange-7 over aluminum oxide nanoparticles. *Jr. of Engg.*, 2013. Article ID593534. doi.org/10.1155/2013/593534.
- [24] Bautista, P., Mohedano, A. F., Casas, J. A., Zazo, J. A., Rodriguez, J. J., (2008). An overview of the application of Fenton oxidation to industrial waste water treatment. *Jr. Chem. Technol. Biotechnol.*, 83: 1323-1338.
- [25] Xu, A., Li, X., Ye, S., Yin, G., Zeng, Q., (2011). Catalyzed oxidative degradation of methylene blue by in situ generated cobalt (II)-bicarbonate complexes with hydrogen peroxide. *Appl. Catal. B.*, 102: 37-43.
- [26] Wei, W., Gao, P., Xie, J., Zong, S., Cui, H., Yue, X., (2013). Uniform Cu<sub>2</sub>Cl(OH) hierarchical microspheres: a novel adsorbent for methylene blue adsorptive removal from aqueous solution. *Jr. Sol. State Chem.*, 204: 305-313.

- [27] Chithambaraj, A. Sanjini, N. S., Bose, A. C., Velmathi, S., (2013). Flower-like hierarchical h-MoO<sub>3</sub>: new findings of efficient visible light driven nanophotocatalyst for methylene blue degradation. *Catal. Sci. Technol.*, 3:1405-1414.
- [28] Chatterjee, D., Rothbart, S., Eldik, van R., (2013). Substrate versus oxidant activation in Ru(II) (EDTA) catalyzed dye degradation. *RSC Adv.*, 3: 3606-3610.
- [29] Etaiw, S. E. H., Saleh, D. I., (2014). The organotin coordination polymer [(n-Bu<sub>3</sub>Sn)<sub>4</sub>Fe(CN)<sub>6</sub>H<sub>2</sub>O] as effective catalyst towards the oxidative degradation of methylene blue. *SpectrochimActa A Mol. BiomolSpectrosc.*, 117: 54-60.
- [30] Le, H. A., Linh, L. T., Chin, S., Jung, J., (2012). Photocatalytic degradation of methylene blue by a combination of TiO<sub>2</sub>-anatase and coconut shell activated carbon. *Powder Technol.*, 225: 167-175.
- [31] Impart, O., Katafias, A., Kita, P., Mills, A., Pietkiewicz-Graczyk, A., Wrzeszcz, G., (2003). Kinetics and mechanism of a fast leuco-methylene blue oxidation by copper (II)-halide species in acidic aqueous media. *Dalton Trans.*, 3: 348-353.
- [32] Varghese, N., Hariharan, M., Cherian, A. B., Sreenivasan, P. V., Paul, J., Antony, A., (2014). PVA - Assisted Synthesis and Characterization of Nano  $\alpha$ -Alumina. *Internat. Jr. of Sci. and Res. Publi.*, 4(10): 1-5.
- [33] Hassena, H., (2016). Photocatalytic degradation of methylene blue by using Al<sub>2</sub>O<sub>3</sub>/Fe<sub>2</sub>O<sub>3</sub> nano composite under visible light. *Mod. Chem. Appl.*, 4: 176. doi:10.4172/2329-6798.1000176
- [34] Byrappa, K., Subramani, A. K., Ananda, S., Lokanatha, R. K. M., Dinesh, R., (2006). Photocatalytic degradation of Rhodamine B dye using hydrothermally synthesized ZnO. *Bull. Mater Sci.*, 29: 433-438.
- [35] Chakrabarti, S., Dutta, B. K., (2004). Photocatalytic degradation of model textile dyes in wastewater using ZnO as semiconductor catalyst. *Jr. Hazard Mater.*, 112: 269-278.
- [36] Sun, J., Qiao, L., Sun, S., Wang, G., (2008). Photocatalytic degradation of Orange G on nitrogen-doped TiO<sub>2</sub> catalysts under visible light and sunlight irradiation. *Jr. Hazard Mater.*, 155: 312-319.
- [37] Huang, M., Xu, C., Wu, Z., Huang, Y., Lin, J., (2008). Photocatalytic discolorization of methyl orange solution by Pt modified TiO<sub>2</sub> loaded on natural zeolite. *Dyes and Pigm.*, 77: 327-334.
- [38] Wang, C. C., Lee, C. K., Lyu, M. D., Juang, L. C., (2008). Photocatalytic degradation of C. I. Basic Violet 10 using TiO<sub>2</sub> catalysts supported by Y zeolite: an investigation of the effects of operational parameters. *Dyes and Pigm.*, 76: 817-824.
- [39] Macedo, L. C., Zaia, D. A. M., Moore, G. J., Santana, de H., (2007). Degradation of leather dye on TiO<sub>2</sub>: a study of applied experimental parameters on photoelectrocatalysis. *Jr. of Photochem. and Photobiol. A: Chemistry*, 185 (1): 86-93.
- [40] Adar, F., (2014). Molecular spectroscopy workbench Raman spectra of metal oxide. *Spectroscopy Solutions for Materials Analysis*. <http://www.horiba.com>
- [41] Banerjee, S., Dubey, S., Gautam, R., Chattopadhyaya, M. C., Sharma, Y. C., (2017). Adsorption characteristics of alumina nanoparticles for the removal of hazardous dye, orange G from aqueous solutions. *Arabian Jr. of Chem.* <http://dx.doi.org/j.arabic.2016.12.016>

## 60. Dielectric behaviour, Resistivity and thermoelectric power of multiferroic composite



Int. Res. J. of Science & Engineering, 2018; Special Issue A2: 58-60  
ISSN: 2322-0015

SJIF Impact Factor 4.11

UGC Approved Journal No. 63628

RESEARCH ARTICLE

OPEN ACCESS

## Dielectric Behavior, Resistivity and Thermoelectric Power of Multiferroic Composite

**Kadam SL** *M. Sc. M. Phil. Ph. D.*

Post Graduate Department of Physics, New Arts, Commerce and Science College, Parner, Tq. Parner  
Dist. Ahmednagar, MS, India

### Manuscript Details

Available online on <http://www.irjse.in>  
ISSN: 2322-0015

**Editor: Dr. Arvind Chavhan**

### Cite this article as:

Kadam SL. Dielectric Behavior, Resistivity and Thermoelectric Power of Multiferroic Composite, *Int. Res. Journal of Science & Engineering*, January 2018 | Special Issue A2 | : 58-60.

© The Author(s). 2018 Open Access

This article is distributed under the terms of the Creative Commons Attribution 4.0 International License

(<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

### ABSTRACT

Composite materials were prepared by ceramic method. Initially Ferrite and ferroelectric phases were prepared separately by solid state reaction. By thoroughly mixing required mole percent of sintered phases composites were prepared. Composites were pressed into pellets. The XRD patterns of all the samples were taken by using CuK $\alpha$  radiation ( $\lambda=1.5418 \text{ \AA}$ ) on Philips PW 1710 diffractometer. XRD patterns shows well defined peaks. The occurrence of the peaks with specific indices characteristic of spinel and perovskite structure confirms the formation of cubic spinel structure in ferrite and tetragonal perovskite structure in ferroelectrics. The well defined XRD peaks show crystalline nature of the samples.

**Keywords:** ME output, Dielectric properties, XRD, Composite.

### INTRODUCTION

The existence of the magnetoelectric effect in some materials was given by Pierre Curie [1]. The magnetoelectric effect is a coupled, two -field effect in which the application of an electric field induces magnetization and a magnetic field induces electric polarization [2]. Such magnetoelectric composites are prepared by sintering together powders of piezoelectric and piezomagnetic phases. These particulate and in situ grown composites have been developed to overcome the problem of single phase magnetoelectric materials, which

State level Seminar on "Advanced Methods for material Characterization" (SCAMMC -2018)

© 2018 | All right reserved

| 58

have complicated crystal structures and show low outputs at low temperatures [3, 4]. In 1978, Boomgard *et. al* [3] outlined the requirements for a good ME effect in composites, which can be summarized as: i- the two phases should be in equilibrium; ii- no chemical reaction should occur between the constituent phases; iii- the resistivity of magnetostrictive phase should be as high as possible to avoid the leakage of current during electric poling; iv- a proper poling strategy should be adopted to get a large ME effect in a composite. These ME materials are used as transducers, actuators, magnetic sensors for dc and ac magnetic field measurements [5,6]. In the present work cobalt ferrite is used as it is highly magnetostrictive and resistive [7-9]. Also BaTiO<sub>3</sub> ferroelectric has high permittivity.

## PREPARATION

Piezomagnetic phase (ferrite) was prepared by solid state reaction by using CoO & Fe<sub>2</sub>O<sub>3</sub> in molar proportions as starting materials. Piezoelectric phase (ferroelectric) was prepared by using BaO, PbO & TiO<sub>2</sub> oxides in molar proportions. The constituent phases were presintered at 900°C. for 12 hrs. separately. After presintering, the constituent phases were ground to fine powder. ME composites were prepared by thoroughly mixing 85, 70 & 55 mole % of ferroelectric material with 15, 30 & 45 mole % of ferrite material respectively. The mixture was presintered again at 1100°C for 24 hrs. in programmable furnace. The composites were again ground for 3hrs. to mix them thoroughly. The powder was then pressed into pellets and final sintering was carried at 1100°C for 24hrs.

## CHARACTERIZATION

The samples were characterized by X-ray Diffractometer (Philips Model PW 1710). The XRD patterns show the presence of constituent phases. The patterns do not indicate any chemical reaction between the components during sintering. The dc resistivity measurements were performed by means of a two probe method. A low value of constant voltage was applied across the sample and current through the sample was measured as a function of temperature

in the range from room temperature to 600°C. Flat surfaces of the pellets were silver pasted for good ohmic contacts. The seebeck coefficient was measured at different temperature by maintaining the thermal gradient of 25°C across the sample surface. The frequency dependent measurements of parameters such as capacitance and dissipation factor ( $\tan \delta$ ) were carried out using LCR meter bridge (Model HP 4248 A) in the frequency range 20 Hz to 1MHz at room temperature. To realize the magnetoelectric voltage coefficient, the electric poling was carried out by heating the samples at about 30-40°C above the ferroelectric Curie temperature in an external electric field of 2-2.5 kV/cm. The ME output  $(dE/dH)_H$  was determined by measuring the electric field generated across the sample using the Keithley electrometer (Model 2000) when dc magnetic field up to 5.0 K Oe was applied to it. The variation of ME output voltage as a function of dc magnetic field was used to measure the magnetoelectric coefficient.

## RESULTS AND DISCUSSION

The XRD pattern of one of the representative composite is shown in Fig.1. It reveals that the composites consist of ferrite and ferroelectric as predominant phases with no unidentified peaks observed. The intensity of ferrite peaks increases with its content in the composites. The indexing of patterns confirms that ferrite has cubic spinel structure and ferroelectric has tetragonal perovskite structure [10, 11]. The lattice parameters of both the phases in these composites do not vary much with the composition.

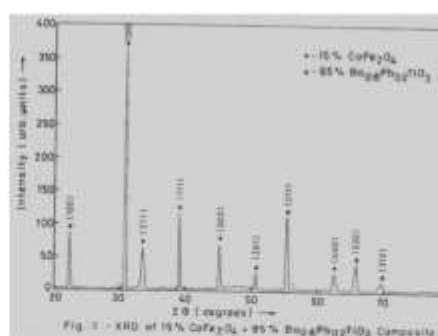


Fig. 1: The XRD pattern of one of the representative composite

The variation of dielectric constant with frequency is shown in Fig.2. The dielectric constant decreases with increase in frequency showing dispersion in a certain lower frequency range. It attains a constant value independent of frequency thereafter. All the samples reveal dispersion due to Maxwell-Wagner type interfacial polarization in agreement with Koop's Phenomenological theory [12].

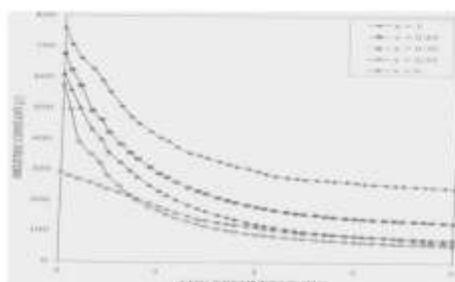


Fig.2: variation of dielectric constant with frequency for  $x\text{Ba}_{0.8}\text{Pb}_{0.2}\text{TiO}_3 + (1-x)\text{CoFe}_2\text{O}_4$  composites

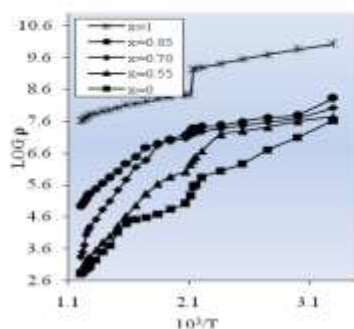


Fig.3-variation of log resistivity ( $\rho$ ) with temperature for  $x\text{Ba}_{0.8}\text{Pb}_{0.2}\text{TiO}_3 + (1-x)\text{CoFe}_2\text{O}_4$  composites

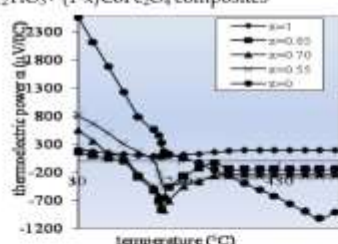


Fig.4- variation of thermoelectric power with temperature for  $x\text{Ba}_{0.8}\text{Pb}_{0.2}\text{TiO}_3 + (1-x)\text{CoFe}_2\text{O}_4$  composites

The variation of resistivity with temperature is shown in Fig.3. There are two regions in the resistivity plots.

The first region at low temperature is attributed to the ordered state of the ferroelectric phase in the composite while the second region is for the paraelectric state of the composite. The first region indicating insulating behavior while second region indicating the conduction due to hopping mechanism. The change in activation energy is observed when transition from ferroelectric to paraelectric state takes place [13].

The variation of Seebeck coefficient ( $\alpha$ ) with temperature is shown in Fig. 4. At lower temperature all the samples show positive values of Seebeck coefficient, which indicates that the charge carriers are of p-type. A p-n transition is observed in all the composites and pure ferrite. It is well known that the evidence for polaron hopping conduction of p-n transition and the temperature independence of Seebeck coefficient [14].

**Conflicts of interest:** The authors stated that no conflicts of interest.

REFERENCES

- Suchetelene JV. *Philips Res. Rep.*, (1972) , 27-28.
- Zing M, Wan JG, Yu H, Lin JM, Jiang XP and Nan CW. *J. Appl. Phys.*, (2004) ,95, 8069-73.
- Ryu J, Priya S, Carazo AV and Uchino K, *J. A. M. Zool Ceram. Soc.*, 1995, 84, 2905-8
- Zhai J, Cai N, Shi Z, Lin Y and Nan CW *J. Phys. D. Appl. Phys.* (2004) ,37, 823-7.
- Wood E and Austin AE, *Int. J. Magnet*, 1974: 5, 303.
- Bracke CMP, Van Vliet RG, *J. Electro.*, 1981: 51,255.
- Kanamadi CM, Pujari LB, Chougule BK, *J. Magn. and Magn. Mater.*, 2005, 295, 139-144.
- Zeng M, Wan JG, Wang Y, Yu H, Liu JM, Jiang XP, Nan CW, *J. Appl. Phys.*, 2004, 95(12), 8069-8073.
- Shrinivas G, Rasmussen ET. *Appl. Phys. A*, 2004, 721.
- Boomgaard JV, Born RAJ. *J. Mater. Sci.*,(1978),13,1538.
- Kadam SL, Patankar KK, Mathe VL, Kothale MB, Kale RB, Chougule BK. *Mater. Chem. Phys.*,(2000),78, 178.
- Koop CG. *Phys. Rev.*,(1951), 83, 121.
- Keer HV 2000,4,13,178.
- Deshmukh LS, Krishnakumar K, Balakshan S, RamKrishan A and Sasathaiah G, *Bull. Mat. Sci.*,(1998), 21(5), 219.

© 2018 | Published by IRJSE

<http://www.irjse.in>

ISSN 2322-0015

## 61. A new species of *Davainea domesticusae* N. SP. Blanchard, 1891 (Davainea, 1860) from *Gallus domesticus*

I J R B A T, Vol. VI (Special Issue 2), Feb 2018 : 122-125

e-ISSN 2347 – 517X



INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)

www.ijrbat.in

### A NEW SPECIES OF *DAVAINEA DOMESTICUSAE* N.SP.BLANCHARD, 1891 (*DAVAINEA*, 1860) FROM *GALLUS DOMESTICUS*

S. N. Pokale

Department. Of Zoology

New Arts Commerce and Science College, Parner (M.S.) India

**ABSTRACT:**

Blanchard, 1891 (Davainea, 1860) erected a new genus, *Davainea* with its type species *D. proglottina* from *Gallus domesticus*. The present communication deals with the description of a new specie, as *Davainea domesticusae* n. sp., which having scolex is small, round in shape, 0.248 to 0.456 in diameter the rostellar hooks are 460 in number, testes are 21 in number and length of cirrus pouch is 0.599mm and Collected from *Gallus domesticus*, at Tisgaon, Dist. Ahmednagar, M. S. India.

**Key words :** *Davainea*, *domesticusae*, *Gallus*, *domesticus* Blanchard

**INTRODUCTION:**

The present work deals with the description of a new species of the same genus as *Davainea domesticusae*. From *Gallus domesticus* Later on the 20 new species are added in this genus. The present communication deals with the description of a new species, as *Davainea domesticusae* n. sp. Collected from *Gallus domesticus*, at Tasgaon, Dist. Ahmednagar, M. S. India.

**MATERIAL & METHODS:**

Seventeen specimens of the cestode parasite, were collected from the intestine of a Hen, *Gallus domesticus*, the worms were small, thin, with scolex, numerous immature and mature proglottids. These worms were flattened, preserved in 4% formalin, stained in Harris haematoxyline, passed through the various alcoholic grade and cleared in xylol, mounted in D.P.X. and whole mount slides were prepared for further anatomical studies

**DESCRIPTION:**

The scolex is small, round, broad in middle with armed rostellum, four suckers and measures 0.248 to 0.456 in length and 0.165 to 0.503 in breadth.

The four suckers are medium, oval, arranged transversely measures 0.097 to 0.112 in length and 0.087 to 0.107 in breadth.

The rostellar hooks are 460 in number arranged in single circle, hooks are small, and single pronged and measures 0.053 to 0.063 in length and 0.005 to 0.024 in width.

The neck is medium, rectangular, longer than broad and measures 0.534 to 0.679 in length and 0.374 to 0.466 in breadth.

The mature segments are medium in size, squarish in shape, acraspedote and measures 0.127 to 0.887 in length and 1.180 to 1.539 in breadth.

The testes are small, medium, oval arranged in two lateral fields, all post ovarian 21 in number, and measures 0.060 to 0.076 in length and 0.053 to 0.076 in breadth.

The cirrus pouch is medium, flask shaped curved posteriorly extend up to the longitudinal excretory canals and measures 0.3180 in length and 0.167 in breadth.

The cirrus is a thin tube, slightly coiled contained within the cirrus pouch and measures 0.599 in length and 0.08 in width.

The vas deference, is thin tube pre ovarian, and measures 1.198 in length and 0.008 in width.

The ovary is medium, butterfly shaped in appearance, bilobed, and measures 0.358 to 0.402 in length and 0.038 to 0.205 in breadth.

The pre ovarian lobes are joined by an isthmus which is short, narrow and measures 0.023 in length and 0.015 in breadth.

The vagina is medium in width placed posterior to the cirrus pouch, start from the genital pore, run obliquely, crosses longitudinal excretory canal, enlarge near ootype and ovary to from the seminal receptacle, reaches and open in to the ootype and measures 0.697 in length and 0.008 in width.

The seminal receptacle is posterior to middle of the segment placed, in between the two ovarian lobe, and measures 0.076 to 0.114 in length and 0.015 to 0.045 in breadth.

The ootype is small in size, round, post ovarian and measures 0.023 in diameter. The vitelline gland is of the medium, roughly oval, situated

posterior to the ovary on the lateral side, elongated diagonally and measures 0.045 to 0.083 in length and 0.045 to 0.068 in breadth. The genital pores are small in size, oval in shape at 1/3<sup>rd</sup> from the anterior margin of the segment, and measures 0.053 in length and 0.008 to 0.015 in breadth.

The longitudinal excretory canal is thin and measures 0.008 in breadth. The gravid segments were not available.

#### RESULT & DISCUSSION:

The present worm differ from *D. Proglottina* which having the diameter of scolex 0.13-0.20, diameter of sucker 0.02-0.03, length of cirrus pouch 0.25, number of testes 19, and reported from *Gallus gallus*

The present worm differ from *D. meleagridis* which having diameter of scolex 0.14-0.17, diameter of sucker 0.04-0.05, length of cirrus pouch 0.24, number of testes 16-20.

The present worm differ from *D. ambajogainis* which having diameter of scolex is 0.36 - 0.40, diameter of sucker 0.06 - 0.08, length of cirrus pouch is not mentioned, number of testes 18 - 20.

The present cestode differ from *D. indica* which having diameter of scolex is 0.45, diameter of sucker 0.06 - 0.08 number of rostellar hook 150 - 160, length of cirrus pouch 0.18, number of testes 24.

The present cestode differ from *D. minuta* which having diameter of scolex is 0.21, length of cirrus pouch 0.16, number of testes 10-12.

The present cestode differ from *D. pauci segmentata* which having diameter of scolex is 0.70, length of cirrus pouch 0.20, number of testes 40.

The present tapeworm differ from *D. himantopodia* which having diameter of scolex is 0.14, number of rostellar hook 50, number of testes 4.

The present cestode differ from *D. nana* which having diameter of scolex is 0.32, number of rostellar hook 50, length of cirrus pouch 0.34, number of testes 50.

The present cestode differ from *D. tetraoensis* which having diameter of scolex is 0.14, length of cirrus pouch 0.18-0.18, number of testes 30.

The present tapeworm differ from *D. andrei* which having diameter of scolex 1 is 0.45, length of cirrus pouch 0.18 - 0.22, number of testes 14.

The present tapeworm differ from *D. baeri* which having diameter of scolex 1 is 0.30, the no of rostellar hooks 400, length of cirrus pouch 0.12, number of testes 9-10.

The present cestode differ from *D. chauhani* which having number of testes 120.

The present cestode differ from *D. retharei* which having diameter of scolex is 0.163 x 0.142 - 0.171, number of rostellar hook 35- 40, length of cirrus pouch 0.180, number of testes 65 - 75.

The present cestode differ from *D. thapari* which having diameter of scolex is 0.562 x 0.123 - 0.171, number of rostellar hook 48, length of cirrus pouch 0.081, number of testes 45-48.

The present tapeworm differs from *D. aurangabadensis* which having diameter of scolex is 0.099 x 0.26 - 0.082, number of rostellar hook 16, length of cirrus pouch 0.085, number of testes 7-8.

The present cestode differs from *D. osmanabadensis* which having, number of rostellar hook 12, number of testes 30-35.

The present tapeworm differ from *D. shindei* which having diameter of scolex is globular., number of rostellar hook 320, number of testes 20-22.

The present tapeworm differ from *D. ibasae* which having diameter of scolex is 0.354 - 0.437 x 0.35 - 0.442 number of rostellar hook 320, length of cirrus pouch 0.218, number of testes 16-20

The present cestode differ from *D. ali* which having diameter of scolexis medium, number of rostellar hooks 14, length of cirrus pouch 0.141, number of testes 17-20 (17)

The present tapeworm differ from *D. shrigondaensis* which having diameter of scolex is medium oval 0.427-0.461 in length, number of rostellar hooks 72, length of cirrus a thin tube, coiled and measures 0.315 in length, number of testes 37-39(38)

#### CONCLUSION:

By observing the above noted distinct characters there is no other way to the author, than to erect a new species, for these worm and hence the name *Davainea domesticusae* n. sp. is proposed, after the species name of the host.

#### REFERENCES:

- Ali S. M. (1990) The hand book of Indian birds salimali, Bombay . Nat. Hist. Soc. 11th edition .  
 Bhaware R. N., Khamkar, D. D. and Shinde, G. B. (1992). A new species of the genus *Davainea* (cestoda: Davaineidae) from Maharashtra. India. *Rivista Di Parasitologia*, 9 (LIII) : 68-70.  
 Burt, D. R. (1981) On *Davainea, minuta* Proc. Spring meet Brit, Soc, Parasit. Uni Leeb 24-26  
 Burt, D. R., Burt M.D.R. (1984) On *Davainea minuta* Cohn, J. Nat. Hist. 1984 (18) (i): 15-23  
 Chauhan B. S. (1982) : Commemoration volume edited by Tiwari K. K. and Shrivastava C. B., Orissa, India. Inst. Of Parasite Davaine achauh

Davainea, Ophricotyle. Mem. Soc. Zool. France 4 : 420-489.

**Davaine, C. (1860).** Traite des Entozoaires et des maladies vermineuses de l'homme et des animaux domestiques. 838 pp. Paris.

Davainea Festschrift Fur Zschokke, Bale, 1920. 19 pp

**Fuhrmann, O. (1932).** Les Tenids des oiseaux memoires dei. Universite de Neuchatel, 8, 381pp.

**Diamare, V. (1893)** Le Funzionidialio varianelia from D. tetragona (mol) Rend . Acad. Sci. Fish. et. Nepolian, 32: 2.5, Vol 7. 213 - 217

**Fuhrmann, O. (1909).** Neue Davaineiden Central bl. Bakt. Parasitenk. I. Abt., 49 : 94-124.

**Fuhrmann, O. (1933).** Cestode nouveaux Rev. Suisse Zool., 40: 169-178.

**Fuhrmann, O. (1933).** Uncestode aberrant Bull. Soc. Sc. Nat. Neuchatel., 58 : 107-120.

**Fuhrmann, O. (1933).** Deux nouveaux cestode de mammiferesd' Angola Bull. Soc. Sc. Nat. Neuchatel., 58 : 97-106.

**Hivare, C.J., Gaikwad, J. M., and Jadhav, B. V. (1993).** Two new species of the genus Davainea (cestoda : Davaineidae) from Aurangabad, M. S. India. Rivista Di Parasitologia, 10 (LIV) N-1 : 103-109.

**J Anicki, (1902)** Veber, Zewi new Artendes Genus Davainea auscelebensis Chen Saugern. Arch, par 6: 287-292

**Jadhav B.V., Shivesh PratapSingh, Bhure, D. B. and Padwal, N. D. (2008).** Biosystematic studies on Davainea shindei N. sp. from Gallus domesticus. Nat. Acad. Sci. Letter, 31 (7& 8): 1 19-122.

**Jones, M.F. (1936).** A new species of cestode, Davainea meleagridis (Davaineidae) from the turkey, with a key to the species of Davainea from galliform birds, Proc. Helm. Soc. Wash 3: 49-52.

**Jones, M. F. (1936)** A new species of cestode D. MELAGRDIS FROM Turkey, with a key to the species of Davainea from Galli Proc. Hel .Soc. 3:49-52.

**K. V. Kalyankar And S. S. Nanware (2010)** Studies on the Genus Davainea, Blanchard, 1891 from Bubulcus ibis with description of a species

**Lakhe A. D. Pawar S. B., Shinde G.B. (2004)** Anew cestode of Davainea muktabaen. sp. (Eucestoda - Davaineidae) from Myna,

Acridothevestrtis at Mundwa M. S., India, Rivista di Parasitologia Vol. 65 (2) : 91-94

**Mahajan, M. A., Shinde, G. B., Mahajan, P. A. and Begum, I. J. (1999).** On a new species of the Genus Davainea Blanchard, 1891 (Cestoda: Davaineidae, Braun, 1900) from Gallus domesticus at Aurangabad, M. S. India. Rivista Di Parasitologia., Vol. XVI (LX) N-2 AGOSTO-1999.

Math Naturw, Klasse, Abt. I, 121.181-192.  
**Fuhrmann, O. (1920).** Considerations general essurles

**Rausch, R. L. (1971).** Davainea lagopodis (Cestoda: Davaineidae) from grouse (tetraonidae) studies on Helminths fauna of Alaska. Helminthological year, 10 : 185-190.

**S. Bandgar, S. R. Patil (2013)** On a new tapeworm Davainea alii Sp. Nov. (Cestoda: Davaineidae) From Pyconotus Cafer At Bhavaninagar, Dist. Sangli, M. S. India, on line international interdisciplinary research journal ISSN 2249 - 9598, Vol-III

**S. Suryawanshi, H. K. Bhagwan, D. K. Mhaske Andg. B. Shinde (2011)** A new species of genus Davainea Blanchard from Gallus domesticus of Shrigonda, Ahmednagar, India. Biosci. Biotech. Res. Comm. Vol. 4No. 2,247-249

**Shinde, G.B. and Ghare, D.N. (1977).** On a new cestode Davainea Blanchard 1891 from fowl, Gallus domesticus in India. Nat. Sci. J., 16: 163-166.

**Shinde, G.B. and Mitra, K.B. (1981).** Davainea domesticus in. sp. from Gallus domesticus at Aurangabad, Abstract 1374, 35 (En.) Dept. of Zoology, Marathwada University, Aurangabad

**Shinde, G. B., Jadhav, B. V. and Kadam, S. S. (1985).** Some avian cestodes from Maharashtra region Riv. parasit, 2 (XLVI) : 141-152.

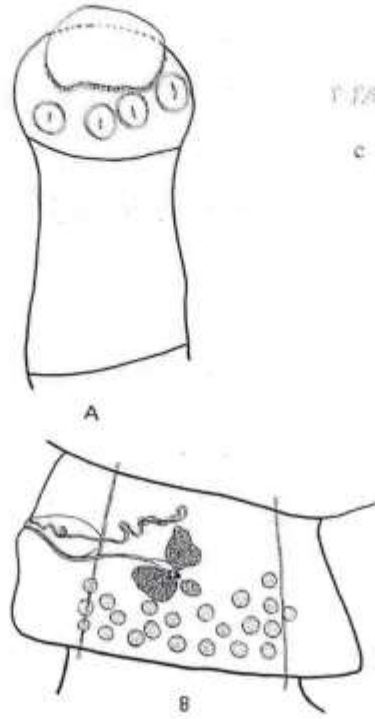
**Subhi Ashfaq, and Shinde, G.B. (1988).** On a new species of the genus Davainea balanchard, 1891 from the intestine of a bird Columbalivia (Emelin) at Jalna M.S. India. Rivista Di Parasitologia, V (XLIX) N-3 : 295-299.

**Yamaguti, S. (1935).** Studies on helminth fauna of Japan part I. Cestodes of Birds, I. Japan J. Zool., 6: 183-232.

**Yamaguti, S. (1935).** Studies on the helminth of Japan part 30, cestodes of birds part II, Japan J. Med. Sci. Sect., 6 V-I:175-211.

**Yamaguti, S. (1956)** Parasitic worms mainly from Celebes Part II Cestodes of birds, pp.1-4.





Davainea domesticusae n.sp.

- A Scolex
- B Mature segments
- C Hooks

## 62. Synthesis and Characterization of Some New Thiadiazole, Triazole, and Thiazole Derivatives

Indian Journal of Heterocyclic Chemistry  
Vol. 27 - Number 04 (Oct-Dec 2017) 367-372

ISSN (Print) : 0971-1627  
ISSN (Online) : 2456-4311

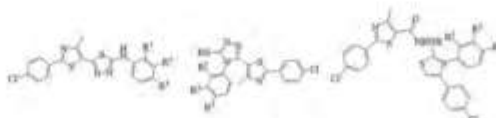
### Synthesis and Characterization of Some New Thiadiazole, Triazole, and Thiazole Derivatives

Vaibhav P. Landage<sup>1</sup>, Dilip R. Thube<sup>1\*</sup>, Bhausaheb K. Karale<sup>2\*</sup>

<sup>1</sup>Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar, Maharashtra, India

<sup>2</sup>Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar, Maharashtra, India

**ABSTRACT** New series of compounds, namely, thiadiazoles **7a-g**, triazoles **8a-g**, and thiazoles **10a-g** were synthesized by the reactions of thiosemicarbazide **6a-g** with concentrated H<sub>2</sub>SO<sub>4</sub>, 1N NaOH and p-chlorophenacyl bromide in ethanol, respectively. The structures of all the synthesized compounds have been confirmed by spectroscopic and analytical methods.



**KEYWORDS** Thiadiazole, Thiazole, Thiosemicarbazide, Triazole.

#### INTRODUCTION

Thiosemicarbazide derivatives are an important class of synthetic compounds and have a variety of biological activities<sup>[1]</sup> such as antiviral,<sup>[2]</sup> antibacterial,<sup>[3]</sup> antifungal,<sup>[4]</sup> anticancer,<sup>[5]</sup> and antimalarial.<sup>[6]</sup> Thiosemicarbazide derivatives are most important intermediates for the synthesis of various heterocyclic compounds such as 1, 3, 4 thiadiazole, 1, 2, 4 triazole, and 1, 3 thiazole. Thiadiazoles are very interesting compounds due to their important applications in many pharmaceutical, biological, and analytical fields. Thiadiazole and its derivatives show biological activities such as anti-inflammatory,<sup>[7]</sup> antibacterial,<sup>[8]</sup> antifungal,<sup>[9]</sup> antitubercular,<sup>[10]</sup> and anticonvulsant.<sup>[11]</sup>

Triazole derivatives have synthetic versatility and pharmacological activities such as antibacterial,<sup>[12]</sup> antifungal,<sup>[13]</sup> antitubercular,<sup>[14]</sup> anti-inflammatory,<sup>[15]</sup> and anticancer.<sup>[16]</sup>

Thiazole derivatives have been found to possess analgesic,<sup>[17]</sup> antitumor,<sup>[18]</sup> anticonvulsant,<sup>[13,16]</sup> and antioxidant<sup>[19]</sup> activities. 4-chlorophenacyl bromide was used to synthesize various heterocyclic derivatives that

show biological activities such as antioxidant,<sup>[20]</sup> anti-inflammatory,<sup>[21]</sup> and analgesic.<sup>[22]</sup>

These observations prompted us to synthesize some new thiadiazole, triazole, and thiazole derivatives.

#### RESULTS AND DISCUSSION

Thiosemicarbazides **6a-g** were synthesized by the treatment of acid hydrazide **4** with one mole equivalent of aryl isothiocyanates **5a-g** under reflux in ethanol. Acid hydrazide<sup>[23]</sup> **4** was synthesized by refluxing the ester **3** and hydrazine hydrate in ethanol. The ester **3**<sup>[23]</sup> was in turn obtained by refluxing mixture of 4-chlorothiobenzamide **1** and ethyl 2-chloroacetoacetate **2** in ethanol (**Scheme 1**). Thiosemicarbazides **6a-g** underwent cyclization when stirred in concentrated H<sub>2</sub>SO<sub>4</sub> to afford thiadiazoles **7a-g**. Similar intramolecular cyclization was observed in the formation of triazoles **8a-g** from thiosemicarbazides **6a-g** and 1N NaOH. Thiazole derivatives **10a-g** were synthesized by the reaction between thiosemicarbazides **6a-g** and 4-chlorophenacyl bromide in ethanol under reflux. Thin-layer chromatography and spectral (NMR, IR, and mass)

\*Corresponding author: Email: drthube@rediffmail.com

Published & Hosted by

Journal Homepage : [www.connectjournals.com/ijhc](http://www.connectjournals.com/ijhc)

©2017 Connect Journals

CONNECT Journals™

[www.connectjournals.com](http://www.connectjournals.com)

characterization data clearly showed the formation of these compounds. Physical data of the newly synthesized compounds are given in **Table 1**.

### EXPERIMENTAL SECTION

Melting points were determined by open capillary method and are uncorrected. The homogeneity of compounds was checked on silica gel TLC plates. IR spectra were recorded on a FT-IR spectrophotometer, and mass spectra were recorded on a Q-TOF MS ES-3.84e3. <sup>1</sup>H NMR spectra were recorded on a BRUKER AVANCE II 400 NMR spectrometer with DMSO-*d*<sub>6</sub> as a solvent, and chemical shifts (δ) are expressed in ppm using TMS as an internal standard.

### General procedures

#### 2-[[2-(4-chlorophenyl)-4-methyl-1,3-thiazol-5-yl]carbonyl]-N-phenylhydrazinecarbothioamides, 6a-g

Equimolar quantities of compound **4** (0.01 mol) and aryl isothiocyanate **5** (0.01 mol) were dissolved in 15 ml ethanol and heated under reflux for 40 min. Completion of reaction was monitored by TLC. After completion of reaction, contents were cooled, and solid thus obtained was filtered and recrystallized in ethanol to afford pure compound **6**.

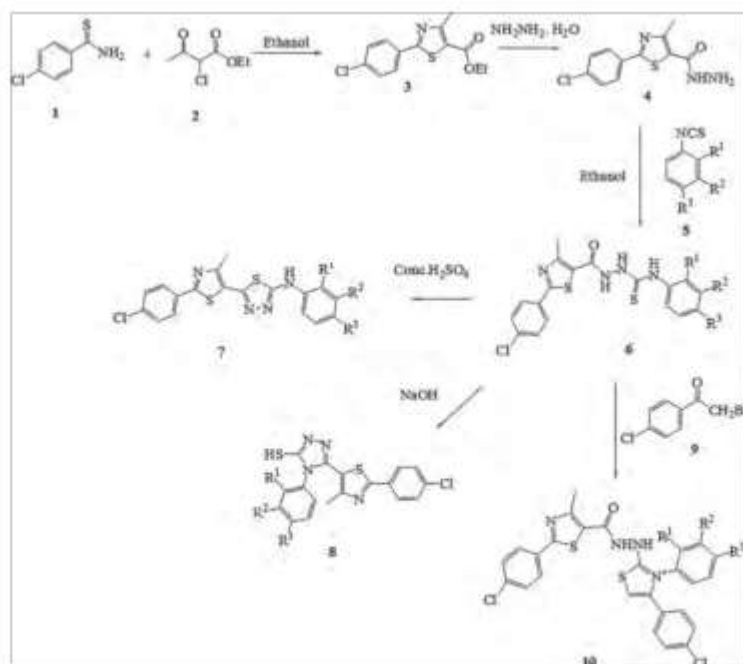
- **6c**: IR (KBr, cm<sup>-1</sup>): 3447 and 3321 (N-H), 3057 (Ar-H), 1773 (C=O), 1215 (C=S), 1610 (C=C), 1090 (Ar-Cl); mass: *m/z* 401 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.69

(s, 3H, CH<sub>3</sub>), 7.12-8.19 (m, 9H, Ar-H), 9.73 (s, 1H, NH), 9.81 (s, 1H, NH), 10.30 (s, 1H, NH). Analytical calculated for C<sub>20</sub>H<sub>15</sub>N<sub>3</sub>O<sub>2</sub>S<sub>2</sub>Cl: C, 53.66; H, 3.75; N, 13.91%. Found: C, 53.69; H, 3.78; N, 13.95%.

- **6e**: IR (KBr, cm<sup>-1</sup>): 3461 & 3318 (N-H), 3057 (Ar-H), 1715 (C=O), 1205 (C=S), 1608 (C=C), 1089 (Ar-Cl); mass: *m/z* 431 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.68 (s, 3H, CH<sub>3</sub>), 3.73 (s, 3H, Ar-OCH<sub>3</sub>), 6.84-8.14 (m, 8H, Ar-H), 9.68 (s, 2H, NH), 10.31 (s, 1H, NH). Analytical calculated for C<sub>24</sub>H<sub>17</sub>N<sub>3</sub>O<sub>2</sub>S<sub>2</sub>Cl: C, 52.71; H, 3.96; N, 12.94%. Found: C, 52.69; H, 3.93; N, 12.92%.
- **6g**: IR (KBr, cm<sup>-1</sup>): 3315 (N-H), 3013 (Ar-H), 1715 (C=O), 1230 (C=S), 1616 (C=C), 1088 (Ar-Cl); mass: *m/z* 417 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.08 (s, 3H, CH<sub>3</sub>), 2.63 (s, 3H, Ar-CH<sub>3</sub>), 7.28-8.07 (m, 8H, Ar-H), 9.67 (s, 1H, NH), 9.70 (s, 1H, NH), 10.29 (s, 1H, NH). Analytical calculated for C<sub>20</sub>H<sub>17</sub>N<sub>3</sub>O<sub>2</sub>S<sub>2</sub>Cl: C, 54.73; H, 4.11; N, 13.44%. Found: C, 52.75; H, 4.09; N, 13.46%.

#### 5-[2-(4-chlorophenyl)-4-methylthiazol-5-yl]-N-phenyl-1,3,4-thiadiazol-2-amines, 7a-g

Thiosemicarbazide **6** (0.01 mol) was mixed with 6 ml concentration H<sub>2</sub>SO<sub>4</sub> in 50 ml beaker and stirred for 3 h at room temperature. Completion of reaction was monitored by TLC. After completion of reaction, contents were poured into 10 g crushed ice and neutralized with NH<sub>3</sub>. The solid



Scheme 1

Vaibhav P. Landage *et al.*

Table 1: Physical data of the synthesized compounds

Compounds	R <sup>1</sup>	R <sup>2</sup>	R <sup>3</sup>	Yield (%)	M.P.(°C)
6a	H	H	Br	86	232-234
6b	H	H	Cl	88	218-220
6c	H	H	H	85	208-210
6d	OMe	H	H	84	206-208
6e	H	H	OMe	87	188-190
6f	Me	H	H	82	162-164
6g	H	H	Me	83	262-264
7a	H	H	Br	55	306-308
7b	H	H	Cl	54	308-310
7c	H	H	H	56	294-296
7d	OMe	H	H	53	328-330
7e	H	H	OMe	52	268-270
7f	Me	H	H	51	322-324
7g	H	H	Me	50	276-278
8a	H	H	Br	85	258-260
8b	H	H	Cl	87	228-230
8c	H	H	H	88	310-312
8d	OMe	H	H	84	230-232
8e	H	H	OMe	83	258-260
8f	Me	H	H	89	226-228
8g	H	H	Me	83	248-250
10a	H	H	Br	39	290-292
10b	H	H	Cl	40	286-288
10c	H	H	H	75	268-270
10d	OMe	H	H	65	258-260
10e	H	H	OMe	44	300-302
10f	Me	H	H	40	266-268
10g	H	H	Me	45	288-290

thus obtained was filtered and recrystallized from 1:1 mixture of DMF and water to afford the pure compound 7.

- **7e**: IR (KBr, cm<sup>-1</sup>): 3249 (N-H), 3052 (Ar-H), 2901 (C-H), 1089 (Ar-Cl), 1029 (C-N); mass: *m/z* 385 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.52 (s, 3H, CH<sub>3</sub>), 7.02-7.96 (m, 9H, Ar-H), 10.54 (s, 1H, NH). Analytical calculated for C<sub>18</sub>H<sub>17</sub>N<sub>3</sub>S<sub>2</sub>Cl: C, 56.17; H, 3.40; N, 14.56%. Found: C, 53.20; H, 3.45; N, 14.54%.
- **7e**: IR (KBr, cm<sup>-1</sup>): 3248 (N-H), 3057 (Ar-H), 2911 (C-H), 1087 (Ar-Cl), 1029 (C-N); mass: *m/z* 415 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.52 (s, 3H, CH<sub>3</sub>), 3.76 (s, 3H, Ar-OCH<sub>3</sub>), 6.94-8.25 (m, 8H, Ar-H), 10.40 (s, 1H, NH). Analytical calculated for C<sub>19</sub>H<sub>17</sub>N<sub>3</sub>OS<sub>2</sub>Cl: C, 55.00; H, 3.64; N, 13.50%. Found: C, 55.04; H, 3.62; N, 13.48%.
- **7g**: IR (KBr, cm<sup>-1</sup>): 3248 (N-H), 3133 (Ar-H), 2916 (C-H), 1087 (Ar-Cl), 1030 (C-N); mass: *m/z* 399 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.28 (s, 3H, CH<sub>3</sub>), 2.69 (s, 3H, CH<sub>3</sub>), 7.14-8.23 (m, 8H, Ar-H), 10.44 (s, 1H, NH). Analytical calculated for C<sub>19</sub>H<sub>17</sub>N<sub>3</sub>S<sub>2</sub>Cl: C, 57.20; H, 3.79; N, 14.04%. Found: C, 57.24; H, 3.82; N, 14.02%.

#### 5-[2-(4-chlorophenyl)-4-methylthiazol-5-yl]-4-phenyl-4*H*-1, 2, 4-triazole-3-thiol, 8a-g

A mixture of thiosemicarbazide **6** (0.01 mol) and 10 ml 1N NaOH was heated under mild reflux for 1.5 h in 100 mL round-bottom flask. Progress of reaction was monitored by TLC. After the completion of reaction, the contents were cooled and acidified with acetic acid. The product thus obtained was separated by filtration and recrystallized from 1:1 mixture of DMF and water to afford pure compound **8**.

- **8c**: IR (KBr, cm<sup>-1</sup>): 3084 (Ar -H), 2746 (S-H), 1593 (C=C), 1092 (Ar-Cl); mass: *m/z* 385 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.51 (s, 3H, CH<sub>3</sub>), 7.30-8.24 (m, 9H, Ar-H), 14.24 (bs, 1H, SH); analytical calculated for C<sub>18</sub>H<sub>17</sub>N<sub>3</sub>S<sub>2</sub>Cl: C, 56.17; H, 3.40; N, 14.56%. Found: C, 53.15; H, 3.42; N, 14.58%.
- **8e**: IR (KBr, cm<sup>-1</sup>): 3068 (Ar -H), 2750 (S-H), 1591 (C=C), 1090 (Ar-Cl); mass: *m/z* 415 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.52 (s, 3H, CH<sub>3</sub>), 3.83 (s, 3H, Ar-OCH<sub>3</sub>), 7.05 (d, 2H, Ar-H), 7.30 (d, 2H, Ar-H), 7.48 (d, 2H, Ar-H), 7.76 (d, 2H, Ar-H), 14.28 (bs, 1H, SH); analytical calculated for C<sub>19</sub>H<sub>17</sub>N<sub>3</sub>OS<sub>2</sub>Cl: C, 55.00; H, 3.64; N, 13.50%. Found: C, 55.02; H, 3.63; N, 13.53%.
- **8g**: IR (KBr, cm<sup>-1</sup>): 3089 (Ar-H), 2747 (S-H), 1593 (C=C), 1091 (Ar-Cl); mass: *m/z* 399 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.38 (s, 3H, CH<sub>3</sub>), 2.45 (s, 3H, Ar-CH<sub>3</sub>), 7.24 (d, 2H, Ar-H), 7.31 (d, 2H, Ar-H), 7.45 (d, 2H, Ar-H), 7.74 (d, 2H, Ar-H), 14.15 (bs, 1H, SH); analytical calculated for C<sub>19</sub>H<sub>17</sub>N<sub>3</sub>S<sub>2</sub>Cl: C, 57.20; H, 3.79; N, 14.04%. Found: C, 57.24; H, 3.78; N, 14.01%.

#### (16*Z*)-2-(4-chlorophenyl)-*N*'-(4-(4-chlorophenyl)-3-phenylthiazol-2(3*H*)-ylidene)-4-methylthiazole-5-carbohydrazides, 10a-g

Thiosemicarbazide **6** (0.01 mol) and the compound **9** (0.01 mol) were heated together in ethanol under reflux for 5 h. Completion of reaction was monitored by TLC. After the completion of reaction, the reaction mixture was cooled and poured into 10 g crushed ice. The solid product thus obtained was separated by filtration and recrystallized from ethanol to afford pure compound **10**.

- **10c**: IR (KBr, cm<sup>-1</sup>): 3420 and 3260 (N-H), 3126 (=C-H), 2931 (C-H), 1630 (C=C), 1089 (Ar-Cl); mass: *m/z* 537 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.66 (s, 3H, CH<sub>3</sub>), 6.55 (s, 1H, =CH), 7.13-8.20 (m, 13H, Ar-H), 10.09 (s, 1H, NH), 10.56 (s, 1H, NH). Analytical calculated for C<sub>26</sub>H<sub>19</sub>N<sub>5</sub>OS<sub>2</sub>Cl<sub>2</sub>: C, 57.99; H, 3.56; N, 10.40%. Found: C, 58.00; H, 3.54; N, 10.42%.
- **10e**: IR (KBr, cm<sup>-1</sup>): 3420 and 3258 (N-H), 3119 (=C-H), 2931 (C-H), 1630 (C=C), 1089 (Ar-Cl); Mass: *m/z* 567 (M<sup>+</sup>); <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 2.70 (s, 3H, CH<sub>3</sub>), 3.58 (s, 3H, Ar-OCH<sub>3</sub>), 6.48 (s, 1H, =CH), 6.98-8.00 (m, 12H, Ar-H), 10.07 (s, 1H, NH), 10.51 (s, 1H, NH). Analytical calculated for C<sub>27</sub>H<sub>21</sub>N<sub>5</sub>O<sub>2</sub>S<sub>2</sub>Cl<sub>2</sub>: C,



57.04; H, 3.72; N, 9.85%. Found: C, 57.06; H, 3.74; N, 9.84%.

- **10g**: IR (KBr,  $\text{cm}^{-1}$ ): 3433 & 3254 (N-H), 3117 (=C-H), 2921 (C-H), 1628 (C=C), 1089 (Ar-Cl); mass:  $m/z$  551 ( $M^+$ );  $^1\text{H NMR}$  ( $\text{DMSO}-d_6$ ):  $\delta$  2.32 (s, 3H, CH<sub>3</sub>), 2.54 (s, 3H, Ar-CH<sub>3</sub>), 6.48 (s, 1H, =CH), 7.15-8.13 (m, 12H, Ar-H), 10.02 (s, 1H, NH), 10.52 (s, 1H, NH). Analytical calculated for C<sub>27</sub>H<sub>27</sub>N<sub>3</sub>OS<sub>2</sub>Cl<sub>2</sub>: C, 58.69; H, 3.83; N, 10.14%. Found: C, 58.67; H, 3.85; N, 10.16%.

#### ACKNOWLEDGMENT

The authors are thankful to P.G. Department of Chemistry, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar, and P.G. Department of Chemistry, New Arts, Commerce and Science College, Parner, Ahmednagar, for providing chemicals and also thankful to the Management of Anekant Education Society, Baramati, for constant encouragement and providing necessary research facilities and to the Director, SAIF, Panjab University, Chandigarh, for providing spectral data.

#### REFERENCES

- [1] Haraguchi, S.K., Silva, A.A., Vidotti, G.J., Da Silva, C.C., dos Santos, P.V., Garcia, F.P., Pedroso, B., Nakamura, C.V., de Oliveira, C.M.A. Antitrypanosomal activity of novel benzaldehyde-thiosemicarbazide derivative from kaurenoic acid, *Molecules*, **2011**, *16*, 1166-1180.
- [2] Shipman, C., Smith, S.H., Drach, J.C., Klayman, D.L. Physiological effect and microbial susceptibility antiviral activity of 2-acetyl pyridine thiosemicarbazones against herpes simplex virus, *Antimicrob. Agents Chemother.*, **1981**, *19*, 682-685.
- [3] Chipeleme, A., Gut, J., Rosenthal, P.J., Chibalea, K. Synthesis and biological evaluation of phenolic Mannich bases of benzaldehyde and (thio) semicarbazone derivatives against the cysteine protease falcipain-2 and a chloroquine resistant strain of plasmodium, *Bioorg. Med. Chem.*, **2007**, *15*, 273-282.
- [4] Sarkanj, B., Molnar, M., Cacic, M., Gille, L. 4-methyl coumarine antifungal antioxidant activity enhancement by substitution with thiosemicarbazide and thiazolidinone moieties, *Food Chem.*, **2013**, *139*, 488-495.
- [5] Hu, W., Zhou, W., Xia, C., Wen, X. Synthesis and anticancer activity of thiosemicarbazones, *Bioorg. Med. Chem. Lett.*, **2006**, *16*, 2213-2218.
- [6] Challan, P., Naser, S., Vivas, L., Chibale, K., Smith, G.S. Cyclopalladated complex containing tridentates thiosemicarbazone ligand of biological significance: Synthesis, structure and antimalarial activities, *J. Organometallic Chem.*, **2010**, *695*, 2225-2232.
- [7] Sharma, R., Chaturvedi, S.C. 2-amino-5-sulphonyl-1, 3, 5-thiadiazoles: A new series of selective cyclooxygenase-2 inhibitors, *Acta Pharm.*, **2008**, *58*, 317-326.
- [8] Ahmed, I., Khazi, M., Mahajanshetti, C.S., Gadad, A.K. Heterocyclic system containing bridgehead nitrogen: Synthesis of 2-alkyl-6, 6-dimethyl-8-oxo-5, 6, 7, 8-tetrahydro-s-triazolo [3, 2-b] benzothiazoles, *Indian J. Heterocycl. Chem.*, **1992**, *2*, 127-130.
- [9] Singh, H., Yadav, L.S. Synthesis of some 5-aryl-2-heteroaryl/heteroarylamino-1, 3, 4-oxadiazoles as potential fungicides, *Agric. Biol. Chem.*, **1976**, *40*, 759-764.
- [10] Foroumadi, A., Karagar, Z., Sharifzadeh, Z., Feyzmohammadi, R., Kazemi, M., Shafiee, A. Synthesis and antimycobacterial activity of some alkyl [5-(nitroaryl)-1, 3, 4-thiadiazol-2-ylthio] propionates, *Bioorg. Med. Chem. Lett.*, **2006**, *16*, 1164-1167.
- [11] Gupta, A., Pandeya, S.N., Mishra, P., Kashaw, S.K., Jatav, V., Stables, J.P. Synthesis and anticonvulsant activity of some novel 3-aryl amino/amino-4-aryl-5-imino-Delta (2)-1, 2, 4-thiadiazoline, *Eur. J. Med. Chem.*, **2008**, *43*, 749-754.
- [12] Akolkar, H.N., Darekar, N.R., Kundlikar, S.G., Karale, B.K. Synthesis and antimicrobial evaluation of pyridine anchored thiazolyl 1,3,4-thiadiazoles and 1,2,4-triazoles, *Indian J. Heterocycl. Chem.*, **2015**, *25*, 87-90.
- [13] Pattan, S., Gadhave, P., Tambe, V., Dengale, S., Thakar, D., Hiremath, S.V., Shete, R.V., Deotarse, P. Synthesis and evaluation of some novel 1,2,4-triazole derivatives for antimicrobial, antitubercular and anti-inflammatory activities, *Indian J. Chem.*, **2012**, *51B*, 297-301.
- [14] Holla, B.S., Veerendra, B., Shivamanda, M.K., Poojary, B. Synthesis, characterisation and anticancer activity: Studies on some Mannich bases derived from 1, 2, 4-triazoles, *Eur. J. Med. Chem.*, **2003**, *38*, 759-767.
- [15] Sanfilippo, P.J., Jetter, M.C., Cordova, R., Noe, R.A., Chourmozis, E., Lau, C.Y., Wang, E. Novel Thiazole based heterocycles as inhibitors of LFA-1/ICAM-1 mediated cell adhesion, *J. Med. Chem.*, **1995**, *38*, 1057-1059.
- [16] Bradshaw, T.D., Westwell, A.D. Development of antitumour benzothiazole prodrug, phortress as a clinical candidate, *Curr. Med. Chem.*, **2004**, *11*, 1009-1021.
- [17] Siddiqui, N., Ahsan, W. Triazoles incorporated thiazoles as a new class of anticonvulsant: Design, synthesis and *in vitro* screening, *Eur. J. Med. Chem.*, **2010**, *45*, 1536-1543.
- [18] Siddiqui, N., Ahsan, W. Synthesis, anticonvulsant and toxicity screening of thiazolyl-thiadiazole derivatives, *Med. Chem. Res.*, **2011**, *20*, 261-268.
- [19] Geronikaki, A., Litina, D.H., Chatziopoulos, C., Soloupa, G. Synthesis and biological evaluation of new 4, 5-disubstituted thiazolylamides derivatives of 4-hydroxy-piperidine or of 4-N-methyl piperazine, *Molecules*, **2003**, *8*, 472-479.
- [20] Chidananda, N., Poojari, B., Sumangala, V., Lobo, P.L. Condensed bridge head nitrogen heterocyclic compounds: Facile synthesis, characterization and bioactivity studies of some substituted-7H-[1,2,4] triazolo[3,4-b][1,3,4]thiadiazines, *J. Appl. Chem.*, **2013**, *2*, 1080-1101.

Vaibhav P. Landage *et al.*

[21] Chao, H., Yu, E. Preparation of Thiazole and Oxazole as Selective Activators of Human PPAR Delta, Publication No. WO2001000603, *AIPCT International Applications*, **2001**.

[22] Uchida, H. Preparation of Heterocyclic Carbamate and Carboxylic Acid Hydrazide Compound as p27Kip1 Degradation Inhibitors, Publication No. 2012002527, *PCT International Applications*, **2012**.

---

*Received: 29 May 2017; Accepted: 20 Nov 2017*

## 63. Synthesis and Characterization of Gd doped Y2O3 Phosphor Material



Int. Res. J. of Science & Engineering, 2018; Special Issue A2 : 147-149  
ISSN: 2322-0015

SJIF Impact Factor 4.11  
UGC Approved Journal No. 63628

RESEARCH ARTICLE

OPEN ACCESS

## Purification of water *via* nano oxide-charcoal composite

Diggikar Rahul S

Department of Chemistry, New Arts, Commerce and Science College, PARNER, Ahmednagar  
E-mail: [diggikarrs@gmail.com](mailto:diggikarrs@gmail.com)

### Manuscript Details

Available online on <http://www.irjse.in>  
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

### Cite this article as:

Diggikar Rahul S. Purification of water *via* nano oxide-charcoal composite, *Int. Res. Journal of Science & Engineering*, January 2018; Special Issue A2: 147-149.

© The Author(s), 2018 Open Access  
This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

### ABSTRACT

Herewith, presented the application of nano metal oxides for the purification of water. Metal oxides in the different nanoforms made composite with activated charcoal, the surface area increases ultimately adsorption increases. Metal oxides like  $V_2O_5$  in the nano level found excellent ecofriendly reagent useful for purification of water through selective adsorption.

**Keywords:** Adsorption, oxalic acid, Nanophase,  $V_2O_5$ , charcoal.

### INTRODUCTION

One of the fundamental requirements for life on earth is water. World is suffering from growing health and hygienic problems and a high percentage of diseases in developing countries is caused by polluted water supply.

In this contest, contaminants from industrial waste streams, that seriously threaten human health and the environment has assumed growing importance in recent years [1]. Reduction, if not elimination, of such pollutants can be achieved through a combination of resource management, product reformulation, process modification and some form of end-of-pipe treatment [2]. The established technologies are based on incineration, biological treatment, condensation and absorption and adsorption processes.

In the field of nanotechnology, the special particles which are known as nanoparticles require minimum space for accommodation and gives more efficiency, as a rule

State level Seminar on "Advanced Methods for material Characterization" (SCAMMC -2018)  
© 2018 | All right reserved

|147

activated carbon is more effective in adsorbing nonelectrolytes from a solution than electrolytes, and the extent of adsorption is usually greater of the adsorbate [3]. Conversely, inorganic solids tend to adsorb electrolytes more readily than nonelectrolytes [5]. This tendency of adsorbents to attract certain substances in preference to other occasionally leads to the phenomenon of negative adsorption i.e. the concentration of a solute is actually increased after the treatment with the adsorbing agent. The explanation suggested for negative adsorption is that the solvent, in this case the water is adsorbed in preference to the electrolyte, and as a consequence the concentration of solute is raised [5].

The adsorption decreases as the temperature increases and increases when the surface area increases, by taking this advantage we are in touch to increase the surface of charcoal by making nanocomposite with nanomaterial because nanomaterial like  $V_2O_5$  can act as catalyst as well as a good adsorbing agent by which the rate of adsorption increases because activation energy increases[6-8]. These characteristic features have tuned us to find feasibility of using nanomaterials for enhancing the charcoal adsorption in purification of water.

In this manuscript, we present the preparation of  $V_2O_5$  in nano oxide powder ultimately used for water purification [9-10].

## METHODOLOGY

All the chemicals were used of AR grade. Ammonium metavanadate, hydrogen peroxide, oxalic acid, activated charcoal etc. are the precursors.

The implemented method is divided into three parts. The first part consists of synthesis and characterization of  $V_2O_5$  nano oxides. In the second part the preparation of composite of charcoal and nano oxides was done. In the third part we verified the validity of Frundlich- Langmuir adsorption isotherm principle by which water purification is possible.

## RESULTS AND DISCUSSION

Fig. 1 presented the XRD of  $V_2O_5$  and charcoal composite. The sharp peaks indicated the microcrystalline state of composites.

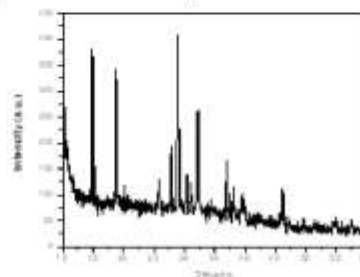


Fig. 1 XRD of  $V_2O_5$  - charcoal composite



Fig. 2 SEM image of  $V_2O_5$  - charcoal composite

Fig. 2 pertains the SEM image of  $V_2O_5$  - charcoal composite. In the figure it is clearly observed that the  $V_2O_5$  nanoparticles are clearly embedded in the layer of charcoal.

## Experimental

The obtained nanophase oxide powders were sonicated in water and incorporated in the matrix of activated charcoal through adsorption. The oxide incorporated charcoal materials have been used as the adsorbing bed for the removal of trace amounts of pollutants from water.

The charcoal embedded fine powders of the inorganic oxides have been able to remove pollutants from water an efficient adsorption of charcoal using nanophase  $V_2O_5$  powder [8]



Solid surfaces can adsorb dissolved substances from solutions of oxalic acid in water is shaken with activated carbon, part of the acid is removed by the

carbon and the concentration of the solution decreases.

<b>Observation No.1</b>	Weight of Charcoal = 100 mg Oxalic acid concentration in water =0.05N Sodium hydroxide concentration = 0.01N Total quantity of solution consisting of charcoal and oxalic acid is 25 ml From 25 ml of total solution 5 ml is pipette out and titrated it with standard solution sodium hydroxide we found that 1.97 gm of oxalic acid is adsorbed with charcoal calculated by some tedious calculations of Frudndlich- Langmuir adsorption isotherm principle equation.
<b>Observation No.2</b>	Weight of Charcoal = 50 mg Weight of (V <sub>2</sub> O <sub>5</sub> ) Nano oxide = 50 mg Oxalic acid concentration in water =0.05N Sodium hydroxide concentration = 0.01N Total quantity of solution consisting of charcoal and oxalic acid with (V <sub>2</sub> O <sub>5</sub> ) Nanomaterials is 25 ml. From 25 ml of total solution 5 ml is pipette out and titrated it with standard solution sodium hydroxide we found that 2.08 gm of oxalic acid is adsorbed with charcoal calculated by of Frudndlich- Langmuir adsorption isotherm principle
<b>Observation No.3</b>	By changing the concentrations of charcoal and nanomaterials we found that the 1:1 ratio is more suitable for adsorption of oxalic acid on charcoal as well as on nanomaterials.
<b>Observation No.4</b>	Above observations are obeyed the important Frudndlich-Langmuir adsorption isotherm principle

## CONCLUSION

Use of nanomaterials is feasible for enhancing the charcoal adsorption in purification of water; it is proved by the verification of Frudndlich-Langmuir adsorption isotherm principle.

**Acknowledgement:** This work was financed by the University Grants Commission, New Delhi, India (File No MRP-MAJOR- MATE-2013-39299).

**Conflicts of interest:** The authors stated that no conflicts of interest.

## REFERENCES

1. Diggikar R M.Phil. Dissertation YCMOU, Nasik 2009
2. Poole C and Oweeos F 2008 *Ind. Pub.* **11** 281
3. Diggikar R Kulkarni M Kale G and Kale 2013 *J. Mater. Chem. A* **1** 3992

4. Diggikar R Dhavale V Shinde D Kanbargi N K Kulkarni M and Kale B 2012 *RSC Adv.* **2** 3231
5. Diggikar R Ambekar J Kulkarni M Kale B *New J. Chem.* **37** 3236
6. Zhang, X. Liu Y Sun C Ji H. Zhao W Sun S, Zhao C 2015 *RSC Adv.* **5** 100651.
7. Pore D Desai U Thopate T Wadgaonkar P *Russian Journal of Organic Chemistry* **43** (7) 1088
8. Desai U Thopate T Pore D Wadgaonkar P *Catalysis Communications* **7** (7) 508
9. Diggikar R Late D and Kale B 2014 *RSC Adv.* **4** 22551
10. Diggikar R Patil R Kale S Thombre D Gade WKulkarni M 2013 *Applied Microbio. And Biotech.* **97** (18) 8283

## 64. A Short Synthesis of Sesquiterpene Ar-himachalene Cedrus Deodara by Heck Reaction

J. Mountain Res. ISSN: 0974-3030  
Vol. 13, (2018) 39-43



## A Short Synthesis of Sesquiterpene Ar- Himachalene from *Cedrus deodara* by Heck reaction

Tukaram Sukhadev Thopate<sup>1\*</sup>

<sup>1</sup>Department of Chemistry and Research Center, New Arts, Commerce and Science College, Parner, Ahmednagar (MS) 414302, India

Corresponding Author Email: thopate1@rediffmail.com

Received: 14.11.2018; Revised: 25.11.2018 Accepted:10.12.2018  
©Society for Himalayan Action Research and Development

**Abstract:** A short synthesis of ar- himachalene was carried out by palladium catalyzed Heck reaction. Heck reaction of p-iodotoluene with ethyl sorbate would yield the conjugated ester. Further hydrogenation of conjugated ester by NaOH and Raney-nickel alloy gives the saturated ester in two steps and in high overall yield. Grignard reaction of saturated ester with methyl magnesium iodide followed by Polyphosphoricacid cyclodehydration of the resultant tertiary alcohol would furnish a sesquiterpene, ar-himachalene.

**Keywords:** Heck reaction • p-iodotoluene • PPA • Sesquiterpene • ar- himachalene

### Introduction

A large number of naturally occurring sesquiterpenes possesses a wide range of applications in drugs, pharmaceuticals, rubber, paints, perfumery, agriculture and many others (Chavan et.al., 2012). Himachalene is a structurally and biologically important class of naturally occurring sesquiterpene hydrocarbons the synthetically challenging benzo(7)annulene ring system (Silva, 2008; Srikrishna et.al, 2004). Himachalene is found as essential oil extracted from several cedar woods, which include *Cedrus deodara* Loud, *Cedrus atlantica* and *Cedrus libani* found in Himalayan and Moroccan forests (Rao et.al., 1952). The different components and essential oil of *Cedrus deodara* shows insecticidal and larvicidal activity and therefore used in pest management (Chaudhary et. al., 2011). Himachalene was also isolated as pheromonal component of *flea beetles*; *Aphthona flava* and *Phyllotreta cruciferae*, which

are typically produced by only one sex but attract both sexes (Bartlet et. al., 2001).

The structure of ar-himachalene has proved on the basis of spectral evidences and its laboratory synthesis has carried out by two different long routes first time based on spectral evidences (Joseph et.al., 1968; Pandey et. al., 1968). The third synthetic approach of ar- himachalene was reported by the use of tricyclic sesquiterpene *viz.* longifolene, a complex starting compound (Mehta et. al., 1974). Recently, an enantioselective synthesis of ar-himachalene was reported by chirality induction approach (Mori, 2005). The synthesized aryl and acyl derivatives of its shows antimicrobial activity (Chaudhary et. al., 2014).

In recent years, the palladium catalyzed coupling of haloarenes and haloalkenes with olefins to form new carbon-carbon bonds, Heck reaction have gained our interest in the synthesis of natural products (Hossini et. al., 2011). Heck reaction has opened the door to a



tremendous variety of elegant and highly convergent routes to structurally complex chemoselective and regioselective molecules (Heck, 1968, 1982). The synthesis of dihydro-ar-turmerone, ar-todomatonic acid and 7-methoxy-1,1-dimethyltetralin, an intermediate for the synthesis of occidol isomer- I has earlier been reported from our laboratory by applying Heck reaction (Solbannavar et. al., 2003). In continuation with these studies, we wish to report herein first time the synthesis of ar-himachalene by shortest route using Heck reaction approach.

#### Materials and Methods

*p*-Toluidine (S. D. Fine Chemicals), sorbic acid (BDH), palladium acetate (Lancaster) and potassium carbonate (S. D. Fine Chemicals) were used as received. Melting Points recorded are uncorrected. IR spectra were recorded on Perkin-Elmer FT-IR-783 spectrophotometer. NMR spectra were recorded on Bruker AC-200 or MSL-300 (200 MHz or 300 MHz for <sup>1</sup>H NMR and 50 MHz or 75 MHz for <sup>13</sup>C NMR) spectrometer in CDCl<sub>3</sub> using TMS as an internal standard and  $\delta$  values are expressed in ppm. Column chromatography was performed on silica gel (60-120 mesh, Qualigens).

#### Procedures for Synthesis

***p*-Iodotoluene (1):** The diazotization of *p*-toluidine followed by Sandmeyer reaction with KI furnished pure *p*-iodotoluene (62 %) pale brown, mp 34-36 °C by steam distillation (Furniss et. al., 1989).

**Ethyl Sorbate (2):** Ethyl sorbate was prepared from sorbic acid using ethanol and conc. sulfuric acid by standard known procedure pale yellow oil, bp 195-196 °C (16).

**Ethyl 5-(4'-methylphenyl)sorbate (3):** A mixture of *p*-iodotoluene 0.9 g (4 mmol), K<sub>2</sub>CO<sub>3</sub> 0.55 g (4 mmol) ethyl sorbate 0.6 mL (4.5 mmol), palladium acetate 0.009 g (0.04 mmol), triphenylphosphine 0.021 g (0.04 mmol) and DMF (5 mL) was heated with stirring at 100 °C on an oil bath till completion of reaction (TLC, 20 hr.). The progress of reaction was monitored by TLC. The reaction mixture was then cooled, acidified with ice-cold dilute HCl (10

mL) and extracted with ether. (3 x10 mL) The ether extract was washed with water and dried over anhydrous sodium sulfate. Removal of ether gave crude ester, which was purified by column chromatography to yield pure ethyl 5-(4'-methylphenyl) sorbate, 0.650 g (68 %).

IR spectrum,  $\nu$ , cm<sup>-1</sup>: 1721 s (COOR), 1655- 1514 (C=C).

<sup>1</sup>H NMR,  $\delta$ , ppm: 1.3 m (3H, -CH<sub>2</sub>-CH<sub>3</sub>), 2.3 s (3H, Ar-CH<sub>3</sub>), 4.2 m (2H, -CH<sub>2</sub>-CH<sub>3</sub>), 5.1 and 6.0 two d (1H, J 16 Hz, CH-COOEt), 6.3 and 6.6 two d (1H, J 8 Hz, CH-CH-CH-COOEt), 7.2 m (4H, Ar-Hs), 7.38 dd (1H, J 16 Hz and 8 Hz, CH-CH-COOEt).

**5-(4'-Methylphenyl)hexanoic acid (4):** Ethyl 5-(4'-methylphenyl)sorbate 0.4 g (2 mmol) was dissolved in 10 % aqueous NaOH solution (15 mL) and Raney-nickel alloy 4.00 g was added in portions with stirring at 95 °C during 4 hr. The reaction mixture was stirred at 95 °C for additional 2 hr. The catalyst was filtered off, washed with boiling water and the alkaline filtrate was acidified with excess of HCl (1:1) and then extracted with ether. From the ether extract, saturated acid, 5-(4'-methylphenyl)hexanoic acid was quenched using aqueous sodium bicarbonate. Acidification of the bicarbonate layer followed by reextraction of the resultant acid in ether furnished almost pure acid 5-(4'-methylphenyl)hexanoic acid, 0.310 g (77.50 %).

**Methyl 5-(4'-methylphenyl)hexanoate (5):** 5-(4'-Methylphenyl)hexanoic acid, 0.31 g (1.4 mmol) was dissolved in methanol (5 mL) and was added conc. H<sub>2</sub>SO<sub>4</sub> (2-3 drops). The solution was refluxed for 8 hours on water bath. The routine work-up of the reaction mixture furnished methyl 5-(4'-methylphenyl)hexanoate, 0.280 g (85 %). This ester was purified by column chromatography over silica gel to yield pure ester, 0.220 g (66%).

IR spectrum,  $\nu$ , cm<sup>-1</sup>: 1732 s (COOR), 1601 s (C=C).

<sup>1</sup>H NMR,  $\delta$ , ppm: 1.4 d (3H, -CH-CH<sub>3</sub>), 2.3 s (3H, Ar-CH<sub>3</sub>), 2.7 m (1H, (CH<sub>2</sub>)<sub>2</sub>-CH), 3.5 m (2H, -OCH<sub>2</sub>-CH<sub>3</sub>), 3.6 s (3H, Ar-OCH<sub>3</sub>), 3.9 m (4H,  $\alpha$ -CH<sub>2</sub> and  $\gamma$ -CH<sub>2</sub>), 7.1 s (4H, Ar-Hs).



**6-(4'-Methylphenyl)-2-methylheptan-2-ol (6):** To a magnetically stirred solution of Grignard reagent (prepared from 0.050 g of magnesium and 0.4 mL of methyl iodide in (10 mL) of dry ether) was added the solution of methyl 5-(4'-methylphenyl)hexanoate, 0.220 g (1 mmol) in dry ether (10 mL) during 1 hour. The reaction mixture was stirred at room temperature for 1 hour and then refluxed on water bath for an additional hour. After cooling, the reaction mixture was decomposed by pouring it into saturated  $\text{NH}_4\text{Cl}$  solution. The organic layer was separated and the aqueous layer was extracted with ether. The combined ether extract was repeatedly washed with water, dried over anhydrous sodium sulfate and ether was removed to give the alcohol, 6-(4'-methylphenyl)-2-methylheptan-2-ol, 0.190 g (73 %).

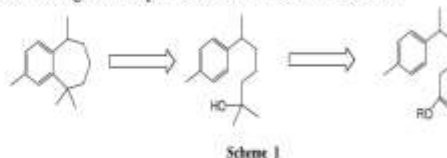
**Ar-Himachalene (7):** To a well stirred solution of polyphosphoric acid (prepared from phosphorus pentoxide 2.5 g and *ortho* phosphoric acid 2.0 g) was added the above tertiary alcohol, 0.19 g and stirring was continued for additional 1 hour. It was then decomposed by addition of ice-cold water and extracted with ether. The ether extract was washed with water, dried and ether removed to give ar-himachalene, 0.14 g (64 %) It was purified by column chromatography over silica gel. Elution with pet. ether furnished pure ar-himachalene.

IR spectrum,  $\nu, \text{cm}^{-1}$ : 2927 (C-H), 1600 (C=C).  
 $^1\text{H}$  NMR,  $\delta$ , ppm: 0.9 d (1H,  $-\text{CH}-\text{CH}_3$ ), 1.1-1.4 m (12H,  $(\text{CH}_3)_2-\text{CH}$  and  $(\text{CH}_2)_5$ ), 2.3 s (3H, Ar- $\text{CH}_3$ ), 2.6 m (1H,  $(\text{CH}_2-\text{CH}-\text{CH}_2)$ ), 6.8-7.2 m (3H, Ar-Hs).  
 $^{13}\text{C}$  NMR,  $\delta$ , ppm: 14.2, 21.1, 21.4, 22.8, 29.77, 32.0, 122.7, 123.0, 126.8, 128.9, 129.1.

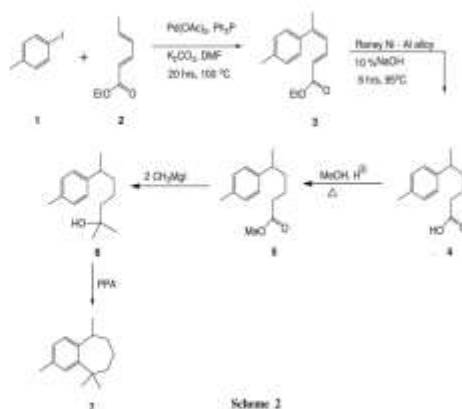
### Results and Discussion

The retrosynthetic approach of ar-himachalene suggest that the preparation of carboxylic acid or ester as the key step of the synthesis because the ester on Grignard reaction with methyl magnesium iodide followed by cyclodehydration using PPA would give ar-himachalene (Scheme-1). This observation prompted us to check a new

short route towards the synthesis of same acid or ester using our experience with Heck reaction.



We envisaged that palladium catalyzed Heck reaction of *p*-iodotoluene 1 with ethyl sorbate 2 was carried out in DMF in presence of triphenylphosphine as ligand and potassium carbonate as a base yielded ethyl 5-(4'-methylphenyl)sorbate 3 in moderate yield. This conjugate ester was reduced with Raney-nickel alloy in NaOH under reflux condition, which upon acidification and work-up furnished 5-(4'-methylphenyl) hexanoic acid 4. The resultant acid 4 was converted into corresponding ester, methyl 5-(4'-methylphenyl) hexanoate 5 by known procedure. The saturated ester was subjected to Grignard reaction with methyl magnesium iodide, which gave the corresponding tertiary alcohol 6-(4'-Methylphenyl)-2-methylheptan-2-ol 6 in good yield. The crude tertiary alcohol on removal of ether was directly subjected to cyclodehydration with PPA to yield ar-himachalene 7 (Scheme 2).





The conjugated ester 3 showed IR bands at 1721 and 816  $\text{cm}^{-1}$  indicated the formation of conjugated ester and *p*-disubstituted aromatic ring, respectively.  $^1\text{H}$  NMR spectrum of the product indicated that compound is a mixture of two isomers. It showed two singlets at  $\delta$  2.2 and 2.3 for vinylic methyl group protons of two isomers. It also showed two doublets (each, with *J* 16 Hz) at  $\delta$  5.8 and 6.0 for one type of a proton, two doublets (each, with *J* 8 Hz) at  $\delta$  6.3 and 6.6 for two other types proton, out of that one proton exhibited doublet of doublet (each, with *J* 16 Hz and 8 Hz) at  $\delta$  7.7.

The conjugate ester was subjected to reduction with Raney-nickel under reflux condition, which upon work-up furnished 5-(4'-methylphenyl) hexanoic acid 4 and the resultant acid was converted into corresponding saturated methyl ester 5-(4'-methylphenyl) hexanoate 5 by known procedure. The saturated ester 5 showed shifting of IR frequency from 1721 to 1732  $\text{cm}^{-1}$  indicated the formation of saturated ester.  $^1\text{H}$  NMR spectrum showed a doublet at  $\delta$  1.4 for benzylic methyl group protons and three singlets at  $\delta$  2.3 and 3.7 and 7.1 for aromatic methyl group protons, ester methyl group protons and aromatic protons, respectively. The benzylic methine proton appeared as multiplet centered at  $\delta$  2.7 while methylene group protons  $\beta$  to ester group appeared at  $\delta$  3.5 as multiplet. The methylene group protons  $\alpha$  to ester and  $\gamma$  to ester function appeared as a multiplet centered at  $\delta$  3.9. The absence of signals due to olefinic protons and the appearance of multiplet due to benzylic methyl ( $\delta$  1.4) and benzylic methine proton ( $\delta$  2.7) clearly indicated the formation of desired saturated ester 5. The ester 5 was subjected to Grignard reaction with methyl magnesium iodide, which gave the corresponding tertiary alcohol 6-(4'-Methylphenyl)-2-methylheptan-2-ol 6. The tertiary alcohol was directly subjected to cyclodehydration with PPA to yield ar-himachalene 7. IR spectrum of ar-himachalene showed the bands at 1383  $\text{cm}^{-1}$  for *gem*-dimethyl group while the bands due to hydroxyl group or ester group were absent.  $^1\text{H}$  NMR spectrum showed a doublet at  $\delta$  0.9 for benzylic methyl group protons and multiplet

between  $\delta$  1.13-1.4 for six protons of *gem*-dimethyl group and six protons of methylene groups. It also exhibited a singlet at  $\delta$  2.3 for aromatic methyl group protons, a multiplet at  $\delta$  2.6 for benzylic methine proton and multiplet at  $\delta$  6.8-7.2 for three aromatic protons. The band due to *gem*-dimethyl group in IR spectrum and benzylic methine proton in  $^1\text{H}$  NMR spectrum substantiated the formation of desired product *viz.* ar-himachalene.  $^{13}\text{C}$  NMR spectrum of the same compound showed the signals at  $\delta$  14.2, 21.1, 21.4, 22.8, 29.8, 32.0, 122.7, 123.0, 126.8, 126.9 and 129.1. The signal at 29.8 was due to the carbons of *gem*-dimethyl group and benzylic methyl group carbons at 22.8 was due to aromatic methyl group carbon and that at 32.0 was due to a tertiary carbon and a quaternary carbon while the signals between 14.2-29.8 ppm were due to carbons of methylene groups. This data also supported the structure of ar-himachalene. In the DEPT scan of the same spectrum the signals at 14.2, 21.1 and 21.4 were found inverted while that at 32.0 was found to be absent confirming the presence of three methylene groups as well as above assignment.

#### Conclusion

In conclusion, we have synthesized ar-himachalene only by four-step reaction sequence using Heck reaction first time.

#### Acknowledgements

Author TST thanks the Management of the Institute, Ahmednagar Jilha Maratha Vidya Prasarak Samaj, Ahmednagar for approving teacher fellowship and UGC, New Delhi for financial support as well as teacher fellowship under Faculty Improvement Programme.

#### References

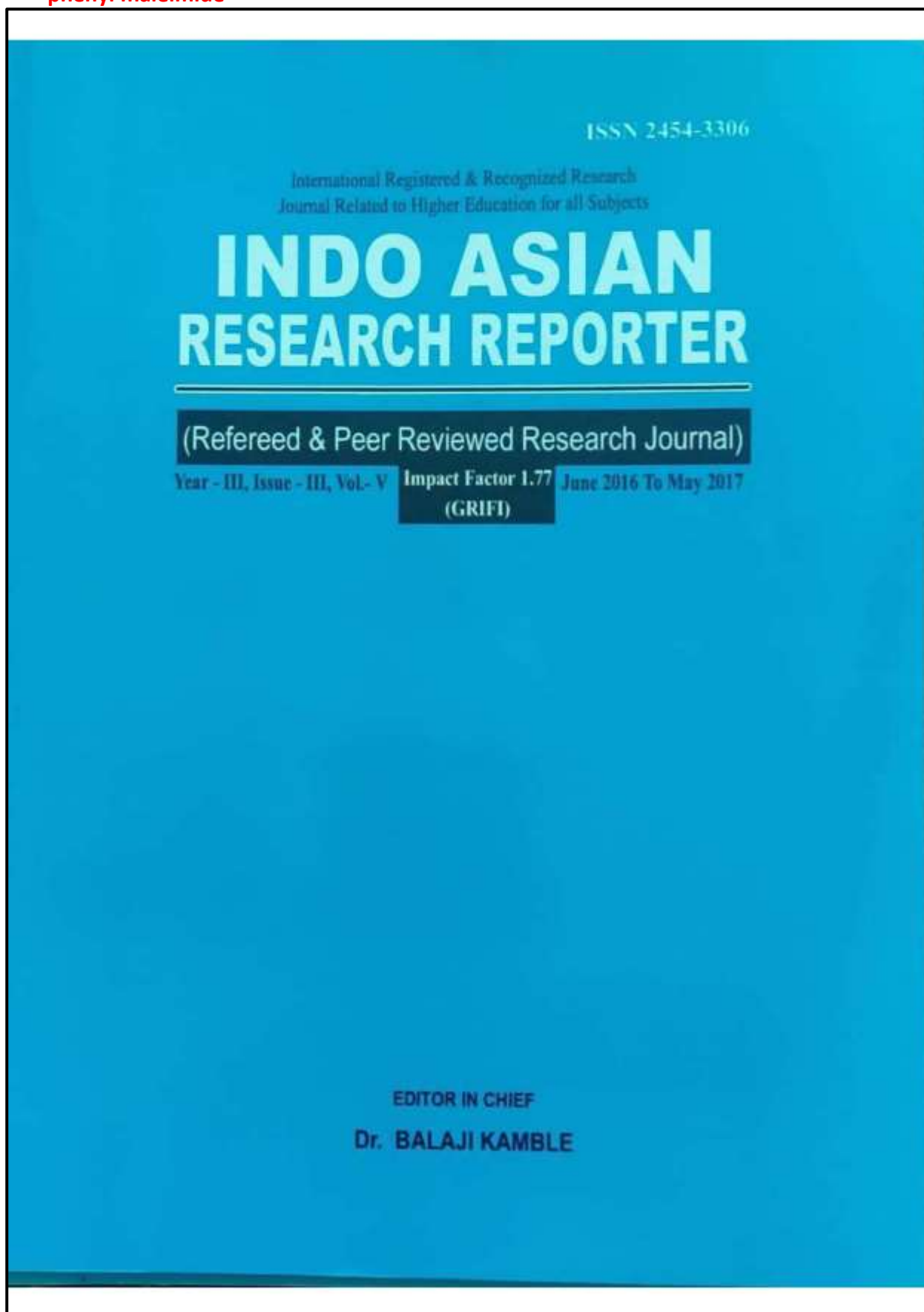
- Chavan, S.P., Khatod, H.S., (2012). Enantioselective synthesis of the essential oil and pheromonal component ar-himachalene by a chiral pool and chirality induction approach. *Tetrahedron Asymmetry*; (3)1410-1415.




- Silva, L.F., Vasconcelos, R.S., Nogueira, M.A., (2008). Iodine (III) –promoted ring expansion of 1-vinylcycloalkanol derivatives: A metal-free approach toward seven-membered rings *Org. Lett.*, (10)1017-1020.
- Srikrishna, A., Ravikumar, P., (2004). Enantiospecific first total synthesis of (+)-trans- $\alpha$ -himachalene. *Tetrahedron Lett.* (45)6867-6870.
- Rao, G.S., Dev, S., Guha, P.C., (1952). Studies in sesquiterpenes—XXXII: Structure of himachalene monohydrochloride and the preparation of trans-himachalenes. *J. Ind. Chem. Soc.*: (29)721-729.
- Chaudhary, A., Sharma, P., Nadda, G., Tewary, D.K., Singh, B., (2011). Chemical composition and larvicidal activities of the Himalayan cedar, *Cedrus deodara* essential oil and its fractions against the diamondback moth, *Plutella xylostella*. *J. Insect. Sci.* (11)257-266.
- Bartlet, R.J., Cosse, A.A., Zilkowski, J.B., Weisleder, B., Momany, F.A., (2001). Male-Specific Sesquiterpenes from *Phyllotreta* and *Aphthona* Flea Beetles. *J. Chem. Ecol.* (27)12, . 2397-2430.
- Joseph, T.C., Dev, S., (1968). Studies in sesquiterpenes—XXIX: Structure of himachalenes *Tetrahedron* : (24) 3809-3827.
- Pandey, R.C. Dev, S., (1968). Studies I sesquiterpenes-xxx Synthesis of ar-himachalene and himachalenes. *Tetrahedron*: (24) 3829-3839.
- Mehta, G., Kapoor, S.K., (1974). Terpenes and related systems. IX. Synthesis of (+)-himachalene dihydrochloride and (+)-ar-himachalene. *J. Org. Chem.* (39)2618-2624.
- Mori, K. (2005) Synthesis of (R)-ar-turmerone and its conversion to (R)-ar-himachalene, a pheromone component of the flea beetle: (R)-ar-himachalene is dextrorotatory in hexane, while laevorotatory in chloroform. *Tetrahedron Asymmetry* (16)685-692.
- Chaudhary, A., Sood, S., Das, P., Kaur, P., Mahajan, I., Gulati, A., Singh, B., (2014). Synthesis of novel antimicrobial aryl himachalene derivatives from naturally occurring himachalenes. *EXCLI J.* (13)1216-1225.
- Hossini, I., Hurrad, M.A., Ali, M.A., El Firdoussi, L. Karim, A., Valerga, P., Puerta, M.C., (2011). Friedel-craft acylation of ar-himachalene: Synthesis of acyl-ar-himachalene and a new acyl-hydroperoxide. *Molecules* (16)5886-5895.
- Heck, R.F., (1982). Palladium-catalyzed vinylation of organic halides. *Org. React.* (27) 345-389.
- Heck, R.F., (1968). Acylation, methylation, and carboxyalkylation of olefins by Group VIII metal derivatives. *J. Am. Chem. Soc.* (90). 5518-5526.
- Beletskaya, LP., Cheprakov, A.V., (2000). The Heck Reaction as a Sharpening Stone of Palladium Catalysis. *Chem. Rev.* (100)3009-3066.
- Solbannavar, S. B. Desai, U. V. Wadgaonkar, P. P. Mane, R. B., (2003). A Short Synthesis Of Ar-Todomatuic Acid And Dihydro-Ar-Turmerone By The Heck Reaction, *OPPI Briefs.* (35)418-420.
- Furniss, B. S. Hannaford, A. J. Smith, P.W. G. Tatchell, A. R., (1989). Vogel's textbook of practical organic chemistry (5th ed.), New York John Wiley

\*\*\*\*\*

65. **Silica sulfuric acid an efficient reusable solid acid catalyst for Synthesis of N-substituted phenyl maleimide**



	<b>IMPACT FACTOR</b> <b>1.77</b>	<b>ISSN 2454-3306</b>										
	International Registered & Recognized Research Journal Related to Higher Education for All Subjects											
<h1>INDO ASIAN</h1> <h2>RESEARCH REPORTER</h2>												
<b>REFEREED &amp; PEER REVIEWED RESEARCH JOURNAL</b>												
<b>Issue :</b> III, Vol. V <b>Year-</b> III, Annual (Yearly) ( June 2016 To May 2017)	<b>EDITOR IN CHIEF</b> <b>Dr. Balaji G. Kamble</b> Head, Dept. of Economics, Dr. Babasaheb Ambedkar Mahavidyalaya, Latur, Dist. Latur (M.S.) India											
<b>Editorial Office :</b> 'Gyandev-Parvati', R-9/139/6-A-1, Near Vishal School, LIC Colony, Pragati Nagar, Latur Dist. Latur - 413531. (Maharashtra), India.	<b>EXECUTIVE EDITORS</b> <table border="0"> <tr> <td> <b>Dr. Nilam Sanghani</b>            Borgaon(Marju),            Dist. Akola (M.S.)         </td> <td> <b>Dr. Satyankumar Sitapara</b>            Principal            Commerce and BBA Colledge            Amreli, Dist. Amreli (Gujrat)         </td> </tr> </table>		<b>Dr. Nilam Sanghani</b> Borgaon(Marju), Dist. Akola (M.S.)	<b>Dr. Satyankumar Sitapara</b> Principal Commerce and BBA Colledge Amreli, Dist. Amreli (Gujrat)								
<b>Dr. Nilam Sanghani</b> Borgaon(Marju), Dist. Akola (M.S.)	<b>Dr. Satyankumar Sitapara</b> Principal Commerce and BBA Colledge Amreli, Dist. Amreli (Gujrat)											
	<b>DEPUTY EDITOR</b> <table border="0"> <tr> <td> <b>Dr. Suma S. Nirni</b>            Dept. of History,            GP, Porwal &amp; V.V.Saithath College,            Sindagi, Dist. Bijapur (M.S.)         </td> <td> <b>Dr. Bhaskar S. Wazire</b>            Head, Dept. of History,            Sitabai Arts College,            Akola, Dist. Akola (M.S.)         </td> </tr> </table>		<b>Dr. Suma S. Nirni</b> Dept. of History, GP, Porwal & V.V.Saithath College, Sindagi, Dist. Bijapur (M.S.)	<b>Dr. Bhaskar S. Wazire</b> Head, Dept. of History, Sitabai Arts College, Akola, Dist. Akola (M.S.)								
<b>Dr. Suma S. Nirni</b> Dept. of History, GP, Porwal & V.V.Saithath College, Sindagi, Dist. Bijapur (M.S.)	<b>Dr. Bhaskar S. Wazire</b> Head, Dept. of History, Sitabai Arts College, Akola, Dist. Akola (M.S.)											
	<b>CO - EDITOR</b> <table border="0"> <tr> <td> <b>Dr. Ambuja Malkhedkar</b>            Gulbarga, Dist. Gulbarba,            (Karnataka)         </td> <td> <b>Dr. Sativa Tiwari</b>            Dept. of Hindi,            Govt. First Grade College,            Gulbarga, Dist. Gulbarga (K.A.)         </td> </tr> </table>		<b>Dr. Ambuja Malkhedkar</b> Gulbarga, Dist. Gulbarba, (Karnataka)	<b>Dr. Sativa Tiwari</b> Dept. of Hindi, Govt. First Grade College, Gulbarga, Dist. Gulbarga (K.A.)								
<b>Dr. Ambuja Malkhedkar</b> Gulbarga, Dist. Gulbarba, (Karnataka)	<b>Dr. Sativa Tiwari</b> Dept. of Hindi, Govt. First Grade College, Gulbarga, Dist. Gulbarga (K.A.)											
<b>Website</b> <a href="http://www.irasg.com">www.irasg.com</a>	<b>MEMBER OF EDITORIAL BOARD</b> <table border="0"> <tr> <td> <b>Dr. Mohmmad T. Rahaman</b>            Dept. of Biomedical Science,            International Islamic University,            Mahkota (Malaysia)         </td> <td> <b>Dr. Sivappa Rasapali</b>            Dept. of Chemistry &amp; Biochemistry,            UMASS, Westport Road,            Dartmouth, MA (U.S.A.)         </td> </tr> <tr> <td> <b>Dr. Rajendra R. Gawhale</b>            Head, Dept. of Economics,            G. S. Mahavidyalaya,            Buldhana, Dist. Buldhana (M.S.)         </td> <td> <b>Dr. M. Ashif Shaikh</b>            Principal            Ramesh Dhawad P. E. College,            Nagpur, Dist. Nagpur ( M.S. )         </td> </tr> <tr> <td> <b>Dr. Rajendra D. Ganapure</b>            Head, Dept. of Economics,            S. M. P. Mahavidyalaya,            Murum, Dist. Osmanabad (M.S.)         </td> <td> <b>Dr. Arun Kumbhar</b>            Head, Dept. of Economics,            Arts &amp; Commerce College,            Nasri, Dist. Kolhapur (M.S.)         </td> </tr> <tr> <td> <b>Dr. G. N. Panchal</b>            Librarian,            Madhavrao Patil College,            Palan, Dist. Parbhani ( M.S. )         </td> <td> <b>Dr. S. D. Salunke</b>            Dept. of Chemistry,            Rajarshi Shahu Mahavidyalaya,            Latur, Dist. Latur (M.S.)         </td> </tr> <tr> <td> <b>Dr. B. S. Thombare</b>            Head, Dept. of Geography,            Babaji Tate College,            Yavatmai, Dist. Yavatmai (M. S.)         </td> <td> <b>Dr. Anita Mudliar</b>            Shri. Nashikrao Tirpude College of            Physical Education,            Nagpur, Dist. Nagpur (M.S.)         </td> </tr> </table>		<b>Dr. Mohmmad T. Rahaman</b> Dept. of Biomedical Science, International Islamic University, Mahkota (Malaysia)	<b>Dr. Sivappa Rasapali</b> Dept. of Chemistry & Biochemistry, UMASS, Westport Road, Dartmouth, MA (U.S.A.)	<b>Dr. Rajendra R. Gawhale</b> Head, Dept. of Economics, G. S. Mahavidyalaya, Buldhana, Dist. Buldhana (M.S.)	<b>Dr. M. Ashif Shaikh</b> Principal Ramesh Dhawad P. E. College, Nagpur, Dist. Nagpur ( M.S. )	<b>Dr. Rajendra D. Ganapure</b> Head, Dept. of Economics, S. M. P. Mahavidyalaya, Murum, Dist. Osmanabad (M.S.)	<b>Dr. Arun Kumbhar</b> Head, Dept. of Economics, Arts & Commerce College, Nasri, Dist. Kolhapur (M.S.)	<b>Dr. G. N. Panchal</b> Librarian, Madhavrao Patil College, Palan, Dist. Parbhani ( M.S. )	<b>Dr. S. D. Salunke</b> Dept. of Chemistry, Rajarshi Shahu Mahavidyalaya, Latur, Dist. Latur (M.S.)	<b>Dr. B. S. Thombare</b> Head, Dept. of Geography, Babaji Tate College, Yavatmai, Dist. Yavatmai (M. S.)	<b>Dr. Anita Mudliar</b> Shri. Nashikrao Tirpude College of Physical Education, Nagpur, Dist. Nagpur (M.S.)
<b>Dr. Mohmmad T. Rahaman</b> Dept. of Biomedical Science, International Islamic University, Mahkota (Malaysia)	<b>Dr. Sivappa Rasapali</b> Dept. of Chemistry & Biochemistry, UMASS, Westport Road, Dartmouth, MA (U.S.A.)											
<b>Dr. Rajendra R. Gawhale</b> Head, Dept. of Economics, G. S. Mahavidyalaya, Buldhana, Dist. Buldhana (M.S.)	<b>Dr. M. Ashif Shaikh</b> Principal Ramesh Dhawad P. E. College, Nagpur, Dist. Nagpur ( M.S. )											
<b>Dr. Rajendra D. Ganapure</b> Head, Dept. of Economics, S. M. P. Mahavidyalaya, Murum, Dist. Osmanabad (M.S.)	<b>Dr. Arun Kumbhar</b> Head, Dept. of Economics, Arts & Commerce College, Nasri, Dist. Kolhapur (M.S.)											
<b>Dr. G. N. Panchal</b> Librarian, Madhavrao Patil College, Palan, Dist. Parbhani ( M.S. )	<b>Dr. S. D. Salunke</b> Dept. of Chemistry, Rajarshi Shahu Mahavidyalaya, Latur, Dist. Latur (M.S.)											
<b>Dr. B. S. Thombare</b> Head, Dept. of Geography, Babaji Tate College, Yavatmai, Dist. Yavatmai (M. S.)	<b>Dr. Anita Mudliar</b> Shri. Nashikrao Tirpude College of Physical Education, Nagpur, Dist. Nagpur (M.S.)											
<b>Contact : - 02382 - 241913</b> 09423346913 / 09637935252 09503814000 / 07276301000												
<b>E-mail :</b> visiongroup1994@gmail.com interlinkresearch@rediffmail.com mbkamble2010@gmail.com												
<b>Published by :</b> <b>Indo Asian Publication,</b> Latur, Dist. Latur - 413531 (M.S.)India												
<b>Price : ₹ 200/-</b>												





Issue : III, Vol. V

IARR

IMPACT FACTOR  
1.77

ISSN 2454-3306

June 2016 To May 2017

Sr. No.	Title of Research Paper	Author(s)	Page No.
60	Study of Pests of Lucerne (Medicago Sativa L.) Alfaalfa in Shrirampur Tahsil Region	Dnyaneshwar M. Shimbre, Shaikh Sameena H., Adhav Usha K., Mayuri Thakkar	59
61	Consequence of Biosynthesized Nanoparticles on Seed Germination	Dr. G. B. Shelar	62
62	Prevalence of Deuteromycetes Fungal Spores over Rice (Oryza Sativa L.) Field in Nashik, M.S.	H. P. Shinde	68
63	Physicochemical Parameters of Amla Healthy and Post-Harvest Infected Fruit	B. N. Sonawane, Sumia Fatima	71
64	Status of Some Medicinal Plants and Their Comparative Account with Surrounding Areas from Sacred Groves of Ahmednagar District, Maharashtra	Anjali Thete, P. P. Sharma	75
65	Study of Airborne Fungal Spores over Bajra Field	R. H. Thorat, Dr. S. G. Pillai	80
66	Popularization of Oyster Mushroom Cultivation in Jawhar Region (Dist. Thane) A Case Study	Sangita Kulkarni	82
67	Studies on The Effect of Various Types of Bagging on Sweet Orange (Citrus Sinensis Osbeck)	Vaishali Arjun, Vasmatkar	84
68	Agriculture – One of the Main Resources of Cultivating Food	S. S. Thube	88
69	Silica Sulfuric Acid: An Efficient, Reusable, Solid Acid Catalyst For Synthesis of N-Substituted Phenyl Maleimide	Dr. T. S. Thopate	91
70	Role Of Jayakwadi Backwater in the Agriculture Development	S. A. Najan	97
71	To Study of Water Resource Management And Sources of Fresh Water	Sanjay B. Shinde	101
72	Oilseed Production-A Study of Soybean Production Trends Inmaharashtra	Archana G. Antre	105
73	Studies on Heavy Metal Contamination in Pimpri Lake at Udgir, Dist. Latur	V. S. Nagpurne, J. M. Patwari, R. K. Narkhede,	114

**SILICA SULFURIC ACID: AN EFFICIENT, REUSABLE, SOLID ACID CATALYST FOR SYNTHESIS OF N-SUBSTITUTED PHENYL MALEIMIDE****Dr. T. S. Thopate**

Dept. of Chemistry,

New Arts Commerce And Science College,  
Parner, Dist. Ahmednagar (MS) India**ABSTRACT**

*A new series of N-substituted phenyl Maleimidederivatives were synthesized with high yield. All the compounds were characterized by IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR, elementary analysis and evaluated for their antimicrobial activities against selected bacteria. All the compounds possess broad spectrum of antimicrobial activity, compared with penicillin.*

**Keywords:** Silica Sulfuric Acid, Synthesis, N-substituted phenyl maleimide, Characterization.

**Introduction:**

N-Substituted phenyl maleimide (N-RPMI) is a class of functional polymer material modifier. As a component of the heat-resistant copolymer, it can significantly increase heat resistance of PVC, ABS, MMA, St-AN-MMA resin, etc. Accordingly, it is widely used for preparation of heat-resistant resin, coating adhesives, photosensitive resins, rubber vulcanization agent of reform, insulating paint, etc.

(Masayukiet al., 1983; Singhet al., 1994). There have been many methods in previous literatures about the synthesis of N-phenyl Maleimide (Chenet al., 2000; Dharamet al., 2005; Cole Halbert et al., 1964; Fredericet al. 2004; Fredericet al. 2002; Matsuura et al., 1985). Among all the methods, acetic anhydride method with acetic anhydride and azeotropic dehydration method with organic solvent are most used. In this study, we adopted the former method to synthesize a new

**Indo Asian Research Reporter (IARR)**

(92)

series of *N*-Substituted phenyl maleimide. However, different from the previous ones, we chose a new catalyst-cobalt acetate instead of sodium acetate and obtained a higher yield. In addition, important biological properties concerning bactericidal, fungicidal and anticancer have been reported for some imides (Wanget al., 2006; Machado, et al., 2005; Fredericet al., 2002; Alaaet al., 2007). In the present paper, we studied the antibacterial activities of the new maleimides against two reference bacteria, namely *Escherichia coli*, *Staphylococcus aureus*.

**Experimental:** Melting points were taken in open capillaries and were uncorrected. Purity of the compounds was checked on TLC. IR spectra  $\text{cm}^{-1}$  were recorded on Bruker TENSOR27 FT-IR using KBr disc as sample.  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra were recorded on Bruker 500 MHz spectrometer in a CDCl<sub>3</sub> solution, and all the compounds gave satisfactory elemental analysis through perkin-Elmer 240C elemental analyzer. The synthesized compounds were screened for their antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* by filter paper disc technique.

**Synthesis of maleamic acid (take 1a For example)** A three-necked flask equipped with a condenser and mechanical stirrer was charged with a solution of aniline (9.3 g, 0.1 mol) in acetone (100 ml). Maleic anhydride (11.8 g, 0.12 mol) dissolved in acetone (50 ml) was added

drop wise to the above mixture. An exothermic reaction occurred and a yellow product precipitation was observed immediately. The mixture was stirred for 1 h at 45°. The yellow precipitate was vacuum filtration, washed with fresh acetone to remove excess maleic anhydride, and dried. At last pale yellow powder was obtained and the yield was 98.1%.

**Synthesis of maleimide: (take 2a For example)**

To a three-necked flask, which was equipped with a condenser, mechanical stirrer, thermometer and nitrogen inlet, was added maleamic, cobaltous acetate, triethylamine and acetic anhydride. The reaction mixture was heated to 45° and stirred for 3 h under nitrogen. At last, the mixture was cooled to room temperature, precipitated with water, filtered, washed with a saturated solution of NaHCO<sub>3</sub> and distilled with reduced pressure distillation to obtain the target products and the yield was 97.2%.

**Antibacterial tests:**

The synthesized compounds were screened for their antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* by filter paper disc technique, using penicillin as a standard. The bacteria were grown in the sterile nutrient broth under 24 hours prior to the experiment. About 0.1 mL of this culture medium was inoculated on the nutrient agar plate uniformly. The test compounds were prepared to 10 mg L<sup>-1</sup>, using *N,N*-Dimethyl-formamide (DMF) as a

Indo Asian Scientific Research Organization (IASRO) (A Division of Indo Asian Publication)

solution, for it doesn't have any antibacterial activity. Then 0.1 ml this solution was added to the plate using a micropipette. The plates were incubated at 37°C for 24h. The zone of inhibition around the papers was checked and measured.

### Results and discussion :

The structure of N-RPMI is given in Fig. 1, represents the reaction of N-RPMI. As shown in Fig. 2, N-substituted phenyl Maleimide derivatives were synthesized through ring-opening addition of maleic anhydride and substituted aniline to give maleamic acid derivatives 1 and followed by cyclodehydration to give N-substituted phenyl Maleimide 2.

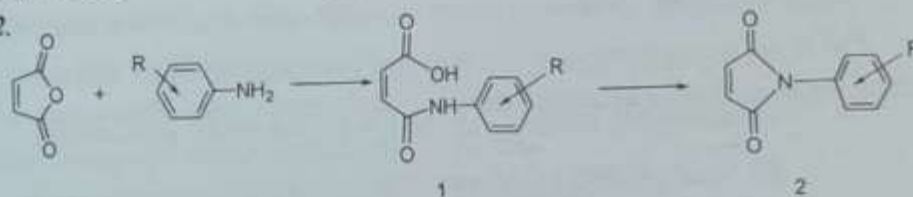


Fig.1. Reaction of N-RPMI

The composition and properties of the corresponding products are summarized in Tables 1 to 2. In a word, compound 2a can be easily synthesized and get a higher yield. The other compounds have an aromatic ring directly linked on the imide nitrogen, so their synthesis is mainly affected by the substituents. On the whole, electron-donating groups are conducive to the reaction, for they can make the electron density of intermediate acid so concentrated as to accelerate the reaction.

Table 1. Substituent of N-RPMI

substituent group	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>
2a	H	H	H
2b	H	H	Br
2c	CH <sub>3</sub>	H	Br
2d	Br, CH <sub>3</sub>	H	Br
2e	H	H	NO <sub>2</sub>
2f	H	Cl	H
2g	OH	H	H
2h	H	H	OCH <sub>3</sub>

**Indo Asian Research Reporter (IARR)**

(95)

The antibacterial activities are presented in Table 4. As shown in Table 4, we can see that all the compounds have a certain degree of antibacterial activity on account of their common structure-Sub-amide ring. But the effect of N-substituted phenyl Maleimide to Gram-positive bacteria is better than that to Gram-negative bacteria. So we can conclude that maybe the antibacterial mechanism of these compounds lies in that they can penetrate the cell wall of Gram-positive bacteria more easily. In addition, compared with the penicillin, N-substituted phenyl Maleimide derivatives have better antimicrobial activity to both Gram-positive bacteria and gram-negative bacteria. In a word, maleimide can be considered as non-specific toxic compounds. Moreover, this inexpensive family of products could be interesting candidates for the formulation of new antibacterial agents.

**Table 3. Antibacterial activity of N-RPML.**

Compound	Escherichia coli	Staphylococcus aureus
2a	++	+++
2b	++	+++
2c	+	++
2d	++	++
2e	++	+
2f	+	+
2g	+++	++
2h	+++	+++
penicillin	+	++++

Zone of inhibition diameter in mm (% inhibition):  
 +, 6-10 (27%-45%); ++, 10-14 (45%-64%);  
 +++, 14-18 (64%-82%);++++, 18-22 (82%-100%). Inhibition percentages are relative to the zone of inhibition of the most active compound (22 mm) with 100% inhibition.

**Conclusions:**

Eight new N-substituted phenyl Maleimide derivatives were synthesized with high yield. Through the antibacterial test against *Escherichia coli* and *Staphylococcus aureus*, we found that N-substituted phenyl Maleimide derivatives have a broad-spectrum antimicrobial activity to both Gram-positive bacteria and gram-negative bacteria, and it could be interesting candidates for the formulation of new antibacterial agents.

**References :-**

1. Masayuki, O., Motoo, K., Hikotada, T., & Nobuhito, K. (1983). N-Substituted phenyl maleimides. US 4400521.
2. Balwant, S., & Robert, J.T. (1994). Heat resistant resin composition comprising polymers of N-(substituted) maleimides and improved process for the preparation of said maleimides. US 5314950.
3. Chen, G.Q., Wu, Z.Q., Wu, J.R., Li, Z.C., & Li, F.M. (2000). Synthesis of alternating copolymers of N-substituted maleimides with styrene via atom transfer radical polymerization. *Macromolecules*,

Indo Asian Scientific Research Organization (IASRO) (A Division of Indo Asian Publication)

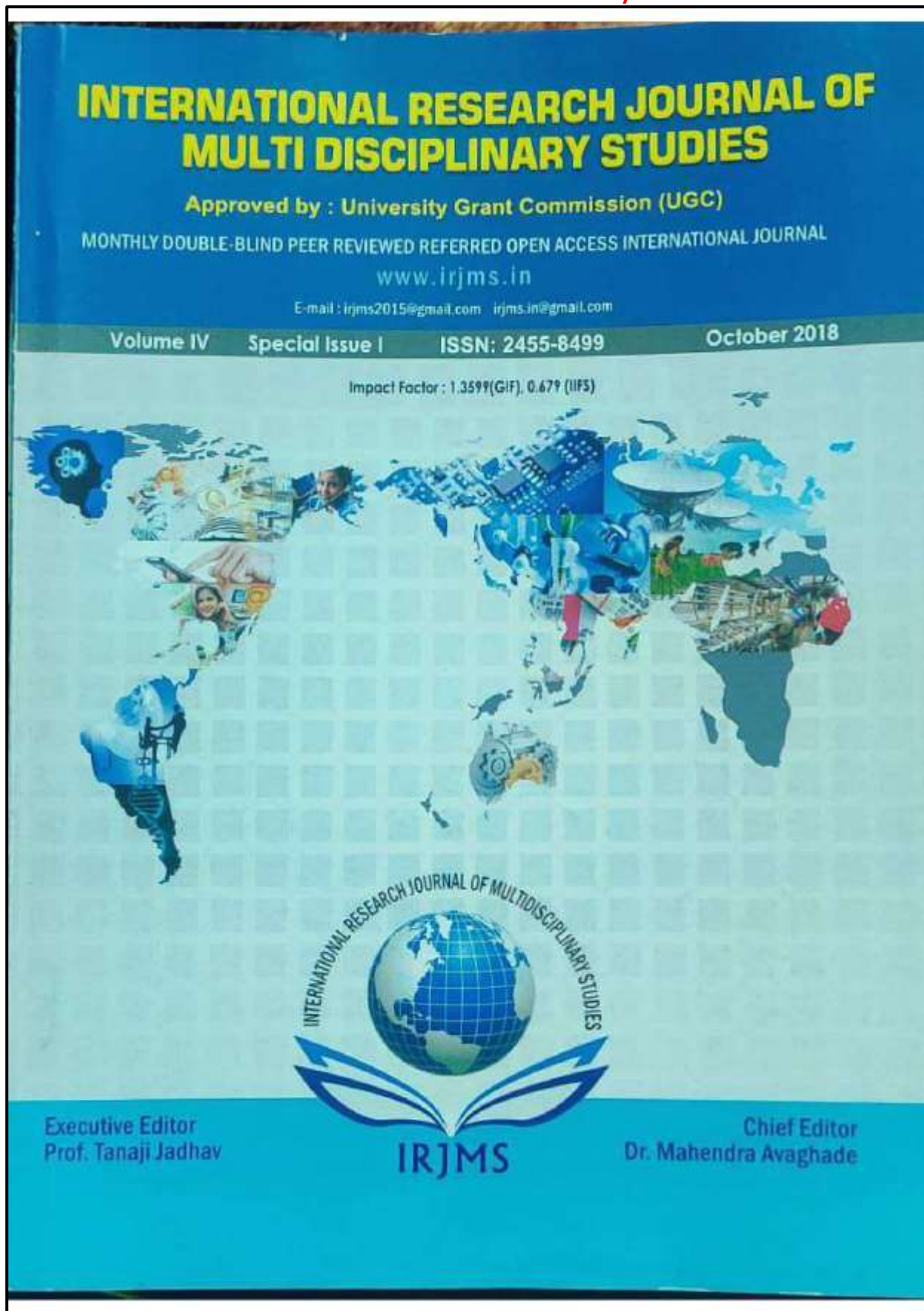
**Indo Asian Research Reporter (IARR)**

(96)

- 33(2), 232-234. DOI: 10.1021/ma991047b.
4. Dharam, P. J., Vikas, B., Birinder, J., Nalin, K., Sheetal, G., Ranju, B., Anja, P. & Rolf, W.H. (2005). Synthesis and study of some new N-substituted imide derivatives as potential anticancer agents. *Il Farmaco*, 60(4), 283-290. DOI: 10.1016/j.farmac.2005.01.011.
  5. Halberf, N.C., Clayinoni, Wilhelm, F. G., & Wilmington. (1964). Preparation of m-pheny-lenedimaleimide. US3127414.
  6. Frederic, Z., Regis, L. G., Roger, L., Danielle, S., Boris, L. & Alain, V. (2004). Syntheses, in vitro antibacterial and cytotoxic activities of a series of 3-substituted succinimides. *Il Farmaco*, 59(11), 879-886. DOI: 10.1016/j.farmac.
  7. Frederic, Z., Alain, V., Regis, L. G., Roger, L., Anne, G. M., & Danielle, S. (2002). Synthesis and antimicrobial activities of N-substituted imides. *Il Farmaco*, 57(5), 421-426. DOI: 10.1016/S0014-827X(02)01207-X.
  8. Matsuura, N., Kawasaki, K. (1985). Preparation of N-phenylmaleimide compound. JP 60100554.

Indo Asian Scientific Research Organization (IASRO) (A Division of Indo Asian Publication)

66. Characterization of nanomaterial at ordinary laboratories





# International Research Journal of Multidisciplinary Studies

Chief Editor  
Dr. Mahendra R. Avaghade

Executive Editor  
Prof. Tanaji D. Jadhav

Published by  
**IJRMS**  
Sr. No. 397, Flat No. 7, 4 Sizan Society,  
Bhugaon, Tal. Mulshi, Dist. Pune 412115

Printed by  
**Anmol Graphics**  
Flat No.3, Ojas Apartment  
Sr.No.57/3B, NR, Morya Vihar, Kothrud,  
Pune 411038 Mob. 8888563815/9764991027

Copyrights: Editors @2018  
All Rights reserved

ISSN: 2454-8499 (Online)

Issue  
Available at [www.irjms.in](http://www.irjms.in)



**Characterization of nanomaterials at ordinary laboratory**Diggikar R.S.<sup>1\*</sup>, Thopate T.S.<sup>1</sup><sup>1</sup>P.G. Department of Chemistry and Research Center

New Arts, Commerce and Science College, Parner, Ahmednagar, India

Corresponding Author: diggikarra@gmail.com

**Abstract**

Herewith, it is presented that the characterization of nanomaterials is carried out by simple ordinary laboratory techniques, as scientific characterization of nanomaterial is a difficult task for newly incoming researchers.

**Key words:** Characterization, Glass slide, solvent suspension, FESEM

**Introduction**

Now a days there are number of Physics, Chemistry, Biology, Biochemistry etc. peoples or researchers are working in the field of nanoscience, nanotechnology and its allied subjects. These subjects / fields are studied under the umbrella of core subject known as Material Science.

In case of Material Science, mainly physical and chemical properties were studied and tried to make the utilization for different applications in the form of devices. However, the properties are depends on the growth of crystal system. The growth will be in 1D (dimensional), 2D and 3D systems, the nanostructures are more significant in 1D and 2D than 3D. The desired growth is based on the method of synthesis [1,2] Synthetic methods are also important as per as quality and quantity is concern. For example the synthesis of polyaniline nanostructures is possible by *in situ* as well as by electro polymerization. Electro polymerization is more convenient for good quality polyaniline nanostructures but its disadvantage is the formation in less quantity so that characterization is difficult. By *in situ* polymerization the quantity is more but quality is poor hence it is conflict for synthesis. The next unresolvable obstacle for the Material Scientist is it's the method of characterization applied for the same at ordinary laboratory. The characterization by scientific techniques needs highly sophisticated, costly instruments and also difficult to make accessible for the newly incoming motivated researchers [3].

Herewith, we have discussed about the simple and easy methods of characterization which is accessible at ordinary laboratory.

**Materials and Methods****Synthesis of vanadium pentaoxides:**

The ammonium metavanadate ( $\text{NH}_4\text{VO}_3$ ) is oxidized by  $\text{H}_2\text{O}_2$  (Hydrogen peroxide). The known amount of ammonium metavanadate is taken in dry and clean glass beaker. The 18%  $\text{H}_2\text{O}_2$  is sprayed on ammonium metavanadate, the bumping of ammonium metavanadate is occurs and yellow suspension is formed. The suspension is filtered by suction pump and dried at  $90^\circ\text{C}$  heating furnace. The yellow dry powder is characterized by using glass slide and by water in glass test tube.

**Characterization by water in Test Tube:** 10 mg of yellowish powder is transfer in a minimum amount of water in a clean and dried beaker. The suspension was stirred on magnetic stirrer for 30 minutes at room temperature by the rate of 100 rpm. The same was transfer in a test tube of 15 ml and kept tightly in a test tube stand.

**Characterization by glass slide:** Minimum amount of yellowish powder is sprayed on a glass slide and glass slide tilt speedily in the air.

**Characterization by FESEM:** The yellowish powder was characterized by Field Emission Scanning Electron Microscope (FESEM).

### Results and Discussion



Figure 1: FESEM image of nanomaterials

As synthesized product is characterized by ordinary laboratory techniques. It is found that the yellowish powder which is suspended in the water filled in test tube, if test tube kept vertically and tightly without disturbances, if powder is not settled at the bottom of the test tube after a long period, it is likely to be indication of formation of nanomaterials. Further it is confirmed by the FESEM image shown in the Figure 1. As synthesized product is also characterized by glass slide. It is found that the yellowish powder which is not removed from the glass slide and strongly adsorbed demonstrated the powder is in the nanosizes. By the way, this it is not possible to represent the structure and growth of nanomaterials [4, 5].

### Conclusion

It is concluded that, the characterization of nanomaterials by scientific techniques is difficult to new researchers. The methods which are herewith presented are suitable for the same. It is crude technique but useful for the new researchers in the field of Physics and Chemistry ultimately in the Material Science. This opens new avenue for the nanoscience and nanotechnology.

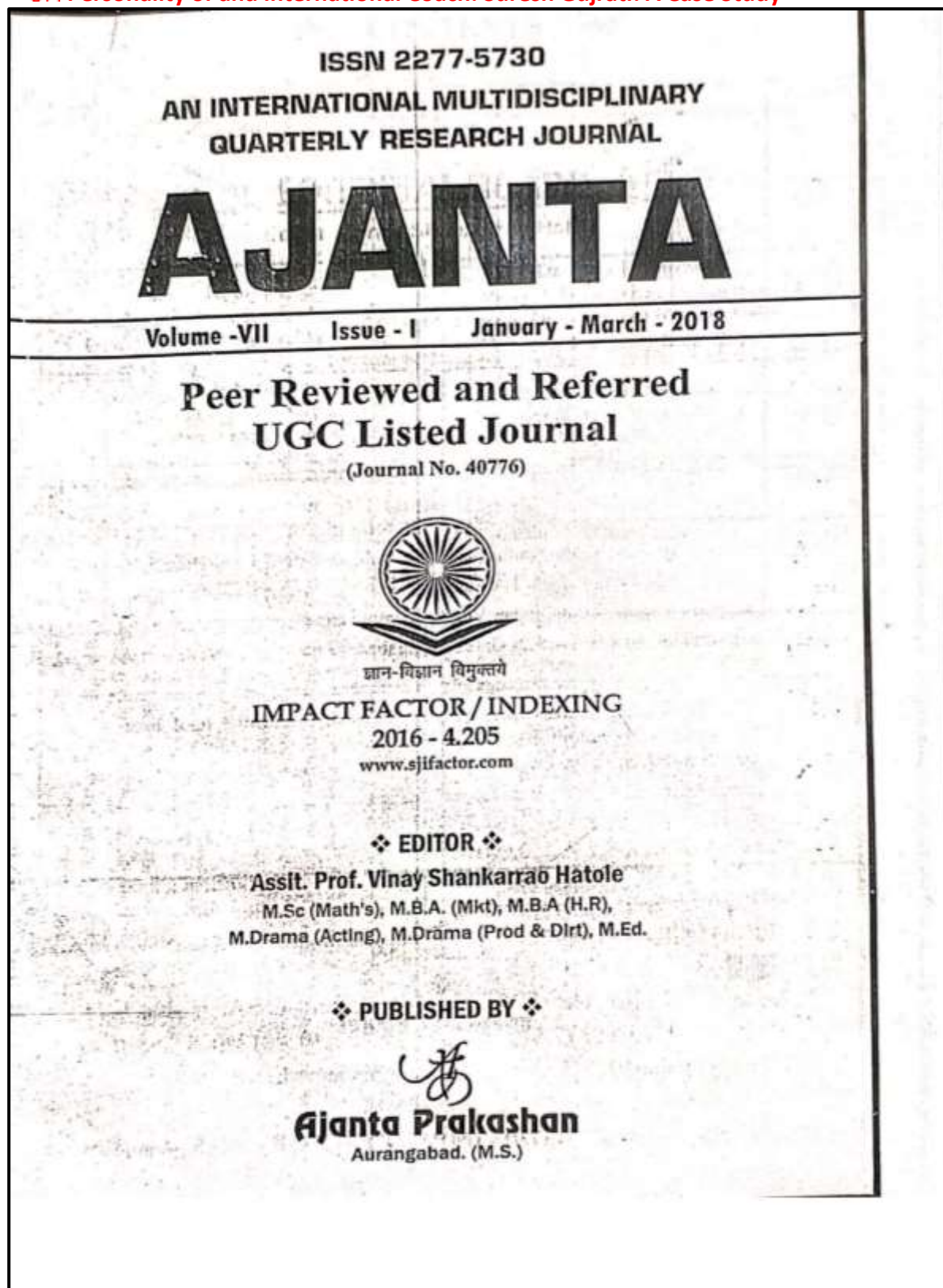
### Acknowledgements

This work was financed by the University Grants Commission, New Delhi, India under Major Research Project Scheme (File No. 43/408/2014 (SR)).

### References:

1. Melissa J. Clague, and Alison Butler On The Mechanism of *cis*-Dioxovanadium(V)-Catalyzed Oxidation of Bromide by Hydrogen Peroxide: Evidence for a Reactive, Binuclear Vanadium(V) PeroxoComplex, *J. Am. Chem. Soc.*, 1995, 117, 12, 3475-3484
2. N. Anicic, M. Vukomanovic and D. Suvorov Design of a multifunctional vanadium pentoxide/polymer biocomposite for implant-coating applications *RSC Adv.*, 2017, 7, 38647
3. Bing-guo LIU Jin-hui PENG Run-dong WAN Li-bo ZHANG, Sheng-hui GUO Shi-ming ZHANG, Optimization of preparing  $V_2O_5$  by calcination from ammonium met vanadate using response surface methodology, *Transactions of Nonferrous Metals Society of China*, 21, 3, 2011, 673-678
4. Rahul S. Diggikar, Dattatray J. Late, Bharat B. Kale, Unusual morphologies of reduced graphene oxide and polyaniline nanofibers-reduced graphene oxide composites for high performance supercapacitor applications, *RSC Advances*, 4, 43, 2014, 22551-22560
5. Rahul S. Diggikar, Milind V. Kulkarni, Girish M. Kale and Bharat B. Kale, Formation of multifunctional nanocomposites with ultrathin layers of polyaniline (PANI) on silver vanadium oxide (SVO) nanospheres by in situ polymerization, *J. Mater. Chem. A*, 2013, 1, 3992

## 67. Personality of and international Coach: Suresh Gujrati: A Case Study



Sr. No.	Name & Author Name	Page No.
38	उत्तम आरोग्यासाठी योगा प्रा. गोरडे राजाराम किसनराव	187-188
39	Development of Norms for Selection of Senior Volleyball Players in Maharashtra Rahul R. Bhosale	189-191
40	Goods Services Tax and Sport D. S. Viegas	192-195
41	Relevance of Women Participation in Sports and Empowerment Dr.Santosh S. Bhujbal	196-198
42	Sport and Society Rahul R. Bhosale	199-202
43	India at the Commonwealth Games D. S. Viegas	203-205
44	Personality of an International Coach Suresh Gujrathi: A Case Study Dr. A. V. Thoke Sanjay M. Gaikwad	206-211

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

## 44. Personality of an International Coach Suresh Gujrathi: A Case Study

Dr. A. V. Thoke

Research Guide, Arts, Commerce & Science College, Deolali, Nashik.

Sanjay M. Gaikwad

Dir. of Phy.Edu. & Sports, New Arts Commerce & Science College, Parner Dist- Ahmednagar.

### Introduction

A sport is an integral part in our day to day life. To excel in sports at all level one needs to work hard. Scientific approach and innovative inventions in sports has made competitions tougher. If a nation desires to excel in the field of sports, there is no shortcut to achieve it. Sports not only help in keeping us healthy, but also help in making our country more productive. A sport is the medium through which we can get people together and developed understanding and coordination among them. It also helps in developing discipline in every individual. It also helps in developing physical and mental health. Like team spirit, confidence, decision making etc.

In developing Sports a coach plays an important role in developing the game. It is very important for a coach to have knowledge of the game. Sound knowledge, technique and tactics of the game help in getting out the best from the players. A good coach makes things easy for the player. Coaching also includes motivating the players. A good coach is a person who understands the strength and weaknesses of his team and the opponent. A good coach is also a good leader, who has sound knowledge and understanding of the game. A communication skill is a basic necessity for coach that would help him to express his ideas and thoughts to his players. A coach is also is good at analyzing the game, during and after the game. Coach plays many roles, a friend, mentor, motivator, counselor, planner etc. Good bonding between the players and coach helps in giving good results on the field.

Suresh Gujrathi was such an international coach who coached Indian athletic team for the Asian athletic at Manila in 1973, Asian Games at Tehran in 1974, Second Asian Athletic meet held at Seoul 1975 and Montreal Olympics in 1976. On his account having twenty four national champions, five Arjuna Awardees, two Padmashree Awardees, one Dronacharya Awardee and he

NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

himself recipient of prestigious coach award from Government of Maharashtra 'Dadoji Kond Award' in 2000-01 for his contributions towards the field of athletics was selected as a subject of study. Suresh Gujrathi his family members, friends, fellow coaches, trainee athletes, photographs, certificates and published materials related to his athletic coaching career were studied to make the study more meaningful.

#### **Key words**

**Personality** – Qualities that form an individual's distinctive character

**Case study** – The case study gathers a large amount of information about one or a few participants. The study consisted of a rigorous, detailed examination of a single case.

**Coach:** Coach enables the athlete/ trainee to achieve higher levels of performance to a degree that may not have been possible if left to his/her own endeavours

**Contribution:** Specific efforts or specific work done or the part played by the person bringing about a result or helping something to advance.

#### **Methodology**

Case study method was used to conduct the study, which comes under Descriptive method. It is an individual case study, in which Suresh Gujrathi is a case.

#### **Tool used for the study as follows**

##### **16 - Personality Factors Test**

Raymond B. Cattell's sixteen source traits were used for the study. The Sixteen personal factors of Suresh Gujrathi were studied.

The personality of Suresh Gujrathi was studied with help of the 16 personality test. It was not only the subject's physical ability but also the mind that played a vital role in shaping the subject into a fine athlete and an international coach.

The personality factors dealt with the five global factors and their primary factors which were as follows,



NATIONAL CONFERENCE - 2018

AJANTA - ISSN 2277 - 5730 - IMPACT FACTOR - 4.205 (www.sjifactor.com)

- He was emotionally stable person would be calm during tension situations.
- He was vigilant and made sure his athlete did what he wanted or that was good for them
- He was had a positive attitude and was satisfied with whatever the outcome was.
- In tense moments he was relaxed and mentally stable.

Seeing to the 16 Personality factors of Suresh Gujrathi it is observed that he is an easy going person self-reliant flexible and group oriented person. He is generally a relaxed and well organized person. He is also moralistic, resourceful and emotionally stable person.

#### Conclusions

The following conclusions may be drawn from the data that was collected from Suresh Gujrathi, his family, friends, and trainee athletes.

- His pleasant nature helped to interact with athletes.
- The physical personality of Suresh Gujrathi impressed the athletes to work hard and to fit.
- Coaches need talent to identify good players and guide them.
- Coaches need to sacrifice many things in life to produce national and international level players.
- Renowned coaches need to felicitate for their contributions to sports.
- Coaches need to update to the latest training methods used to coach the sportsmen.
- Coaches need to innovative in their training methods given to their players.
- Coaches need to share a healthy bonding with their players.
- Heavy incentives need to be given to keep them motivated.

#### References

1. Best, John W. and Kahn James V, (2006). *Research in Education*, 9th edition, Pearson Education, Dorling Kindersley Publication Inc.
2. A. K. Uppal, Vivekananda. Dey, (2006). *A-Z Athletics*. Friends Publication.
3. Chris Oxlade and David Ballheimer, (1999). *Olympics*, Dorling Kindersley.
4. Saradindu Sanyal, (1970). *Olympic Games and India*, Metropolitan Book co.
5. W. H. Freeman, (1974). *A Biographical study of William Jay Bower man*. Complete Research in Health, Physical Education and Recreation.
6. Ajit Singh, (2007). *A Case study of Mr. Ranveer Singh, The Arjuna Awardee in Volleyball*. Unpublished Master's Degree Dissertation, University of Pune.
7. Gauresh Naik, (2007). *A Case study on Shri Bruno Coutinho, Arjun Awardee and International Footballer*. Unpublished Degree Dissertation, University of Pune.