



Est. 1967

Shri Balaji Sansthan, Deulgaon Raja's

SHRI VYANKATESH ARTS, COMMERCE & SCIENCE COLLEGE

DEULGAON RAJA, DIST. BULDANA (M.S.) - 443 204
(Affiliated to Sant Gadge Baba Amravati University, Amravati)



SELF STUDY REPORT

Criteria-III Research Innovation and Extension

3.3 Research Publication and Awards

**3.3.1 Number of research papers published per teacher
in the Journals notified on the UGC care list during the
last five years**



Shri Balaji Sansthan Deulgaon Raja's

SHRI VYANKATESH ARTS, COMMERCE & SCIENCE COLLEGE

Deulgaon Raja - 443 204, Dist. Buldana (M.S.)

NAAC RE-ACCREDITED AT 'B' LEVEL

▪ Affiliated to SGBAU, Amravati ▪ College Code No. 309 ▪ UGC Recog. U/S 2 (F) & 12 (B)

Outward No. SVC / IQAC / 2024

Date: 02 /05/2024

Declaration

This is to declare that the supporting documents provided in this file, including information, reports, numerical data, true copies, etc., have been verified by the Internal Quality Assurance Cell and the Head of the Institution. It is confirmed to be accurate and authentic.

Dr. E. B. Bhalerao

Coordinator, IQAC
Shri Vyankatesh Arts, Commerce &
Science College, Deulgaon Raja
Dist. Buldhana-443204 (MS)

Dr. D. V. Gore

PRINCIPAL
Shri Vyankatesh Arts, Comm. &
Science College, Deulgaon Raja
Dist. Buldana Pin - 443 204



Index

Shri Vyankatesh Art's, Commerce & Science College, Deulgaon Raja. Research Papers Published During the Year- 2021.

5	Title of the Paper	Name of the Author/s	Dept. Of the Teacher	Name of the Journal	Page No.
1.	Creative Innovation and Social Entrepreneurship in Factor Driven Economies in Asia.	Dr. Dnyaneshwar V. Gore	Economics	Printing Area March, 2021 (Issue 74, Vol. 04)	1
2.	Histopathological Study of Lytocestus Species Infection in Host Intestine Clarias Batrachus (L) From Kham River, Aurangabad (M.S) India	R.R. Khawal	Zoology	International Journal for Innovative Research in Multidisciplinary Field	5
3.	On A New Cestode of Moniezia (Cestoda-Anoplocephalidae) From The Intestine of Capra Hircus (L.) From Ghansavangi, District Jalna (M.S.)	R.R. Khawal	Zoology	International Journal for Innovative Research in Multidisciplinary Field	8
4.	Biochemical Profile and Inhibitory Effect of Haliclona permollis (Bowerbank, 1866) Marine Sponge of Ratnagiri, West Coast of India	R.R. Khawal	Zoology	International Journal for Innovative Research in Multidisciplinary Field	12
5.	Analysis of Chemical parameters of freshwater bodies of Kajali river Ratnagiri, India.	Tandale Mahesh	Zoology	Int. J. of Life Sciences	20
6.	Morphological And Electrical Properties of Spray Deposited CdSe _{0.3} Te _{0.7} Thin Film page no. 473-476	Arvind D. Kanwate, Dr. E. U. Masumdar	Physics	Journal of the Maharaja Sayajirao University of Baroda	25
7.	Characterizations of Spray Deposited CdTe Thin Film page no. 83-90	Arvind D. Kanwate, E. U. Masumdar, V.R. Panse, Mikael Syvajarvi, Manmeet Kaur	Physics	YMER http://ymerdigital.com	28
8.	Synthesis of (±)-Baclofen	Deekshaputra	Chemistry	Journal of	34

	using Witting Olefination-Claisen Rearrangement	Ramrao Birhade Rohit Gulab Shinde Milind Dhondiba Nikalje.		Applied Organometallic Chemistry	
9.	Lectotypification of six names in the genus Sida (Malvaceae)	Nimbalkar V. V. Tambde G. M. Sardesai M. M.	Botany	Rheedea	39
10.	The Use of ICT in Political Science Teaching	Dr.A.M. Awati	Political Science	Research Journey	44
11.	भारत आणि चीन संबंध	Dr.A.M. Awati	Political	B. Aadhar	50
12.	Optimization of media composition and physicochemical conditions for maximum phenazine-1- carboxylic acid (PCA) production by Pseudomonas RSML35	P.B.Pawar D.V.Vedpathak S.M.Inchure	Microbiology	Bioinfolet	59
13.	Isolation and biochemical characterization of Xanthomonas axonopodis pv. Punicae causing bacterial blight of pomegranate.	P. B. Pawar Dr. V. Vedpathak S. M. Inchure	Microbiology	Bioinfolet	61
14.	William Wells Brown's Escape or A Leap For Freedom: The First Published African American Play	Dr. E. B. Bhalerao	English	Research Hub	63
15.	गिरोली बू. येथील शेतकऱ्यांच्या आर्थिक स्थितिचे अध्ययन	Dr. N. H. Shegokar	Commerce	SJIF	67
16.	"Bahinabai Chaudhari Yanchya Kavitetil Stree Jeevan'	Madhukar Balasaheb Jadhao	Marathi	Power Of Knowledge Special Issue IV	72
17.	"Marathichya Adhyayan- Adhyapan Prakriyet Mahiti TantradnyanachiUpayuktataV a Mahatva	Madhukar Balasaheb Jadhao	Marathi	Research Journey	74
18.	"Vartaman Kalat Santanchya Vichar Karyachi Upayogita	Madhukar Balasaheb Jadhao	Marathi	"Shodh-Rityu An International Multidisciplinary Research Journal	78
19.	"Lokakavi Wamandada Kardak Yanchya Kavitetil Samajikata	Madhukar Balasaheb Jadhao	Marathi	"TIFAN Lokakavi Wamandada Kardak Visheshank (Part- 3)	81
20.	" Socio-Cultural Aspects with Special Reference to Raja	Dr. Jyoti D. Dhokale	English	International Journal of	84

	Rao's Kanthapura			humanities, Law and Social Sciences .	
21.	Anti Plagiarism Tools : a review	Dr. Umesh B.Deshmukh	Librarian	International Journal of Scientific Research in Multidisciplinary Studies	89
22.	Importance of rural public library in their service to rural population: a study of Maharashtra state	Dr. Umesh B. Deshmukh	Librarian	International journal of scientific research in science and technology .	96
23.	Investigation of phyllospheric mycoflora of Tomato from western Vidarbha Maharashtra 199 - 206	Dr. Rameshwar Y Mane	Botany	IJSRST	101
24.	Investigation of phyllospheric mycoflora of chili from western Vidarbha Maharashtra 414 - 420	Dr. Rameshwar Y Mane	Botany	IJSRST	109

ISSN: 2394 5303

Impact Factor 7.891(1111)

Printing Area® Peer-Reviewed International Journal

March 2021

Issue-74, Vol-04

041

06

CREATIVE INNOVATION AND SOCIAL ENTREPRENEURSHIP IN FACTOR DRIVEN ECONOMIES IN ASIA

Dr. Dnyaneshwar Vishnu Gore
Associate Professor & Head,
Department of Economics,
Shri Vyankatesh College Arts, Commerce &
Science College, Deulgaon Raja,
Dist. Buldana (MS)

Dr. Sandip Bhaskarrao Jagtap
Associate Professor, Department of Commerce,
Shri Vyankatesh College Arts, Commerce &
Science College, Deulgaon Raja,
Dist. Buldana (MS)

Introduction:

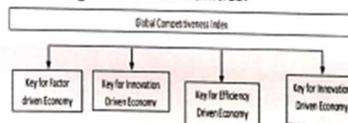
Entrepreneurs with innovative solutions to society's problems are ambitious, persistent, tackle major social issues and offer new ideas for wide scale change, find what is not working and persuade entire society to take a leap. Social entrepreneurs organize local people that will standup, siez idea & act as change agent for betterment of society. (HH Stevenson 2000) They are of opinion to take up the societal needs themselves rather than leaving it to government or business sectors. Social Entrepreneurs are visionaries and ultimate realists, concerned with practical implementations they present ideas which are user friendly, understandable ethical and engage in widespread support. Social entrepreneurs act as change agent of society for better.

Social Entrepreneurship:

It is all about indentifying and recognizing a social problem, here the expertise and skill of an entrepreneur help him move ahead using

entrepreneurial principles to organize try to create, manage a social venture to achieve a long time desired social change envisioned by him.(Aldrich H.,1992) There is another angle to this very interesting situation business entrepreneurship who take up this noble task measure performance in profit and return. One can through social entrepreneurship further broad social, cultural and environmental goals because it is associated with voluntary or no profit sectors.

Noble Laureate Mohammed Yunus a social entrepreneur and founder of Gramin Bank and its growing family of social venture business are a role model for a developing economy like Bangladesh where social entrepreneurs have a lot of gaps to exploit left by relatively small state, similarly you find some of the European and south American countries where social entrepreneurs closely knitted with public organizations at both national and local level, here youth can also contribute in similar fashion where you find youth social pioneers (Australia) an initiative to strengthen support and celebrate role of young people in creating positive change in the communities.



Basic Requirements Sub Index	Efficiency Sub Index	Entrances sub Index	Innovation & Sophistic Factors sub Index
Pillar 1: Institutions	Pillar 5 : Higher Education and Training	Pillar 11: Business	
Pillar 2: Infrastructure	Pillar 6 : Goods Market Efficiency	Pillar 12: Innovation	
Pillar 3 : Macro Economic Environment	Pillar 7 : Labor Market Efficiency		
Pillar 4 : health & Primary Education	Pillar 8 : Financial Market Development		
	Pillar 9 : Technological Readiness		
	Pillar 10: Market Size		

Factor Driven Economies & Global Competitiveness:

Going back 10 years from the global financial crises the prospectus for a sustained

Printing Area : Interdisciplinary Multilingual Refereed Journal



ISSN: 2394 5303 | Impact Factor 7.891 (IIJIF) | *Printing Area*[®] | Peer-Reviewed International Journal | March 2021 | Issue-74, Vol-04 | 042

economic recovery remain at risk due to wide-spread failures on the part of leaders and it is here the policy makers try to put in place reforms necessary to underpin competitiveness and bring about much needed increase in productivity (Global Competitiveness report 2017-18) it is a time when global economy is showing signs of recovery with GDP growth at 3.5% in 2017. (Klaus Schwab, Xavier Sala-i-Martin, 2017) Study have found to have high level of uncertainty with the perception that current approach do not serve people and societies well enough is gaining ground, prompting call for new models of human centric economic progress. Ensuring future economic growth will require solutions that are more creative than any way have seen so far. The world economic forum seek to provide guidance, inform future oriented solutions, identifying areas of improvement and are as where economies are lagging infact it is barrier to growth facing the economies.

India is one of the fastest growing economy in Asia the classification of global competitiveness index show that India is one the verge of transforming itself from the basic requirement of factor driven economy to efficiency driven economy. The factors of developing nations population poverty & unemployment supplemented by the basic facilities required is not upto the mark. The factor driven economy includes four pillars institutions, Infrastructure, Microeconomic environment, health and primary education for which an effort is extraordinarily done but in the end it is short of the requirement hence a bottleneck to move to efficiency driven economy. The fact that development is always all round can not be denied and hence the factors for efficiency are also catered to by a developing country like India. (UNDESA 2015) The expectation to be called efficiency driven economy lies in the fact that along with basic needs market for goods and labor, Technological readiness, Higher Education and Training with financial market development is the need

which is being taken care of by India but cannot go to higher scale as the efficiency demands more of manufacturing with greater technological use which India in comparison to china have not been able to achieve.

Make in India drive will bring fruits in future and so manufacturing sectors contribution to gross domestic product (GDP) to 25% is predicted by 2022 from 16% in 2016-17. (Anant Geete, 2016) India's manufacturing sector is in trouble for the last many years and in the era of Globalization competing in international markets has become a challenge for the country's private as well as state owned firms, the reason is first compete with China and then compete globally. Stability of manufacturing industry is prime and the fact cannot be denied that micro, small & medium enterprises are the backbone of manufacturing sector in any country. Their survival will always boost the manufacturing industry and higher contribution to economy.

The problem in India is that in the last four years number of sick MSME's have doubled from 2,22,204 sick units in 2012-13 to 4,86,291 sick units in the year 2016. (M. Ramesh, 2017) According to ministry of Micro small & medium enterprises. There are 3.6 crore MSME's which provide employment to 80 million people in India. They produce 6000 products which account for 8% of the GDP and 45% of the total manufacturing output in India. The MSMEs are having great potential as they contribute to 40% of exports in India. (S. Swaminathan, 2018) If manufacturing and other efficiency enhancer factors are not catered to properly it may lead to problems in the basic provision of amenities by the government which is a peculiar characteristics of any developing country across the world.

What is the feasible solution?
Social Entrepreneurship is the answer to fill the gap between the basic requirements and efficiency enhancer factors.

I. Focus on Social Entrepreneurship Policy of Scale up & Not Start up :

Printing Area : Interdisciplinary Multilingual Refereed Journal





ISSN: 2394 5303	Impact Factor 7.891	<i>Printing Area</i> [®] Peer-Reviewed International Journal	March 2021 Issue-74, Vol-04	044
-----------------	---------------------	--	--------------------------------	-----

Wonder what social entrepreneur can do if they identify the problem and come out with viable, feasible & Economical solution, Neha Juneja (CEO, Greenway, Grameen Infra) along with Satvik Upadyaya (Co-Founder) travelled in India separately to study factors effecting common man. Little was happening to improve the quality of common man joined by the third person Shoeb Kazi in 2011 launched their own product. (Sonal Khetarpal, 2017), What stayed with them from their travel was the sighting women using mud Stoves in villages and smoke emanating from every household. Every year it kills over 4.3 million people globally which is higher than Malaria, HIV and Tuberculosis combined. Rural India must convert to cooking gas and there has to be healthier alternative. How much difficult it is to be build efficient burning device? The company designed smart stove which burns with biomass that is mixture of plant and plant based material, the specialty is incredible efficiency to such an extent that smoke emission is 80% less and the overall consumption of energy is 65% less.

Innovators all over the world are interested in smart stoves. Which is purely a rural based product and can be handled easily in other words it has easy approach. Neha Juneja a Social entrepreneurs have been able to combine her passion with talent in making the product design of Smart Stoves which prices in between a mere 25\$ to 50\$ i.e. RS. 1800 to Rs. 3000. Greenway Grameen Infra have already sold a Million Biomass stoves made of Steel and aluminum.

Conclusion:
The Emerging consensus is that economic growth once again needs to focus more on human well being; such human centric economic progress is multidimensional by nature it is broad based by benefiting the vast majority of people, environmentally sustainable and equitable in terms of creating opportunities for all and not disadvantaging future generations. The challenge before developing countries like India which is placed 40th in Global competitive Index with an average score of 4.59 is down one spot from world ranking last year of 39 and is still placed in factor driven economy and is on the verge of moving to efficiency driven economy expose the gaps in many sectors of economy where considerable effort is necessary the solution of filling the gap can be done by social entrepreneurs who can take up the problems and find out viable alternative solutions themselves with two fold effect of benefiting the society at large and also earning profit from social venture. Social entrepreneurs like Gyanesh Pandey & Ratnesh Yadav were successful in solving problem of Electricity for more than 350 villages in Bihar State of India an Neha Juneja finding solution to 4.5 Million deaths due to smoke while cooking by brining out smart stove for cooking, using biomass. Innovation is the need of the hour for Developing Countries where in social entrepreneurs can come forward to take up challenge instead of leaving it to government.

References :

1. HH Stevenson (2000) why entrepreneurship has won, Harvard, Business Review, Boston, MA
2. World Economic Forum, Executive Opinion Survey 2016-17, weighted average.
3. United Nations, Department of Economic & Social Affairs (UNDESA) 2015.
4. Sonal Khetarpal, (2017), Business Today, A Green Chulha for Rural India, New Delhi.
5. Ritu Jaiswal, (2011), VIT Business School Inspiring India, Gyanesh Pandey, Lights up Bihar Villages using Rice Husk, 3 June Volume, 2 Issue 22, Mumbai.
6. Klaus Schwab, Xavier Sala-i-Martin (2017), Global Competitiveness Report 2017-18, World Economic Forum, Geneva, ISBN 13 978-1-944835-11-8, Switzerland.
7. M. Ramesh, (2017) Number of Sick MSME's Doubled in Four years, Business line.

♣ Printing Area : Interdisciplinary Multilingual Refereed Journal ♣



A Two-Day International (Web) Conference
New Vistas in Aquatic & Terrestrial Biology and Environment
During Current Pandemic (ATBE-2021)
26 & 27 March, 2021

Department of Zoology R.S.S.P. Mandal's Nanasaheb Y. N. Chavan Arts, Science and Commerce College Chalisgaon,
Dist. Jalgaon (M.S.) India.

Histopathological Study Of *Lytocestus* Species Infection In Host Intestine
***Clarias Batrachus* (L) From Kham River, Aurangabad (M.S) India**

Rahul Khawal¹, Arun Gaware², Sunita Borde³ and Vijay Lakwal⁴.

¹Department of Zoology, Shri Vyankatesh Art's Com. & Science College, Deulgaon Raja,
Dist. Buldana (M.S.) India.

²Department of Zoology, Shri Shivaji Art's Com. & Science College, Motla, Dist. Buldana (M.S.) India.

³Department of Zoology, Dr.B.A.M. University Aurangabad (M.S.) India.

⁴PG Department of Zoology, Nanasaheb Y.N. Chavan ASC College Chalisgaon, Jalgaon, (M.S.) India
Email - ¹rahulkhawal@gmail.com

Abstract: In the present investigation occurrence and pathological changes caused by cestode parasites *Lytocestus* Species in the intestine of fresh water fishes, *Clarias batrachus* (Linn.) from Kham river, Aurangabad (M.S) India are studied. The worm *Lytocestus* Sp. attached to the intestine of host *Clarias batrachus*. In T.S. of intestine of *Clarias batrachus* it has been observed that the cestode attached to the intestinal layer and slowly damaged the host intestinal villi, invaded deep and sucking the content in the region of villi.

Keywords: *Clarias batrachus*, Histology, Kham River, *Lytocestus*.

1. INTRODUCTION:

The term 'host-parasites relationship' correctly designates an intimate interaction, between two or more distinct organisms, in which the one benefits while causing damage to the others. The study of parasites and parasitism is without an end. One could go on and on like this as the various aspects are not only important but quite interesting too. What about the host-parasites and parasites-parasites relationship as also the relationship between the definitive and intermediate hosts of the parasites.

The Caryophyllidean cestodes produce disease to the fishes by inducing mild irritation, inflammation between the folds, thinning of intestinal walls and sometimes death resulting from dysfunctioning of intestinal mucosa. The other remarkable feature of the Caryophyllidean cestodes is the presence of prominent secretory glands which are used by the parasites for establishment. The structure and function of scolex glands in different species of Caryophyllidean cestodes were studied in detail by Hayunga (1979) and Hayunga and Mackiewicz (1988). They reported that the scolex glands were more developed in those species, which lack attachment organs and suggested that the secretion of the glands was used by the parasite to adhere to the host intestine.

The host parasite relationship has studied by Mitra and Shinde, 1980 of *Amoebotaenia indiana* and *Hymenolepis nana* by Bailey, 1951. The establishment and distribution of *Raillietina cesticillas* in the fowl was by Foster and Daugherty, 1959, cestode relationship of hill stream, fishes was observed by Chauhan and Malhotra, 1981. Host various parasite responses were described Mitchell, 1981. Histopathological changes were also observed *Moniezia* from *Capra hircus* (L.) by Nanware and Jadhav, 2005, *Circumcobotrium* and *Senga* from *Mastomys natalensis* by Fartade Asawari and Sunita Borde, 2011 and Marine Cestode from marine fish by Anarse Sandeep and Borde Sunita, 2012. Noteworthy work was carried out on histopathological changes caused by cestode parasites by Mackiewicz *et al.*, 1972, Molnar *et al.*, 2003, Rubela *et al.*, 2006, Williams, 2007, Jadhav *et al.*, 2012, and Laxma Reddy and Benarjee, 2014.

The foregoing literature survey clearly reveals that Caryophyllidean parasites cause considerable damage and therefore great economic losses to the fishermen. Thus, these groups of parasites require attention of parasitologists to develop an integrated control programme.

The present communication deals with the study of histopathology of *Lytocestus* species infection in host intestine *Clarias batrachus* from Kham River, Aurangabad (M.S) India.

2. MATERIAL AND METHODS:

For the histopathological study, intestines of fishes were dissected to observe the rate of infection. Some fishes were found to be infected and some non-infected. Both infected and non-infected hosts intestine were dissected and



fixed in Bouin's fluid to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in xylene and embedded in paraffin wax (58-62°C).

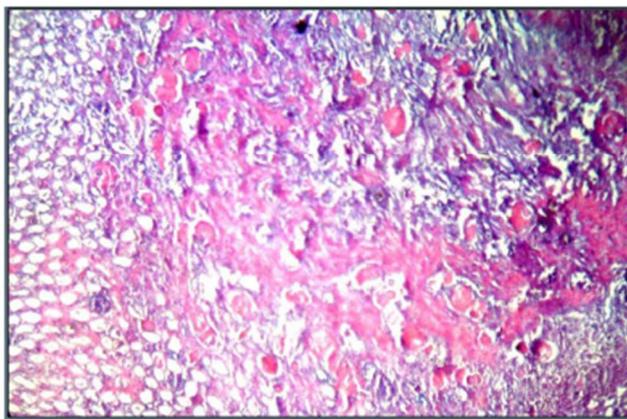
The blocks were cut at 7µ and slides were stained in Eosin haematoxylin double staining method. Best slides or sections were selected and observed under the microscope.

3. RESULT AND DISCUSSION:

From the present communication the results indicate that some of the intestines were found to be infected with cestode parasite. In T.S. of non-infected intestine of *Clarias batrachus* (L.) it has been observed normal intestinal villi and other layers of intestine. In T.S. of infected intestine of *Clarias batrachus* (L.) has been observed that the cestode attached to the mucosal, sub-mucosal and muscularis mucosa of intestine and slowly damaged the hosts intestinal villi, invaded deep and forming the cyst like structure for sucking the content from the region of the intestine. Healthy intestine showed, healthy villi and all layers are clearly observed, whereas infected intestine has been observed that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

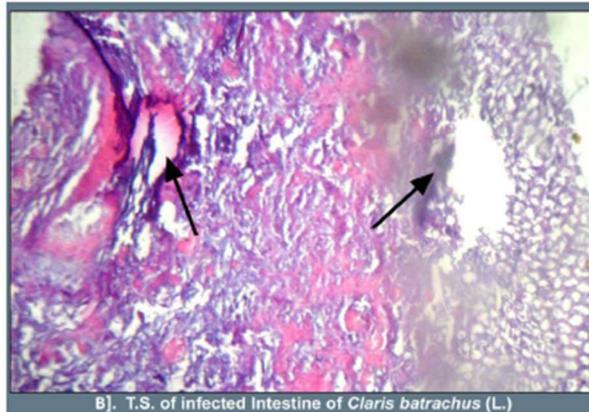
The worm *Lyocestus* Sp. attached to the intestine of host *Clarias batrachus*. In T.S. of intestine of *Clarias batrachus* it has been observed that the cestode attached to the intestinal layer and slowly damaged the hosts intestinal villi, invaded deep and sucking the content in the region of villi.

In the present study case the damage of *Lyocestus* sp. observed is similar to the damage reported by Satpute and Agrawal (1974) and A. S. Raipalli and A. L. Deshmukh (2018). However, the helminths crosses majority of the intestinal layers (internal epithelium, submucosa, muscularis layer) and come to lie near serosa suggesting that, it is very dangerous and destructive parasites to the definitive host (C. J. Hiware, 2008). The worm is not only successful to enter into the intestine forming the ulceration in the intestinal wall causing damage to the host tissue but the parasite may affect host physiology in many ways that induce stress in the host. The parasitic infection in turn disturbs the metabolic pathways (Esch GW et al., 1977). The intestinal cells of the host become stretched and distorted causing mechanical obstruction of the lumen of fish intestine (Bauer., 1968; Ahmad and Sanahullah, 1979; Scott and Grizzle, 1979). During heavy infection, the intestine gets blocked causing death of the host (Bauer et. al., 1981). In some cases, high number of parasites reduces the diameter of the lumen by more than 50% which affects the movement of the food through the intestine (Shostak and Dick, 1986). Marty, G. (2008) reported the Atlantic salmon (*Salmo salar*) had ananisakid larva partly embedded in the wall of an intestinal caecum.



A]. T.S. of non-infected Intestine of *Clarias batrachus* (L.)





B]. T.S. of infected Intestine of *Claris batrachus* (L.)

4. CONCLUSION:

From the above histopathological discussion it can be concluded that helminth parasites like *Lyoceus* Sp. finds the nutritive material from the intestine of hosts *Clarias batrachus* (L.) which is essential for their nourishment and growth. While taking nourishment parasites invade host tissue resulting tissue damage causing mechanical injury to the host at the attachment site.

REFERENCES:

1. Ahmed A.T. and Sanatullah M., (1975): Pathological observation of the intestinal lesions induced by cartophyllaeid cestodes in *Clarias batrachus* (Linnaeus), (Siluriformes: Clariidae) Fish path, 14, 1-7
2. Ahmed, A.T.A., and M. Sanatullah. (1979): Pathological observations of the intestinal lesions induced by caryophyllid cestodes in *Clarias batrachus* (Linnaeus) (Siluriformes: Clariidae). Fish Pathol. 14: 1-7.
3. Bailey, W. S (1951), Host tissue reactions to initial superimposed infection with *Hymenolepis nanavar*. *Fraema. J. Parasitology*, 37: 440 - 444
4. Bauer, O.N. (1968): Contiol of caip diseases in the USSR, FAO. Fish. Rep. 44:344-352.
5. Bauer, O.N., Egusa, S. and Hoffmann, G.L. (1981): Parasitic infections of economic importance in fishes. In: Review of advances in Parasitology. (Proc.4th Int. Cong. Parasitol. (ICOPA IV), Warsaw, 09 - 26 Aug. 1978). (Ed. Slusarski, W.J)
6. C.J. Hiware *et al*, (2008): Studies on Histopathology of *Clarias batrachus* (Linnaeus) intestine Parasited by Cestode, *Lyoceus clariasae* Jadhav and Gahvane, 1991 Journal of Yala Rajabhat University
7. Chauhan, R. S., Malhotra, S. K. and Kapoor, V. N. (1981): An analysis of parasitization index and certain ecological parameters of cestode parasites infecting in hill stream fishes of district Pauri- Garahwal, U. P. India.
8. Coleman R.M. and D.E. SA, L.M., (1962): Host response to implanted adult *Hymenolepis nana*, J. Parasit, 50 (Suppl.), 17.
9. ESCH, G.W. (1977): Regulation of parasite population. Academic press, INC, New York. 253.
10. Foresk Z. and Rukavina J., (1959): Experimental immunization of dogs against *Echinoccus granulosus*. I. First observation, Veterinaria, Saraj., 8, 479-482
11. Foster and Daughtery, (1959): Establishment and distribution of *Raillietina cesticillus* in the fowl and comparative studies on amino acid metabolism of *R. cesticillus* and *Hymenolepis diminua*. Experimental parasitology. 8(4):413-426.
12. Gopal Krishnana V., (1968): Diseases and parasites of fishes in warm water ponds in Asia and Far East, fisheries. Report. FAO-UN 445, 319-343. (Proceedings of the Foto world symposium on warm water ponds in Asia and the far East, fisheries. Report. FAO-UN 445, 319-343, (Proceedings of the Foto world symposium on warm water pond fish culture)
13. Haque M and Siddiqui A.H., (1978): Histopathology of pig and man, Indian journal of parasitology, 2(2), 97-98
14. Hayunga E.G., (1977): Comparative histology of the Scolices of three caryophyllaeid tapeworms, Relationship to pathology and site selection in Host intestine, Diss. Abs. Int., 38



**A Two-Day International (Web) Conference
 New Vistas in Aquatic & Terrestrial Biology and Environment
 During Current Pandemic (ATBE-2021)
 26 & 27 March, 2021**

Department of Zoology R.S.S.P. Mandal's Nanasaheb Y. N. Chavan Arts, Science and Commerce College Chalisgaon,
 Dist. Jalgaon (M.S.) India.

**On A New Cestode Of *Moniezia* (Cestoda-Anoplocephalidae) From The
 Intestine Of *Capra Hircus* (L.) From Ghansavangi, District Jalna (M.S.)**

¹Arun Gaware, ²Rahul Khawal, ³Sunita Borde and ⁴Vijay Lakwal

¹Department of Zoology, Shri Shivaji ACS College Motala, Dist. Buldana (M.S.) India.

²Department of Zoology, Shri Vyankatesh ASC College, Deulgaon Raja Dist- Buldana (M.S.) India.

³Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) India.

⁴PG Department of Zoology, Nanasaheb Y.N. Chavan ASC College Chalisgaon, Jalgaon, (M.S.) India

Email – ¹arungaware26@gmail.com

Abstract: The present investigation deals with systematic observation of the cestode parasites *Moniezia* Blanchard, 1891, that is, *Moniezia mehdii* Sp. Nov. collected from the intestine of domestic goat *Capra hircus* Linnaeus, 1758 at Ghansavangi, District Jalna. The present worm comes closer to all the known species of the genus *Moniezia* in general topography of organ but differs due to having the scolex small squarish, mature proglottids nearly two times broader than long, testes small, oval to rounded in shape, 130-140 in numbers, cirrus pouch large cylindrical, ovary horse-shoe shaped, vitelline gland post ovarian, inner proglottid glands 15-16 in numbers.

Keywords: Anoplocephalidae, *Capra hircus*, Jalna, *Moniezia*

1. INTRODUCTION:

The genus *Moniezia* was established by Blanchard, 1891. Skrjabin and Schulz (1937) divided this genus in to three subgenera as follows:

- 1) Inter proglottid glands grouped in rosettes-----*Moniezia*.
- 2) Inter proglottid glands arranged linearly-----*Blancharia*.
(Some time absent)
- 3) Inter proglottid glands absent-----*Baerizia*.

The present worm agrees in all characters with subgenus *Blancharia*. Skrjabin and Schulz, 1937 includes having two species *M. (B.) benedeni* (Moniez, 1879), Skrjabin and Schulz, 1937 and *M. (B.) pallida*, Monnig, 1926. In India Shinde *et al.*, 1985 added two species of the genus i.e. *M. (B.) aurangabadensis* and *M. (B.) bharalae* from *Ovis bharal* in Aurangabad district, (M.S.), India. Later on Patil, *et al.*, 1997 described *M. (B.) warnanagarensis* from *Capra hircus* (L.). In 1999 Nanware, *et al.* erected *M. (B.) kalawati* and Kalse, *et al.* erected *M. (B.) murhari* from *Capra hircus* (L.). In 2004, Pawar *et al.* added *M. (B.) Shindei* and Tat and Jadhav B. V. added *M. (B.) hircusae* from *Capra hircus* (L.). Pokle, *et al.* added *M. (B.) caprai* from *Capra hircus* (L.). Borde, *et al.*, 2007 erected new species i.e. *M. (B.) rajalaensis* from *Capra hircus* (L.). *M. (B.) caprae* is added by Nanware S. S. 2010. Padwal, *et al.* 2011 added *M. (B.) govindae* from *Capra hircus* (L.). Later Humbe, *et al.*, erected four more species i.e. *M. (B.) babai*, 2011, *M. (B.) ovisae*, 2011, *M. (B.) osmanabadensis*, 2012 and *M. (B.) devraoi*, 2013. Later on Barote, *et al.* added two more species i.e. *M. (B.) shegaonesis*, 2013 and *M. (B.) shivajiraovae*, 2014. Ravi Solunke, 2015 erected *M. (B.) sureshi* and Amol Thosar, *et al.*, 2015 erected *M. (B.) jadhavii* from *Capra hircus* (L.). Later on *Moniezia (B.) marathwadensis* is added by Shaikh Kalim 2015, *Moniezia (B.) bhalchandrai* is added by Kalse A. T. *et al.*, 2016, Sunita Borde, *et al.*, 2017 erected *M. (B.) bordeae* from *Ovis bharal* (L.) and Jadhav V.M. *et al.* 2018 erected *Moniezia (B.) madhavae* from *Capra hircus* (L.). Recently Amol Thosar, *et al.*, 2020 *Moniezia (B.) shilae*, added to this genus from *Capra hircus* (L.).

The present communication, deals with the description of a new species, *Moniezia mehdii* Sp. Nov. collected from the *Capra hircus* Linnaeus, 1758 at Ghansavangi, District Jalna.

2. MATERIALS AND METHODS:

Cestode parasites were collected from the intestine of *Capra hircus* (L.) from Ghansavangi, District Jalna (M.S.) India. These cestodes were preserved in 4% formalin and stained with Acetocarmine or Harris Haematoxylin, passed through various alcoholic grades, cleared in xylene, mounted in D.P.X. and drawings are made with the aid of Camera Lucida. All measurements are given in millimeters. The identification is made with the help of Systema Helminthum.



3. DESCRIPTION:

The cestodes are long consisting scolex, neck and proglottids. Proglottids are immature and mature. The scolex is small in size, squarish in shape and measures, 1.567 (1.485-1.650) in length and 1.435 (1.386-1.485) in width. The suckers are large, oval in shape, four in numbers, arranged in two pairs, obliquely placed and measures, 0.429 in diameter. The neck is long and measures, 5.362 (5.280-5.445) in length and 0.957 (0.924-0.990) in width. Mature proglottids are large in size, rectangular, almost two time broader than long, each proglottids with a double set of reproductive organs and measures, 3.663 (3.630-3.696) in length and 7.837 (7.425-8.25) in width. The testes are small, oval to rounded in shape, 130-140 in numbers, scattered in the posterior half of the segment in between two longitudinal excretory canals and measures, 0.049 (0.033-0.066) in diameter. The vas-deference is long, thin coiled tube and measures, 0.940 in length and 0.033 in width. The cirrus pouch is large, cylindrical, situated in middle margin of the segments and measures, 0.445 (0.396-0.495) in length and 0.297 (0.264-0.330) in width. The cirrus is thin tube, cylindrical, inside the cirrus pouch and measures, 0.445 in length and 0.297 in width. The ovary large, horse shoe shaped, compact with acinia, two in numbers and measures, 1.419 (1.353-1.485) in length and 1.320 (1.320 -1.320) in width. The ootype is small, elongated, anterior to the ovary and measures, 0.099 in diameter. The vagina posterior to cirrus pouch, long tube reaches to the ootype and measures, 0.858 in length and 0.049 in width. The genital pores medium in size, oval in shape, bilateral, middle in position and measures, 0.198 (0.165-0.231) in length and 0.066 (0.066-0.066) in width. The vitelline gland small, oval in shape, compact, post-ovarian and measures, 0.247 (0.231-0.264) in diameter. The Inter-proglottidal glands present in between two proglottids, oval to rounded, 15-16 in numbers, arranged in a single row in between two longitudinal excretory canals, and measures, 0.379 (0.330-0.429) in diameter. The longitudinal excretory canals are thin, present on both lateral sides of segments along the body length and measures, 0.082 (0.066-0.099) in width.

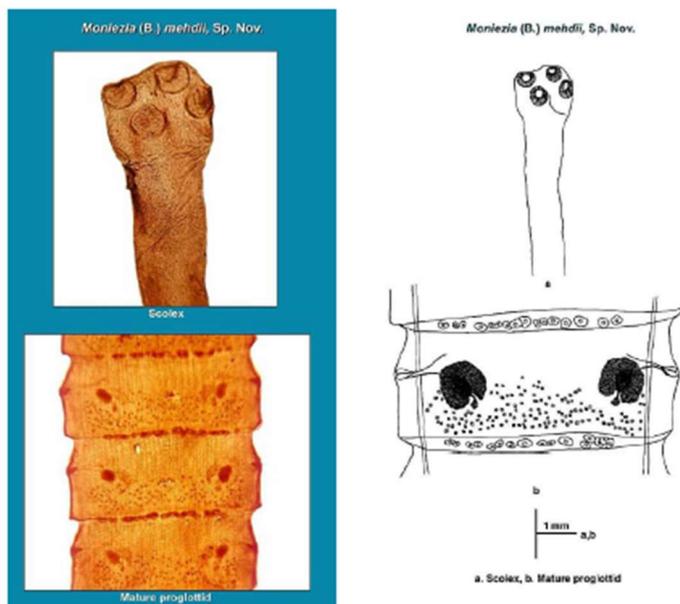


Fig. 1 Microphotograph And Camera Lucida Of
 a) Scolex; B) Mature Proglottid



4. RESULTS AND DISCUSSION:

The genus *Moniezia* was erected by Blanchard in 1891. The worm under discussion is having the scolex small squarish, mature proglottids nearly two times broader than long, testes small, oval to rounded in shape, 130-140 in numbers, cirrus pouch large cylindrical, ovary horse-shoe shaped, vitelline gland post ovarian, inter proglottidal glands 15-16 in numbers.

- The present worm differs from *Moniezia* (B) *benedeni*, Moniez, 1879, Skrjabin and Schulz, 1937, which is having numerous proglottids broader than long, posterior proglottids fleshy, testes 500 in numbers, arranged in two groups, cirrus pouch short and wide, vas deferens with 2-3 coils, ovary compact, in the center of the segments, eggs well developed, inter proglottidal glands liner and close to the posterior margin of the segments, arranged transversely and reported from the Calves and Lambs.
- The present cestode differs from *Moniezia* (B) *pallida*, Monnig, 1926, which is having the uterus external, dorsal and ventrally over excretory canals, the inter-proglottidal glands varying in size and reported from the host horse in South Africa.
- The present parasite differs from *Moniezia* (B) *aurangabadensis*, Shinde, *et al.* 1985, which is having the scolex quadrangular, testes small, 1100-1200 in numbers, vas deferens coiled, cirrus pouch cylindrical, oval with some rounded acini, gravid proglottids broader than long, uterus reticulate, inter proglottidal glands 12-15 in numbers and reported from *Ovis bharal* (L.).
- The present tapeworm differs from *Moniezia* (B) *bharalae*, Shinde, *et al.* 1985, which is having testes rounded, 190-200 in numbers, vas deferens short, elongated, fusiform, genital pores bilateral, sub marginal, ovary compact, inter proglottidal glands arranged in two rows, small in size, 38-44 in numbers and reported from *Ovis bharal* (L.).
- The present form differs from *Moniezia* (B) *warananagarensis*, Patil, *et al.* 1997, which is having scolex large, globular, testes 300-320 in numbers, distributed throughout the proglottids, in single field, ovary indistinctly lobed with 13-15 short, blunt acini, transversely elongated, inter proglottidal glands, 56 in numbers, oval, medium in size, cirrus pouch medium, oval, transversely elongated, slightly obliquely placed and extend beyond longitudinal excretory canal.
- The present cestode differs from *Moniezia* (B) *kalawati*, Nanware, *et al.* 1999, Which is having squarish scolex, oval shaped cirrus pouch, testes small, oval, distributed throughout the segment, 172 in numbers, ovary medium, short, blunt acini, and 54 inter proglottidal glands in the inter segmental region, medium, oval either single or paired, irregularly arranged in the central width of the segments and leaving space on each lateral side.
- The present tapeworm differs from *Moniezia* (B) *murhari*, Kalse, *et al.* 1999, in having the scolex squarish, testes 405-415 in numbers, cirrus pouch elongated in the anterior region of the segments, ovary inverted horse shoe shaped, indistinctly bilobed each with numerous short, blunt, round, acini and inter proglottidal glands 63 in numbers.
- The present parasites differs from *Moniezia* (B) *caprai*, Pokale, *et al.* 2004, which is having the scolex is medium, squarish, with large four suckers, without rostellum, testes oval in shape, 255-260 in numbers, cirrus pouch is medium in size and ovary medium in size, kidney shaped.
- The present worm differs from *Moniezia* (B) *shindei*, Pawar, *et al.*, 2004 in having scolex large, mature segments craspedote, testes 190-200 (195) in numbers, scattered all over segment and ovary a single mass, large, oval, cirrus pouch oval, elongated, in center of the segment and vitelline gland large, oval, internal to ovary.
- The present cestode differs from *Moniezia* (B) *hircusae*, Tat and Jadhav B. V., 2004 which is having scolex large, globular, mature segments big, craspedote, testes 168 in numbers, small, scattered in a single field, ovary large, oval, a single mass, in anterior half of the segment, inter proglottidal glands 14-15 in numbers, large, oval and cirrus pouch in anterior 1/3rd region of the segment.
- The present cestode differs from *Moniezia* (B) *rajalaensis*, Borde, *et al.* 2007, in having scolex large, globular, mature proglottids squarish, broader than long, testes 250-260 in numbers, medium, scattered throughout proglottids, ovary large, horse shoe shaped, inter proglottidal glands 31-32 in numbers, large, oval and cirrus pouch oval.
- The present cestode differs from *Moniezia* (B) *caprae*, Nanware S.S., 2010 in having scolex large, mature segment big, almost three and a half times broader than long, testes 84-85 in numbers, medium in size, oval in shape, ovary large, bilobed, inter proglottidal glands 40 in numbers, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *govindae*, Padwal, *et al.*, 2011 in having scolex large, globular, mature proglottids big, broader than long, testes 100-140 in numbers, medium, scattered throughout proglottids, ovary large, compact, nut shaped, inter proglottidal glands 40-42 in numbers, large, oval and cirrus pouch elongated.
- The present cestode differs from *Moniezia* (B) *babai*, Humbe, *et al.*, 2011 in having scolex globular, mature segment four times broader than long, testes 190-220 in numbers, small in size, rounded in shape, ovary large, rounded, inter proglottidal glands 18-20 in numbers, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *ovisae*, Humbe, *et al.*, 2011 in having scolex broad anteriorly and narrow towards neck, mature segment two times broader than long, testes 155-165 in numbers, small in size, rounded in shape, ovary large, bilobed, inter proglottidal glands 32-35 in numbers, oval, rounded and cirrus pouch on each side.



- The present cestode differs from *Moniezia* (B) *osmanabadensis*, Humbe, *et al.*, 2012 in having scolex globular, mature segment five times broader than long, craspedote, testes 170-200 in numbers, small in size, rounded in shape, ovary large, bilobed, inter proglottidal glands 38-40 in numbers, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *devraoi*, Humbe, *et al.*, 2013 in having scolex quadrangular, mature segment four times broader than long, testes 160-180 in numbers, small in size, rounded in shape, ovary large, bilobed, inter proglottidal glands 40-45 in numbers, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *shegaonensis*, Barote, *et al.*, 2013 in having scolex globular, mature segment four to five times broader than long, testes 190-220 in numbers, small in size, rounded in shape, ovary compact, inter proglottidal glands 20-25 in number, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *shivajiraovae*, Barote, *et al.*, 2014 in having scolex squarish, large in size, mature segment six to eight times broader than long, testes 84-95 in numbers, small in size, rounded in shape, ovary horse-shoe shaped, inter proglottidal glands 40-42 in numbers, oval, rounded and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *sureshi*, Ravi Solunke, 2015 in having scolex oval, quadrangular, mature segment four to five times broader than long, testes 180-185 in numbers, single field, unevenly distributed, ovary medium, horse-shoe shaped, in appearance having numerous short, blunt acini, inter proglottidal glands 18-19 in numbers, oval and cirrus pouch on each side.
- The present cestode differs from *Moniezia* (B) *jadhavi*, Amol Thosar, *et al.*, 2015 in having scolex squarish, mature segment craspedote, five times broader than long, testes 210-220 in numbers, small, oval to round, ovary horse-shoe shaped, compact, inter proglottidal glands 46-52 in numbers, arranged lineally in one or two rows, cirrus pouch small oval.
- The present cestode differs from *Moniezia* (B) *marathwadensis*, Shaikh Kalim, 2015 in having scolex quadrangular, mature segment five times broader than long, testes 125-130 in numbers, small, oval in shape, ovary compact with numerous blunt acini, inter proglottidal glands 50-52 in numbers, arranged lineally in one or two rows, cirrus pouch large, elongated, oval.
- The present cestode differs from *Moniezia* (B) *bhalchandrai*, Kalse A.T. *et al.*, 2016 in having scolex quadrangular, mature segment rectangular in shape, almost four and half times broader than long, testes 196-200 in numbers, oval in shape, ovary medium in size, inverted cup shaped, inter proglottidal glands 13-14 in numbers, oval in shape, highly muscular, single regularly and lineally arranged, cirrus pouch large, oval in shape.
- The present worm differs from *Moniezia* (B) *bordeae*, Sunita Borde, *et al.*, 2017 in having scolex quadrangular, mature segment nearly four to five times broader than long, testes 130-170 in numbers, spread in the medulla in between the longitudinal excretory canals, ovary bean shaped, small, forms concavity posteriorly, inter proglottidal glands 5-9 in numbers, arranged single row, cirrus pouch on each side and reported from *Ovis bharal* (L.).
- The present cestode differs from *Moniezia* (B) *madhavae*, Jadhav V.M. *et al.*, 2018 in having scolex quadrangular, mature segment near five times broader than long, testes 45-60 in numbers, medium in size, oval in shape, ovary distinctly bilobed, inter proglottidal glands 40-42 in numbers, oval in shape, cirrus pouch small in shape, curved.
- The present cestode differs from *Moniezia* (B) *shilae*, Amol Thosar *et al.*, 2020 in having the scolex quadrangular, mature proglottids nearly four times broader than long, craspedote in shape, testes small in size, oval to rounded, 180-210 in numbers, cirrus pouch oval, ovary large, compact, horse-shoe shaped, vitelline gland post ovarian, inter proglottidal glands 26-30 in numbers.

The above differentiating characters are valid enough to erect a new species for these cestodes and hence the name *Moniezia* (B) *mehdii* Sp. Nov. is proposed, in honour of late Prof. Syed Mehdi Ali, well known Helminthologist in India and Ex-head and professor, Department of Zoology, Dr. Babasaheb Ambedkar University, Aurangabad-431004.

ACKNOWLEDGMENTS:

Author is thankful to the Dr. S.W. Mamlkar Principal, Shri Shivaji College Motala for his support and also thankful Dr. Sunita Borde, Professor, Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for her guidance.

REFERENCES:

1. Amol Thosar *et al.*, (2020): A Taxonomic study of a new Cestode *Moniezia* (B) *shilae*, Sp. Nov. (Cestoda: Anoplocephalidae) in *Capra hircus* (L.) from Aurangabad District International online Multidisciplinary Journal 1-6.
2. Amol Thosar, *et al.*, (2015): Morphological and molecular studies of *Moniezia* Sp. (Cestoda: Anoplocephalidae) a parasite of the domestic goat *Capra hircus* (L.) in Aurangabad district (M.S.), India. International Journal of Applied Research, 5(8): 10-13.
3. Barote, *et al.*, (2013): On a new species of *Moniezia* Blanchard, 1891 (Cestoda: Anoplocephalidae) in *Ovis bharal* from Bhuldhana dist. (M.S.) India. Trends in Parasitology Research, volume 2(3):1-4 (Online).
4. Barote, *et al.*, (2014): On a new species of *Moniezia* Blanchard, 1891 (Cestoda: Anoplocephalidae) in *Ovis bharal* from Bhuldhana dist. (M.S.) India. Trends in Parasitology Research, volume 3(1):1-4.
5. Barote, *et al.* (2014): On a new species of *Moniezia* Blanchard, 1891 (Cestoda: Anoplocephalidae) in *Ovis bharal* from Bhuldhana dist. (M.S.) India. Trends in Parasitology Research, volume 3(1):1-4.



A Two-Day International (Web) Conference
New Vistas in Aquatic & Terrestrial Biology and Environment
During Current Pandemic (ATBE-2021)

26 & 27 March, 2021

Department of Zoology R.S.S.P. Mandal's Nanasahab Y. N. Chavan Arts, Science and Commerce College Chalisgaon,
Dist. Jalgaon (M.S.) India.

Biochemical Profile and Inhibitory Effect of *Haliclona permollis*
(Bowerbank, 1866) Marine Sponge of Ratnagiri, West Coast of India

¹V.R. Lakwal, ²A.P. Rajput, ³M.S. Kharate, ⁴P.B. Pardeshi, ⁵A.B. Gaware, ⁶R.R. Khawal and ⁷D.S. Kharate
¹P.G. Department of Zoology, Nanasahab Yashwantrao Narayanao Chavan Art's, Science and
Commerce College, Chalisgaon, Jalgaon (M.S.) India

²Department of Physics, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) India

³Department of Botany, Vinayakrao Patil Art's, Commerce and Science College, Vijapur, Aurangabad (M.S.) India

⁴Department of Zoology, M.G.V. Arts, Science and Commerce College, Manmad Tal. Nandgaon, Nashik (M.S.)

⁵Department of Zoology, Shri Shivaji Arts, Commerce and Science College Motala, Buldana (M.S.) India

⁶Department of Zoology, Shri Vyankatesh Art's Com & Science College, Deulgaon Raja, Buldana (M.S.) India

⁷Department of Zoology, Sant Ramdas Art's, Commerce and Science College, Ghansawangi, Jalna (M.S.) India

Email: vijaylakwal02@gmail.com

Abstract: The intertidal marine sponge, *Haliclona permollis* was assessed for the antimicrobial effects of various crude extracts, against pathogenic microbes by agar well diffusion method as well as to determine preliminary biochemical screening. The methanol and acetone depicted strong positive antimicrobial activity. It may be due to the presence of alkaloids, glycosides, saponins, flavonoids, proteins and amino acids, steroids, carbohydrates, fats and fixed oil. The hexane and chloroform showed weak positive antimicrobial activity because of presence of biologically active compounds in small quantity. The investigation indicated that *Haliclona permollis* remain an interesting source for antimicrobial activity and also suggest that could be a good source of the secondary metabolite. However it required further investigation for isolation of pure compound.

Keywords: Antimicrobial activity, *Haliclona permollis*, Biochemical profile, Intertidal, Pathogens.

1. INTRODUCTION:

The marine sponges are the oldest metazoan group and characterized as sessile active filter feeders [1]. Sponges are simple, multicellular, sessile animals with no true tissue layers or organs [2]. This rocky shore area is directly exposed to sea and it is inhabited by diverse flora and fauna. Sponges are the most primitive multicellular animals that have existed for more than 800 million years. The sponges (Porifera), being evolutionarily ancient inhabit every type of marine benthic environment [3]. Sponges are primitive marine invertebrates' presence of high number natural products than any other marine phylum. The marine sponges are broadly distributed from intertidal zones to thousands of meters deep in the ocean [4].

The sponges are one of the richest sources of biologically active secondary metabolites and chemical diversity (5) (6). Until now, more than 5000 different compounds have been isolated and identified from about 500 species of sponges (7) with nearly 800 of them exhibiting antibiotic activity (8). These natural products belonged to different class of compounds like terpenoids, alkaloids, macrolides, polyethers, nucleoside derivatives and peptides. In recent time attention has been directed to the search of bioactive peptides from sponges, being actually a well-established sector in the research of marine natural product. Antitumor studies were conducted with 19 marine natural products in a number of experimental and clinical models proved that sponges act as an excellent source for bioactive compounds (9).

Marine sponges are a rich source of structurally novel and biologically active secondary metabolites [10]. Over 60% of potentially useful bioactive compounds discovered from living organisms have been obtained from marine fauna, 70% of which detected from sponges [11]. The sponge class Demospongiae is known for producing the largest number and diversity of secondary metabolites isolated from marine invertebrates [12]. Many sponge or sponge symbiont-derived metabolites are potent antibacterial, antifungal, anti-feeding and antifouling compounds [13]; a number of bacteria associated with sponges were found to be the sources of antibiotics and other bioactive compounds in the marine environment [14].

However, the bioactive potential of compounds from Indian sponges has been little studied, especially west coast of India. Therefore, In the present investigation report the antimicrobial and biochemical potential of marine intertidal sponge, *Haliclona permollis* collected from Ratnagiri coast (16°55'N73°16'E).



2. MATERIALS AND METHODS:**Collection of sample & preparation of crude extract-**

The marine sponge, *Haliciona permollis* were collected from the low intertidal rocky pools of Ratnagiri coast (16°55'N 73°16'E), Maharashtra, India. The sponge was collected by an eco-friendly. Identified sponge tissues samples were washed with sea water, air dried and chopped into small size and extracted with 1000 ml (1:10) methanol, acetone, chloroform and hexane for about 7 days. Then extract was filtered through Whatmann paper No. 1 and solvent was processed by rotary vacuum evaporator (Buchi type-Superfit, Bangalore) under reduced pressure to get the crude extract of sponge. The concentrated extract was used for further study.

Antibacterial activity of *Haliciona permollis*

The assays were performed by agar well diffusion method is widely used to evaluate the antibacterial activity of crude extracts [15]. The four pathogenic bacterial strains were used as test organisms such as *Escherichia coli*, *Salmonella typhi*, (Gram negative bacteria) *Bacillus subtilis*, *Staphylococcus aureus* (Gram positive bacteria). All bacteria were stored at -20°C until use. Cells were grown at 3°C in Muller Hinton broth to an OD 420 = 1.9 (approx. 105 CFU/mL), and were transfer to Muller Hinton agar. The broth cultures swabbed onto agar medium so as to achieve a lawn of confluent bacterial growth separately for each strain. The sterile stainless steel borer (6 mm) was used to make well in the agar medium. Five wells were bored in each plate. The sponge crude extract (100µg/mL) was loaded in to the well and to find out the inhibitory potential. Triplicate plates were maintained for each test. Discs of Streptomycin (25µg/ml) were used as positive control. The bacterial assay plates were incubated at 37°C for 24 hrs. Growth of bacteria around each well was observed carefully and the diameter of the zone of inhibition around each agar well was measured using a Hi-media zone reader.

Antifungal activity of *Haliciona permollis*

The assays were performed by agar well diffusion method is widely used to evaluate the antifungal activity of crude extracts [15]. Assays were performed by agar well diffusion method. The crude extract was tested against *Aspergillus* spp., *Penicillium* spp., *Alternaria* spp. and *Fusarium* spp. The fungal cultures were maintained in 0.2% Sabouraud dextrose broth; each fungal inoculum was applied on plate and evenly spread on Sabouraud dextrose agar using a sterile cotton swab. The Fluconazole discs were used as the positive control. The sponge crude extract (100µg/mL) was loaded in to the well and to find out the inhibitory potential. The fungal assay plates were incubated at 28°C for 48 hrs.

Preliminary biochemical screening of *Haliciona permollis*

The preliminary biochemical analysis was carried out using following methods [17, 18]. The sponge crude extracts were qualitatively analyzed for the presence of various biologically active compounds.

1. Detection of alkaloids

- i. **Mayer's Test:** Extracts were treated with Mayer's reagent (potassium mercuric iodide). The formation of a yellow coloured precipitate indicates the presence of alkaloids in the extract.
- ii. **Wagner's Test:** Extracts were treated with Wagner's reagent (Iodine in Potassium Iodide). The formation of a brown/reddish precipitate indicates the presence of alkaloids in the extract.
- iii. **Dragendroff's Test:** Extracts were treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). The formation of a red precipitate indicates the presence of alkaloids in the extract.
- iv. **Hager's Test:** Extracts were treated with Hager's reagent (saturated picric acid solution). The formation of yellow coloured precipitate confirmed the Presence of alkaloids.

2. Detection of glycosides

Legal's Test: The extracts were treated with sodium nitropruside in pyridine and sodium hydroxide. The pink to blood red colour indicates the presence of cardiac glycosides in the extract.

3. Detection of tannins

- i. **Gelatin Test:** To the extract, 1% gelatin solution containing sodium chloride was added. The formation of a white precipitate indicates the presence of tannins in the extract.
- ii. **Ferric Chloride Test:** With 1% ferric chloride solution the extract gives blue, green, or brownish green colour indicating the presence of tannins.

4. Detection of flavonoids

- i. **Alkaline Reagent Test:** Extracts were treated with few drops of sodium hydroxide solution. The formation of intense yellow colour, it becomes colourless on addition of dilute acid indicates the presence of flavonoids in the extract.
- ii. **Lead acetate Test:** Extracts were treated with few drops of lead acetate solution. The formation of a yellow coloured precipitate indicates the presence of flavonoids in the extract.
- iii. **Shinoda Test:** Take 2-3 ml of extract, a piece of magnesium ribbon and 1 ml of conc. hydrochloric acid was added. The Pink or red coloration of the solution indicates the presence of flavonoids in the extract.
- iv. **Zinc Hydrochloride Test:** To the test solution, add a mixture of zinc dust and conc. Hydrochloric acid. It gives red colour after few minutes.



5. Detection of proteins and amino acids

- i. **Xanthoproteic Test:** The crude extracts were treated with few drops of concentrated nitric acid. The formation of a yellow colour indicates the presence of proteins.
- ii. **Ninhydrin Test:** To the extract, 0.25% w/v ninhydrin reagent was added and boiled for few minutes. The formation of a blue colour indicates the presence of amino acid.

6. Detection of saponins

Foam Test: Take the 0.5 gm of extract was shaken with 2 ml of water and Then formation of foam persistently for ten minutes it indicates the presence of saponins in the extract.

7. Detection of sterols and terpenoids

Salkowski's Test: Extracts were treated with few drops of concentrated sulphuric acid, red colour at the lower layer indicates presence of steroids and formation of yellow colour at the lower layer indicates the presence of terpenoids in the extract.

8. Detection of carbohydrates

- i. **Molisch's Test:** Filtrates were treated with 2 drops of alcoholic α -naphthol solution in a test tube. The violet ring at the junction indicates the presence of Carbohydrates in the extract.
- ii. **Benedict's Test:** Filtrates were treated with Benedict's reagent and heated gently. The orange red precipitate indicates the presence of reducing sugars in the extract.
- iii. **Fehling's Test:** Filtrates were hydrolysed with diluted HCl, neutralized with alkali and heated with Fehling's A & B solutions. The formation of a red precipitate indicates the presence of reducing sugars in the extract.
- iv. **Selwanoffs Test:** Take 1 ml of a sample solution of extract is placed in a test tube. The 2 ml of selwanoffs reagent (a solution of resorcinol and HCL) is added. The solution is heated in a boiling water bath for two minutes. The formation of red product indicates the presence of carbohydrates.
- v. **Cammeilisation Test:** 1 ml crude extract were treated with strong sulphuric acid, it gives a burning sugar smell. This indicates the presence of carbohydrates in the extract.

9. Fats and Fixed Oils

Stain Test: The small amount of extract was pressed between two filter papers. The oily stain on filter paper indicates the presence of fixed oil in the extract.

3. RESULTS:

The *Haliclona permollis* crude extracts methanol, acetone, chloroform and hexane were used to investigate the antimicrobial activity against four human pathogenic bacteria as well as four plant pathogenic fungal species; and the preliminary biochemical screening. Figure 1 shows result of in vitro testing of sponge extracts against pathogenic bacteria. Inhibition zones of sponge crude extracts against the specific test organisms were measured in mm. The crude extract restricted the growth of pathogen strains on the media around wells. The maximum inhibition zone (5-7 mm) was observed in methanol and acetone crude extract against *Escherichia coli*, *Salmonella typhi*, *Bacillus subtilis*, *Staphylococcus aureus*. The minimum inhibition zone (2-4 mm) was noticed in chloroform and hexane extract against all four pathogenic bacterial strains.

The figure 2 shows results of sponge crude extract against plant pathogenic fungal species. The maximum inhibition zone (5-7 mm) was observed in methanol crude extract against *Aspergillus* spp., *Penicillium* spp., *Alternaria* spp. and *Fusarium* spp. and acetone extract shows (4-5) inhibition against *Aspergillus* spp., *Penicillium* spp., *Alternaria* spp. and *Fusarium* spp.. The minimum inhibition zone (1-3.5 mm) was noticed in chloroform and hexane extract against all four pathogenic fungal strains.

The figure 3 to figure 10 depicted the various biochemical present in different extracts of sponge *Haliclona permollis*; the methanol and acetone crude extract contains alkaloids, tannins, flavonoids and proteins and amino acids, steroids, carbohydrates, fats and fixed oils strongly in high quantity; as well as chloroform and hexane extract contains presence of secondary metabolites in small quantity.

4. DISCUSSION:

In the present study the crude methanol, acetone, chloroform and hexane extracts of *Haliclona permollis* showed antimicrobial action against the bacteria and fungi. The crude extract of methanol shows maximum antimicrobial activity against all test microorganisms. The sponges shows wide spectrum of antibacterial efficacy and exhibited the growth of all the test bacteria. The reports on antibacterial activity of sponges revealed their activity on gram positive bacteria. Various studies have confirmed the predominance of gram negative producers in the marine environment [19]. Marine sponge *Aplysina cavernicola* produces the aerophysinin, aethionin derivatives, with some antibiotic activity against *Bacillus subtilis* and *Proteus vulgaris* [20].

Various studies have been done on anti-microbial properties of the bacteria associated with the sponges. The antibiotics produce by these bacteria ranged from broad spectral to species specific [21]. The discovery of new classes of antibiotics is necessary due to the increased incidence of multiple resistances among pathogenic microorganisms to



drugs that are currently in clinical use [22]. The Sponges of Demospongiae class are known to produce the largest number of secondary metabolites, most of them with medically relevant biological activities and important ecological roles [23].

Sponges are primitive marine invertebrates present high number of natural products than any other marine phylum. Many of their products have strong bioactivities including anticancer, antimicrobial, larvicidal, hemolytic and anti-inflammatory activities and are often applicable for medical use [24]. The anti-tumour activity of cell free extracts from sponge associated actinomycetes might be due to the presence of the biologically active compounds alkaloids and guanidine [25]. Hence, the present results profounded the promising antimicrobial activity of *Haliclona permollis* against eight active pathogenic strains. The study shows that *Haliclona permollis* possessed excellent source of antimicrobial properties and secondary metabolites.

5. CONCLUSION:

The present investigation reveals that the marine sponges *Haliclona permollis* shows the potential source for the antimicrobial and biochemical properties. The methanol and acetone depicted strong positive antimicrobial activity. It may be due to the presence of alkaloids, glycosides, tannins, flavonoids, proteins and amino acids, steroids, carbohydrate, fats and fixed oil. The hexane and chloroform showed weak positive antimicrobial activity because presence of biologically active compounds in small quantity. The investigation indicated that *Haliclona permollis* remain an interesting source for antimicrobial activity and also suggest that could be a good source of the secondary metabolite. Probably is the first report on the antimicrobial activity and biochemical profiling of *Haliclona permollis* from Ratnagiri coast, Maharashtra, India, to the best of our knowledge. However it required further investigation for isolation of pure compound.

REFERENCES:

- Hausmann R., Marco V., Frank L. and Christoph S. (2006): Advances in the production of sponge biomass *Aplysina aerophoba*, A model sponge for ex situ sponge biomass production. *J. of Biotech.*, 124: 117-127.
- Bergquist R.P. (1978): Sponges, *University of California Press*, Berkeley.
- Radjasa O.K., Kencana D.S., Sabdono A., Hutagalung R.A. and Lestari E.S. (2007): Antibacterial activity of marine bacteria associated with sponge *Aaptos* sp. against Multi drug resistant (MDR) strains. *Journal Matematika dan Sains*, 12, 147-152.
- Fusetani N. and Matsunaga S. (1993): Bioactive sponge peptides. *Chem. Rev.*, 93, 1793-1806.
- Proksch P., Ebel R.E. and Ebel R. (2003): Drugs from the sea-opportunities and obstacles. *Marine Drugs*, 1, 5-17.
- Kijjoa A. and Swangwong P. (2004): Drugs and cosmetics from the sea. *Marine Natural Products*, 2, 73-82.
- Touati I., Chaieb K., Bakhrouf A. and Gaddour K. (2007): Screening of antimicrobial activity of marine sponge extracts collected from Tunisia coast. *Journal of Medical Mycology*, 17, 183-187.
- Nigrelli R.F., Jakowska S. and Calventi I. (1959): Ectyoinin on antimicrobial agent from the sponge *Microciona prolifera*. *Zoological Sciences*, 44, 173-176.
- Azevedo L.P., Peraza G., Lerner C., Soares A., Murcia N. and Muccillo B.A. (2008): Investigation of the anti-inflammatory and analgesic effect from an extract of *Aplysina caissara*, a marine sponge. *Fundamental Clinical Pharmacological*, 22, 549-556.
- Sepic K., Batista U., Vacelet J., Macek P. and Turk T. (1997): Biological activities of aqueous extracts from marine sponges and cytotoxic effects of 3-alkylpyridinium polymers from *Reniera sarai*. Comparative biochemistry and physiology, pharmacology, toxicology, and endocrinology, 117(1), 47-53.
- Abas H.H., Zulfigar Y. and Chan K.L. (1999): Cytotoxicity and drug metabolism screening of several marine sponges from Pulau Pasir, Kedah and Pulau Aur, Johor. *Asian Review of Biodiversity and Environmental Conservation (ARBEC)*.
- Newbold R.W., Jensen, P.R., Fenical W. and Pawlik J.R. (1999): Antimicrobial activity of Caribbean sponge extracts. *Aqua. Microb. Ecol.*, 19, 279-84.
- Becerro M.A., Uriz M.J. and Turon X. (1997): Chemically mediated interactions in benthic organisms: the chemical ecology of *Crambe crambe* (Porifera Poecilosclerida). *Hydrobiol.*, 355, 77-89.
- Bewley C.A., Holland, N.D. and Faulkner D.J. (1996): Two classes of metabolites from *Theonella swinhoei* are localized in distinct populations of bacterial symbionts. *Experientia*. 52, 716-722.
- Valgas C., De Souza S.M. and Smania E.F.A. (2007): Screening methods to determine antibacterial activity of natural products. *Braz. J. Microbiol.*, 38, 369-380.
- Magaldi S., Mata-Essayag S. and Hartung de Capriles C. (2004): Well diffusion for antifungal susceptibility testing. *Int. J. Infect. Dis.*, 8, 39-45.
- Harborne J. B. (1998): *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*. 3rd Edn., Springer-Verlag, Berlin, Germany, ISBN-13: 9780412572609, 302.



18. Kokate K.C. (1997): Practical pharmacognosy, 4th ed. Delhi, *Vallabh Prakashan*, 218.
19. Sakemi S., Ichiba T., Kohmoto S. and Saucy G. (1988): Isolation and structure elucidation of onnamide A a new bioactive metabolite of a marine sponge *Theonella* sp. *Journal of American Chemical Society*, 110, 4851- 4853.
20. Thakur N.L. and Anil A.C. (2000): Antibacterial activity of the sponge *Ircinia ramose*: importance of its surface-associated bacteria. *Journal of Chemical Ecology*, 26, 57-71.
21. Anand T.P., Bhat A.W., Shouche Y.S., Roy U. and Sharma S.P. (2006): Antimicrobial activity of marine bacteria associated with sponge from the waters off the coast of South East India. *Microbiological Research*, 161, 252-262.
22. Burgess J.G., Hiyashita H., Sudo H. and Matsunga T. (1999): Microbial antagonism, a neglected avenue of natural products research. *Biotechnology*, 70, 27-32.
23. Faulkner D.J. (2002): Marine natural products. *Natural Product Research*, 19, 1-48.
24. Andersson, D. (2003): Persistence of antibiotics resistant bacteria. *Current opinion in Microbiology*, 6, 452-456.
25. Selvin J. and Lipton A.P. (2004): Biopotential of secondary metabolites isolated from marine sponges. *Hydrobiologia*, 513, 231-238.

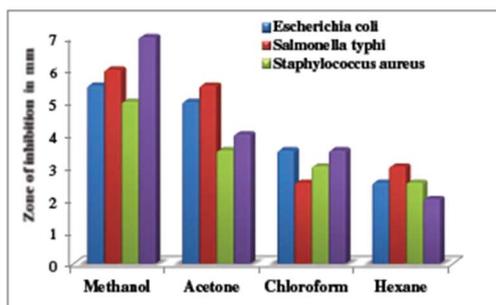


Figure 1: Antibacterial activity of crude extract of *Haliclona permollis*.

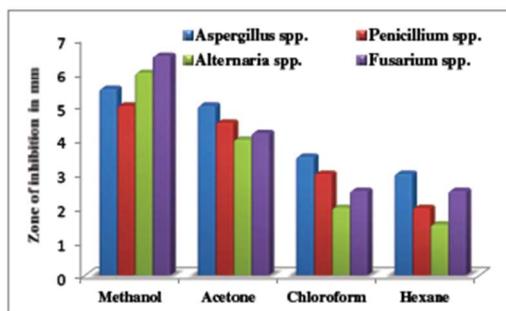


Figure 2: Antifungal activity of crude extract of *Haliclona permollis*.



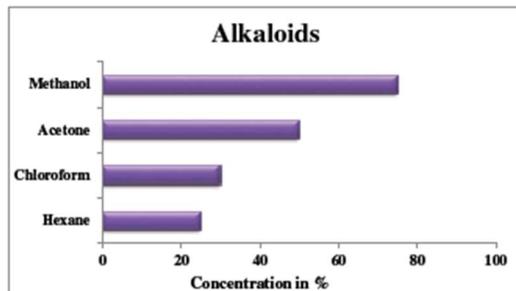


Figure 3: Alkaloid content in crude extracts of *Haliclona permollis*.

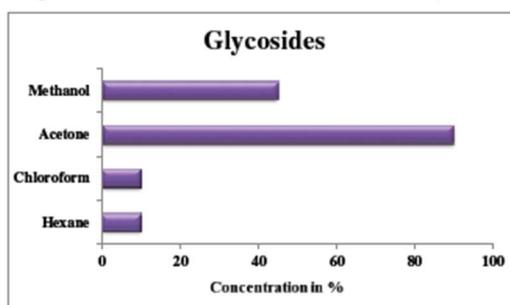


Figure 4: Glycoside content in crude extracts of *Haliclona permollis*.

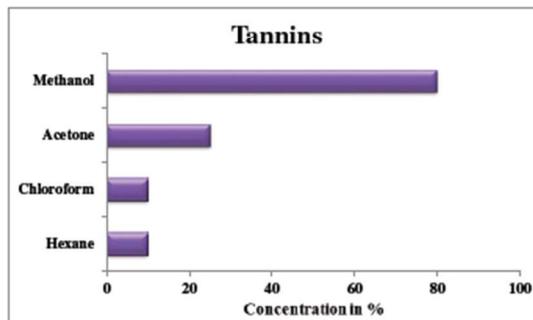


Figure 5: Tannin content in crude extracts of *Haliclona permollis*.



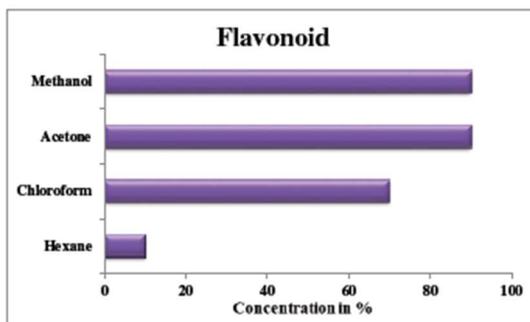


Figure 6: Flavonoid content in crude extracts of *Haliclona permollis*.

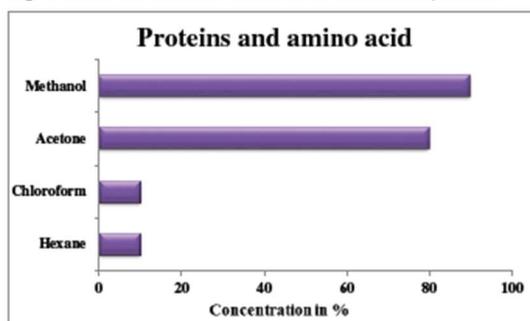


Figure 7: Proteins and amino acid content in crude extracts of *Haliclona permollis*.

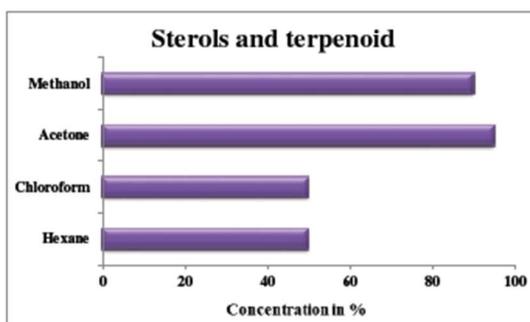


Figure 8: Sterols and terpenoid content in crude extracts of *Haliclona permollis*.



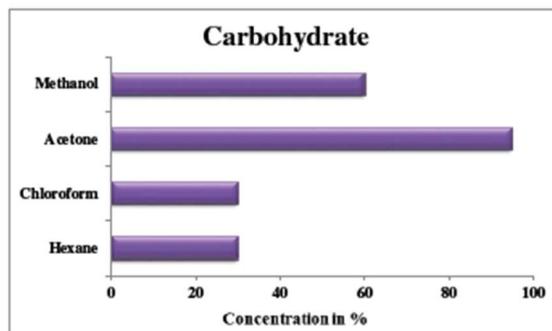


Figure 9: Carbohydrate content in crude extracts of *Haliclona permollis*.

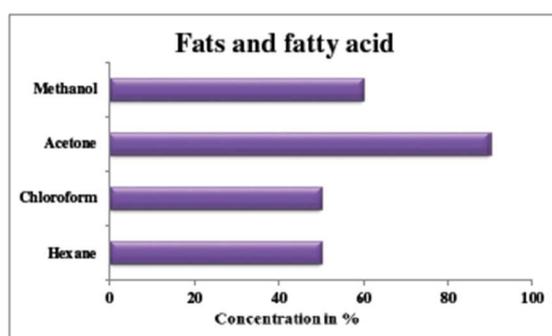


Figure 10: Fats and fatty acid content in crude extracts of *Haliclona permollis*.



Analysis of chemical parameters of freshwater bodies of Kajali river Ratnagiri, India

Tandale Mahesh R¹ and Nagmote Sandip R² and Laljee Ram Meena³

¹Shri Vyankatesh Arts, Commerce & Science College, Deulgaon Raja-443204

²Late B. S. Arts, Prof. N. G. Science & A. G. Commerce College Sakharherda

³Bhaskaracharya College of Applied Sciences, Dwarka sector 02, University of Delhi, India-110075

Email: tandalemahesh4@gmail.com¹, sr.nagmote@gmail.com², dr.laljeeram57zoology@gmail.com³

Manuscript details:

Received: 14.05.2020
Accepted: 23.06.2021
Published: 30.06.2021

Cite this article as:

Tandale Mahesh R and Nagmote Sandip R and Laljee Ram Meena (2021) Analysis of chemical parameters of freshwater bodies of Kajali river Ratnagiri, India. *Int. J. of Life Sciences*, 9 (2): 255-259.

Available online on <http://www.ijlsci.in>
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as 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 images or other thirdparty material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>

ABSTRACT

In the present study some chemical parameters were analyzed of three sampling sites of Kajali river viz. S1, S2 and S3. The monsoon and winter seasons show different seasonal fluctuations in various chemical parameters. The observed chemical status of these water bodies are reported to be suitable for the development on planktonic organisms and fishes. The water parameters indicate that the S2 and S3 are rich in nutrients. The life in the aquatic ecosystem is directly or indirectly depends on water quality.

Keywords: Chemical Parameters, Fish, Fresh water.

INTRODUCTION

India is a unique country with the great cultural diversity associated with all kinds of climates, rich flora and fauna. In spite of enormous volume of hydrosphere only a small portion of it is actually available as a resource. More than 97% occurs in the form of sea, whose salinity makes it useless, while fresh water makes up only 2.6%.

Fresh water ecosystems are subset of Earths aquatic system. They include lakes, ponds, rivers, streams, springs and wetland. Limnology deals with the biological productivity of inland water and with all its causal influences which determines its causal influences involve meteorological, physical, chemical and biological factors, "which determine the quality and quantity of biological production. Physico-chemical analysis indicates the changes in different factors and their influence on biological status of the system. Limnological study will define the biological, chemical and physical nature of each reservoir, as well as its hydrological regime including those elements imposed by humans. India is having very rich sources of inland waters in the form of lake, reservoirs and rivers.



Baviskar RN, 2021



Figure 1: Satellite View of Kajali River Showing All Sampling Sites.

MATERIAL AND METHODS

Water sample was collected by using plastic bottle, glass bottle and polyethylene bottles no any reactive material containing container is use such care should be taken that the water sample does not change their composition before tests of analysis. Water samples from the bottle the shallow knee-depth areas were collected manually by lowering a closed glass bottle or polyethylene bottles to the bottom, opening and closing it there by hands and taking it out. Monthly water samples were collected early in the morning from three different sampling sites of Kajali river viz S1, S2, and S3. This water sample brings in to the laboratory and analyzed by following the prescribed Standard methods for the Examination of water APHA (1998).

RESULTS

In the present study chemical parameters of Kajali River Ratnagiri, Maharashtra were analysed for a period of six months (From August 2018-January 2019). Analytical report of water quality characteristics is presented in the figure 1 to 6.

Dissolved Oxygen (DO)

The Dissolved oxygen is one of the major parameters of water the mean value of DO of Kajali river during the study periods was 3.55 ± 0.599 mg/L, 2.066 ± 1.246 mg/L of S1 sampling site, 1.883 ± 0.594 mg/L of S2 and 4.666 ± 0.2804 mg/L of S3. The highest value of DO was recorded in the month of December on S3 which was 4.6mg/L and lowest was 0.9 mg/L on same sampling site in the month of September. Dissolved oxygen varies greatly from one site to another site. The dissolved oxygen of the water sample was found to be maximum during the winter season whereas monsoon exhibits low amount of dissolved oxygen as compared to the winter values showing Figure 2. The high DO content might be due the increased photosynthetic activity of the autotrophs while low content might increase respiration of the organisms, low photosynthetic rate and increased organic matter decomposition. Similar studies were carried out by Kumar (2013).

Carbon dioxide (CO₂):

Depending on the P^H and other biological conditions carbon dioxide is found in various forms. the carbon dioxide in turn obtained from the conversion of carbonate to bicarbonate with the rise in the pH. The



Analysis of chemical parameters of freshwater bodies of Kajali river Ratnagiri

mean value of free CO₂ recorded on all three sampling site was absent. Free CO₂ was absent due to the activity of respiration in water bodies. It indicates that water contain high amounts of zooplanktons are there means respiration was more and less amounts of photosynthesis is there Dabhade (2006).

Total Alkalinity:

Alkalinity represents the buffering capacity for water and its ability to resist a change in pH and is the total

measure of the substance in water that has "acid-neutralizing ability". Excessive alkalinity may cause eye irritation in humans and chlorosis in plants. Surface water with alkalinity less than 200 mg/L is potentially sensitive to heavy acid deposition. Alkalinity itself is not harmful to human beings; still water supplies with less than 100 mg-l of alkalinity are desirable for domestic use. The desirable level of total alkalinity for drinking water should be below 200 ppm (ISI, 1991). & III.

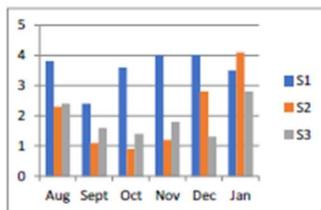


Figure 2: Seasonal Changes in the DO

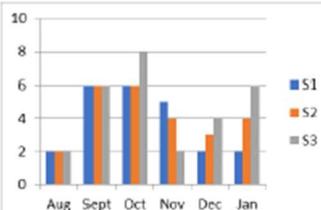


Figure 3: Seasonal Changes in the CO₂



Figure 4: Seasonal Changes in the HCO₃



Figure 5: Seasonal Changes in the Chlorinity



Figure 6: Seasonal Changes in the Total Hardness



Figure 7: Seasonal Changes in the Salinity



Baviskar RN, 2021

CO₃ (Carbonate Phenolphthalein alkalinity):

The mean Carbonates values of four different sampling sites during the present study was 3.285 ± 2.041 mg/L on S1, 4.166 ± 1.602 mg/L on S2, 4.666 ± 2.422 mg/L on S3. Alkalinity was found to be increased in winter season and decreased in rainy season and decrease in alkalinity during rainy season may be due to dilution, while increase in alkalinity in winter might be due associated with values of P^o, hardness and high dissolved solids and rate of carbon assimilation in water. Similar studies were carried out by Indresha et al. (2014). Seasonal variations showing Figure 3

HCO₃ (Bicarbonate or Methyl Orange alkalinity):

The mean Carbonates values of four different sampling sites during the present study are 51 ± 6.033 mg/L, on S1, 51.33 ± 9.933 mg/L, on S2, 46 ± 7.483 mg/L, on S3. The comparative changes in the bicarbonate are Seasonal variations showing Figure 4.

Chloride (Cl⁻)

Chlorides occur naturally in all types of waters, in Natural freshwaters, however, their concentration remains quite low and generally less that of sulphate and bicarbonate. The seasonal variations in the chloride value of all sampling sites are 35.45mg/L, 42.54mg/L, 28.36mg/L, 21.27mg/L, 28.36mg/L, 28.36mg/L of S1, 56.72mg/L, 63.81mg/L, 49.63mg/L, 35.45mg/L, 42.54mg/L, 35.36mg/L of S2, 42.54mg/L, 35.35mg/L, 49.63mg/L, 28.36mg/L, 28.36mg/L, 42.54mg/L of S3. The average chloride concentration during the present study was found to be 30.723 ± 7.322 mg/L, in S1, 47.266 ± 11.57 mg/L in S2, mg/L 37.979 ± 8.592 mg/L in S3. The comparative changes of chloride are shown in Figure 5.

Total Hardness:

Total hardness is defined as the concentration of multivalent metallic cations in solution. Water hardness is very important parameter of water quality. High concentration of hardness points out toward eutrophication of the aquatic ecosystem (Rai, 1974). During present investigation the average concentration of total hardness of S1 was found to be 320 ± 28.284 mg/L, 363.33 ± 44.57 mg/L in S2, 330 ± 10.954 mg/L in S3. The similar studies were carried out by Indresha et al. (2014) and Muralidharan and Waghod (2014) and it also supports to the finding of Shinde et al., (2011). The comparative values of total hardness are shown in Figure 6.

Salinity:

Salinity has been defined traditionally as the total solids in water after all carbonates have been converted to oxides, all bromide and iodide have been replaced by chloride and all organic matter has been oxidized. Salinity is an important unit less property of industrial and natural waters. It originally conceived as a measure of mass of dissolved salts in a given mass of solution. The seasonal variations in the salinity of all sampling sites are 65.05g/L, 78.06g/L, 52.04g/L, 39.03g/L, 52.04g/L, 52.04g/L of S1, 104.08g/L, 117.09g/L, 91.07g/L, 65.05g/L, 78.04g/L, 65.05g/L of S2, 78.06g/L, 78.06g/L, 91.07g/L, 52.04g/L, 52.04g/L, 78.06g/L of S3. The average concentration of the salinity during the present study was found to be 56.376 ± 13.43 g/L in S1, 86.733 ± 21.24 g/L in S2, 71.555 ± 15.93 g/L in S3. All the three sampling sites shows the slight fluctuations in the salinity during the present study and the similar studies were carried out by Indresha et al. (2014). The comparative values of salinity are shown in Figure 7.

SUMMARY AND CONCLUSION

In the present study total chemical parameters viz. DO, CO₂, CO₃, HCO₃, Chloride, salinity, Total hardness of four fresh water bodies viz. S1, S2 and S3 were analyzed. The monsoon and winter seasons shows different seasonal fluctuations in various chemical parameters. The observed chemical status of these water bodies are reported to be suitable for the development on planktonic organisms and fishes. The water of present reservoirs is useful for irrigation as well as fish culture. The water parameters indicate that the S2 and S3 are rich in nutrients. The life in the aquatic ecosystem is directly or indirectly depends on water quality.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

- APHA (1998) Standard methods for examination of water and waste water, 20th edition, edited by Lenore S. Clesceri, Arnold E. Greenber and Andrew D. Eaton.
- Dabhade DS (2006) Limnological studies on Lonar Crater Lake, Maharashtra. Ph.D. Thesis submitted to S.G.B. Amravati University, Amravati.

258 |

Int. J. of Life Sciences, Volume 9 (2) 2021



Analysis of chemical parameters of freshwater bodies of Kajali river Ratnagiri

- Indresha GN and Patra AK (2014) Seasonal variations in the physico-chemical parameters of Kanji lake. *Life Sciences Leaflets*, vol 47: 55-64.
- Kumar Vinay (2013) Physico-chemical characteristics of a fresh water body, Dadri, District G.B.Nagar, U.P. *Advances in Bioresearch*, vol4 (4):160-161.
- Muralidharan L and Waghode S (2014) Studies on physico-chemical characteristics of Tawa and Halali reservoir of Bhopal, India. *International Journal of Current Science*, vol 11:70-83.
- Rai H (1974) Limnological Studies on the River Yamuna at Delhi (Part - I) Relation between chemistry and the state of pollution. *Archives of Hydrobiology*, 73: 269-393.
- Shinde SE, Pathan TS, Raut KS and Sonawane DL (2011) Studies on the physico-chemical parameters and correlation coefficient of Harsool-Savangi Dam, District Aurangabad, India. *Middle-East Journal Scientific Research*, vol 8(3): 544-554.

© 2021 | Published by IJLSCI

www.ijlsci.in

Int. J. of Life Sciences, Volume 9 (2) 2021

| 259



Journal of the Maharaja Sayajirao University of Baroda
ISSN: 0025-0422

MORPHOLOGICAL AND ELECTRICAL PROPERTIES OF SPRAY DEPOSITED CdSe_{0.3}Te_{0.7} THIN FILM

Mr. A.D. Kanwate Thin Films and Materials Science Research Laboratory, Department of Physics,
Shahu college, Latur- 413512, Maharashtra, India.

Dr. E. U. Masumdarb Thin Films and Materials Science Research Laboratory, Department of Physics,
Shahu college, Latur- 413512, Maharashtra, India.

Abstract:

The CdSe_{0.3}Te_{0.7} thin film was deposited by using spray deposition techniques having substrate temperature 3000C. We studied morphological and electrical properties of deposited CdSe_{0.3}Te_{0.7} thin film through SEM, EDAX and two probe measurements techniques. The SEM micrograph of CdSe_{0.3}Te_{0.7} thin film looks like leaf structure composed of large number of flake-like thin micro-particles. From EDAX analysis conform that, the presence of Cd, Se and Te in prepared film with elemental stoichiometry of Cd, Se and Te were 54.49%, 9.12% and 36.39% respectively. The electrical resistivity of the film at room temperature was $1 \times 10^6 \Omega \text{cm}$.

Keywords: Morphological, Electrical, Spray techniques.

Introduction:

The II–VI semiconducting materials are very interesting and potential candidate for this ever-advancing technological fields, recently ternary alloys of semiconducting materials have received much attention in the fields of optoelectronic devices and solar energy conversion owing to their properties of band gap and lattice constant modulation by composition and other growth parameters [1, 2]. The cadmium chalcogenides CdSeTe has received much attention as it is used in devices such as solar cells, photoconductors, solar control applications and thin film transistors due to by obtaining desired crystal structure and tailored optical bandgap by changing the concentration of Se and Te [3-5].

Surendra K. Shinde et al [6] have deposited CdSe_{0.6}Te_{0.4} thin film on stainless steel and ITO coated glass substrate by using electrodeposition method. From XRD analysis shows that the films were polycrystalline nature with hexagonal crystal structure. FE-SEM studies reveal that the entire substrate surface was covered with CdSe_{0.6}Te_{0.4} nano-nest. In optical absorption study shows the presence of direct transition and calculated band gap of the film was $E_g = 1.7 \text{ eV}$. Further photovoltaic activity of CdSe_{0.6}Te_{0.4} films were studied. The efficiency and fill factor of these PEC cells were found to be 0.64% and 0.49 respectively. A. Kathalingam et al [7] investigated CdSe_xTe_{1-x} thin films by electrochemical deposition with variation of $x = 0.2, 0.4, 0.6$ and 0.8 . The XRD pattern of CdSeTe thin film at composition $x = 0.58$ shows polycrystalline hexagonal crystal structure with average crystalline size found that 200nm. From optical study revealed that, the bandgap of the film varied between 1.48 to 1.69 eV with compositions varied from 0.2 to 0.8. N. Muzhnikumarasany et al [8] have deposited CdSe_{0.7}Te_{0.3} and CdSe_{0.15}Te_{0.85} by hot wall deposition. The XRD pattern of CdSe_{0.7}Te_{0.3} film exhibits hexagonal structure and CdSe_{0.15}Te_{0.85} film exhibits cubic zinc blende structure.

So far in literature, there was no one deposited CdSeTe thin film with spray pyrolysis techniques. In our study, first time we trying to deposited CdSeTe thin film with the help of homemade spray pyrolysis techniques. The deposited film characterized through morphological, compositional and electrical with the help of SEM, EDAX and two probe measurement techniques respectively.

Experimental Setup:

The CdSeTe thin film deposited on silica glass by using homemade spray pyrolysis techniques with deposition temperature 300°C. For deposition glass substrate were boiled in chromic acid for 15 min. & washed with lebalene and distilled water, also substrates were ultrasonically cleaned for 10 min. The precursor were used for deposition as 0.025M equimolar 15ml solution of Cadmium Chloride (CdCl₂·H₂O) in double distilled water, 4.5ml solution of Selenium Dioxide (SeO₂) & 10.5ml solution of Tellurium Dioxide (TeO₂) in double distilled water and ammonia. The Triethanolamine (TEA) used as complexing agents and Hydrazine hydrate used for reduction agent. The total 30ml solution were mixed together and used for deposition with spray rate 4ml/sec. onto a glass substrate. Compressed air pressure was used as carrier gas to spraying a solution. The as-grown sample was thin, uniform, smooth and tightly adherent to the substrate support. The colour of the deposited film was dark brown.

The thickness of the deposited film was measured by gravimetric weight by difference method using sensitive microbalance and that was found 355nm. The surface morphology of the film was observed using scanning electron microscope (JOEL-JSM 5600 operating at accelerating voltage of 15 and 200kV). Elemental chemical compositions were studied by an energy dispersive X-ray spectrometer (Bruker EDAX, X Flash 6130). The electrical properties was studied by two probe measurement (Keithley Model 2400).

Characterization:

Scanning Electron Microscopy (SEM):

Volume-55, No.2 2021

473



Journal of the Maharaja Sayajirao University of Baroda
 ISSN: 0025-0422

The scanning electron microscopy is used to obtain information about surface topography of the deposited film. The scanning electron microscopy image of resultant CdSe_{0.3}Te_{0.7} film given in Fig.1. The SEM micrograph of CdSe_{0.3}Te_{0.7} thin film looks like leaf structure composed of large number of flake-like thin micro-particles with different sizes ranging from 1.681 to 2.836 μm. Thus there was not agreement with grain sizes calculated from SEM and XRD [9]. This may be due to two or more grains fusing together to form the cluster type of structure [10]. The SEM image also exhibits porous nature with small roughness at the surface of CdSe_{0.3}Te_{0.7} film.

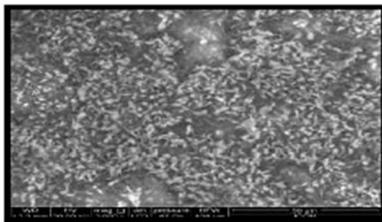


Fig.1: FSEM image of deposited CdSe_{0.3}Te_{0.7} thin film

Energy Dispersive X-ray Analysis (EDAX):

The compositional analysis of the CdSe_{0.3}Te_{0.7} thin film deposited at optimized preparative parameters is carried out by the EDAX technique. Fig.2 shows typical EDAX pattern of spray deposited CdSe_{0.3}Te_{0.7} thin film at substrate temperature 300°C. The presence of well-defined peaks related to Cd, Se and Te confirms the successful preparation of CdSeTe film with average atomic stoichiometry of Cd, Se and Te were 54.49%, 9.12% and 36.39% respectively, which shows slight rich in Cd and Te. The average weight and atomic percentage of Cd, Se and Te is shown in Table 1.

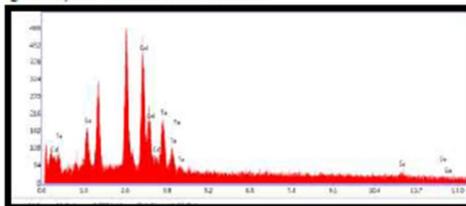


Fig.2: EDAX pattern of CdSe_{0.3}Te_{0.7} thin film

Table 1: Elements composition of CdSe_{0.3}Te_{0.7} thin film

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
Cd	53.31	54.48	372.31	4.30	0.8361	1.0189	0.9877	0.8662	1.0262
Te	49.42	36.38	156.78	14.20	0.3174	0.9648	1.0187	0.8053	1.0173
Se	8.27	9.12	7.10	63.88	0.0623	1.4888	0.9676	0.8747	1.2280

Electrical Properties:

The electrical resistivity of the CdSe_{0.3}Te_{0.7} thin film deposited at 300°C substrate temperatures was measured using a standard DC two-point probe method in temperature range 300-500K. The electrical resistivity of CdSe_{0.3}Te_{0.7} thin film was calculated by relation [11];

$$\rho = 2\pi s \frac{V}{I} \dots \dots \dots (1)$$

Where s is distance between two probes, the V was kept constant and I measured with varying temperature. Fig.3 shows the relationship between the inverse absolute temperature of the cooling cycle and log (resistivity). Resistivity decreases with



Journal of the Maharaja Sayajirao University of Baroda

ISSN: 0025-0422

increasing temperature, shows the typical semiconductor nature of the sample [12]. The value of resistivity at room temperature was found that $1 \times 10^6 \Omega \text{cm}$. These results have been reported in one of our previous work. The higher value of resistivity may be due to nanocrystalline nature of the film, discontinuity at surface boundary, imperfection and dislocation of the film. Due to grain boundary discontinuities the intergrain space effectively increases and increases the height of the grain boundary potential resulting in a decrease in carrier concentration as well as mobility and hence the electrical resistivity increases [13, 14].

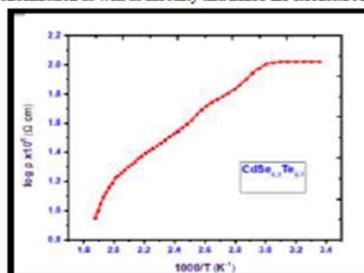


Fig.3: Variation of $\log \rho$ vs inverse temperature

Conclusion:

In recent years cadmium chalcogenide compounds have been extensively investigated because of their potential applications in solar energy conversion with different methods. But we successfully first time demonstrated synthesis of $\text{CdSe}_{0.3}\text{Te}_{0.7}$ thin film by homemade spray pyrolysis technique. The homemade spray pyrolysis technique is simple, cost effective and easy for deposition of ternary materials with desired parameters. The spray deposited $\text{CdSe}_{0.3}\text{Te}_{0.7}$ thin film have leading material in the field of optoelectronics, photo-voltaic devices because bandgap of the film near in optical spectrum reported in previous paper [15]. The SEM image of $\text{CdSe}_{0.3}\text{Te}_{0.7}$ thin film shows leaf of large number of flakes thin micro-particles. In EDAX pattern conforms the presence of Cd, Se, and Te materials. The electrical resistivity of the film at room temperature was found to be $1 \times 10^6 \Omega \text{cm}$.

References:

1. V. Saaminathan, K.R. Murali, *Physica B* 373 (2006) 233–239.
2. A.S. Khomane, P.P. Hankare, *Journal of Alloys and Compounds* 489 (2010) 605–608.
3. P.D. More, G.S. Shahane, L.P. Deshmukh, P.N. Bhosale, *Materials Chemistry and Physics* 80 (2003) 48–54.
4. K.R. Murali, *Materials Science in Semiconductor Processing* 13 (2010) 193–198.
5. K.R. Murali, B. Jayasutha, *Solar Energy* 83 (2009) 891–895.
6. Surendra K. Shinde, Jagannath V. Thombare, Deepak P. Dubal, Vijay J. Fulari, *Applied Surface Science* 282 (2013) 561–565.
7. A. Kathalingam, Mi-Ra Kim, Yeon-Sik Chae, Jin-Koo Rhee, S. Thanikaikarasan, T. Mahalingam, *Journal of Alloys and Compounds* 505 (2010) 758–761.
8. N. Muthukumarasamy, S. Velumani, R. Balasundaraprabhu, S. Jayakumar, M.D. Kannan, *Journal of Vacuum* 84 (2010) 1216–1219.
9. A. D. Kawate, E. U. Masumdar, Volume XII, Number 8, ISSN: 2319-7129, *Edu. World* (2018) 296-300.
10. S. Mahato, A.K. Kar, *J. Elec. Che.* 742, (2015), 23–29.
11. S. Erat, H. Metin, M. Ari, *Mater. Chem. Phys.* 111 (2008) 114.
12. K. Chaudhari, N. Gosavi, N. Deshpande, S. Gosavi, *J. Sci.: Advanced Materials and Devices* 1, (2016), 476-481.
13. A. Purohit, S. Chander, S.P. Nehra, M.S. Dhaka, *Physica E* 69 (2015) 342–348.
14. P.A. Chate, D.J. Sathe, P.P. Hankare, S.D. Lakade, V.D. Bhabad, *Journal of Alloys and Compounds* 552 (2013) 40–43.
15. S.K. Shinde, D.P. Dubal, G.S. Ghodake, V.J. Fulari, *Materials Letters* 126 (2014) 17–19.
16. K.R. Murali, *Materials Science in Semiconductor Processing* 13 (2010) 193–198.
17. S.K. Shinde, G.S. Ghodake, D.P. Dubal, G.M. Lohar, D.S. Lee, V.J. Fulari, *Ceramics International* 40 (2014) 11519–11524.
18. N. Muthukumarasamy, S. Velumani, R. Balasundaraprabhu, S. Jayakumar, M.D. Kannan, *Journal of Vacuum* 84 (2010) 1216–1219.
19. N. Muthukumarasamy, R. Balasundaraprabhu, S. Jayakumar, M.D. Kannan, *Materials Chemistry and Physics* 102 (2007) 86–91.
20. N. Muthukumarasamy, R. Balasundaraprabhu, S. Jayakumar, M.D. Kannan, *Materials Science and Engineering B* 137 (2007) 1–4.

Volume-55, No.2 2021

475



Characterizations of Spray Deposited CdTe Thin Film

A. D. Kanwate^a, E. U. Masumdar^a, V.R. Panse^b, Mikael Syvajarvi^c
Manmeet Kaur^d

^aThin Films and Materials Science Research Laboratory, Department of Physics, Shahu college, Latur- 413512, Maharashtra, India.

^bDepartment of Physics, Late B.S.Arts Prof.N.G.Sci & A.G.Comm College Sakharherda, India-443202

^cLinkoping University, Sweden ALMINICA AB ,ICM Research Institute
Research utilization and innovation capacity

^dDept of Applied Physics, Shri Shankaracharya Technical Campus, Bhilai, Chhattisgarh, India.

[✉]Corresponding author email id: ysh.panse@gmail.com

Abstract:

The spray pyrolysis is promising technique for deposition of CdTe thin film. We deposited CdTe thin film on glass substrate by homemade spray pyrolysis technique at substrate temperature 300°C. The CdTe thin film was characterized through Field scanning electron microscopy (FSEM), Energy dispersive X-ray analysis (EDAX), UV-Visible spectroscopy. The SEM micrograph shows the film was uniform coverage, large number of densely packed grain whose sizes ranging from 474nm to 1.64µm. From EDAX analysis confirm that the presence of Cd and Te in prepared film with elemental stoichiometry of Cd and Se was 50.28% and 49.72% respectively. The optical absorption coefficient of the film of order of 10⁶ and band gap of the film 1.45eV.

Keywords: Thin Film, Morphological, Compositional, Optical

1. Introduction:

Theoretically, Cadmium Telluride (CdTe) solar cell technology can improve on the production costs and conversion efficiency of conventional silicon solar cell technology. This was possible due to optimal band gap energy (about 1.4 eV) for huge light absorption capability, solar energy absorption and small cost requirements for production of commercial solar cell [1, 2]. S.D. Gunjal et. al have deposited CdTe thin film on sodalime glass substrate by homemade spray pyrolysis technique at temperature 350°C. From XRD pattern revealed that, film was cubic crystal structure having crystalline size 32nm. The SEM micrograph shows a spherical granules with average size of 0.25µm. The thickness of the film was found to be 3.2µm. In optical study calculated absorbance and band gap of the film and found that 0.94 and 1.44 eV respectively [3]. V.V. Ison et. al have deposited CdTe film on glass substrate by spray pyrolysis techniques with substrate temperature 350°C. The XRD pattern of CdTe thin film at different ambient condition shows a formation of oxides such as



CdTeO₃, TeO₂ and Te. These oxides removed from CdTe thin film by adjusting the amount of oxygen in the spray [4]. V. M. Nikale et al. investigated CdTe thin films have prepared by using spray pyrolysis. The XRD analysis shows the film has polycrystalline nature having cubic structure with strong (111) orientation. Micrographs reveal that grains were uniformly distributed over the surface. The EDAX study shows there was a stoichiometric 1:1 Cd & Te ratio. The optical absorption shows the presence of direct transition with band gap energy of 1.5 eV [5]. Huizhen Yao et al. have been investigated properties of CdTe thin films on Ni foil substrate by screen printing and then film sintered in a nitrogen atmosphere. Furthermore, studied effect of sintering temperature on CdTe thin films. From XRD pattern revealed that the CdTe thin film exhibits cubic crystal structure. From UV-visible spectra of CdTe thin films revealed that, there was a large absorption in range of 600-900nm, with the raising sintering temperature, the absorption bands exhibit a constant red-shift. The optical bandgap of the films were found that 1.472 eV, 1.470 eV, 1.465 eV and 1.440 eV for films fabricated at 450°C, 500°C, 550°C, 600°C respectively [6]. Laxman Gouda et al. have been deposited CdTe thin film on glass and ITO coated glass substrate by using chemical bath deposition with variations in composition of the solution. From XRD pattern revealed that, film exhibit cubic crystal structure with lattice constant 6.4424 Å. The optical studies in the UV-Visible radiation range show that the band gap varies from about 1.26 eV to over 1.8 eV depending on the composition of the film [7]. Jun Wang et al. have been deposited CdTe thin film on Ni foils by using two-step electrode position method. From SEM images they observed that, film contains some raised particles in one-step CdTe deposition while no raised particles were observed for two-step CdTe thin films, indicating that the smooth surface and dense structure were achieved by two-step electrode position. From UV-Visible spectra observed that, absorption band of the one-step film yields an onset near 400 nm and an absorption peak at about 650 nm [8].

In the present paper deals with synthesis of CdTe thin film by simple and low cost homemade spray pyrolysis techniques onto glass substrate. Further film characterized through Field scanning electron microscopy (FSEM), Energy dispersive X-ray analysis (EDAX), UV-Visible spectroscopy.

2. Experimental Details:

The spray pyrolysis an easy and inexpensive technique conformable for the manufacture of large area thin films. A main advantage of this technique is that, the properties of the thin films can easily change by varying the deposition conditions.

The CdTe thin film was prepared on glass substrate using homemade spray pyrolysis technique at room temperature 300°C. Before the deposition the substrates were cleaned with freshly prepared chromic acid, followed by labolene solution and double distilled water. Before the deposition substrates were ultrasonically cleaned for 10 min. For deposition the precursor solution consist of 0.025M Cadmium Chloride (CdCl₂.H₂O) was dissolved in 15ml double distilled water complexed with two droplets of TEA to release Cd²⁺ ions and 0.025M Selenium dioxides (SeO₂) dissolved in 7.5ml of double distilled water complexed by using 7.5ml aqueous ammonia (25% NH₄OH) to obtained pH ~11.5. Finally these two solutions were mixed together and sprayed by pressurized atmospheric air through a nozzle onto



YMER // ISSN : 0044-0477 http://ymedigital.com

preheated glass substrate. The spray rate of the solution was maintained at 2ml/min. During deposition, substrate was kept 22cm apart from nozzle. These spray deposited film was strong, mechanically hard, pin hole free. The deposited CdTe thin film was black in color. The gravimetric weight by difference method was used for measuring the thickness of film by using sensitive microbalance. The surface morphology of the film was observed using scanning electron microscope (JOEL-JSM 5600 operating at accelerating voltage of 15 and 200kV). Elemental compositions of the film was studied by an Energy dispersive X-ray spectrometer (Bruker EDAX, XFlash6130). Optical absorptions and band of the film was recorded by UV-visible spectrophotometer (Shimadzu 2450).

3. Result and Discussion:

3.1 Thickness Measurements
 The thickness of the deposited films was determined by gravimetric method using the relation [9]:

$$t = \frac{\Delta m}{l \times b \times \rho} \dots \dots \dots (1)$$

Where Δm is weight difference between before and after the deposition of substrate, l is length of substrate, b is breadth of substrate; ρ is density of CdTe material. The films thickness was found to be 446nm. The estimated value of thickness is small as compared to previous reported value [3, 4].

3.2 Scanning Electron Microscopy :
 The scanning electron microscopy is used to determine the surface morphology of the deposited CdTe thin film. The micrograph of deposited film as shown in Fig.1 it is observed that, the film was uniform coverage, large number of densely packed cubic crystalline grain whose sizes ranging from 474nm to 1.64 μ m. Thus there was not agreement with grain sizes calculated from SEM and XRD. This may be due to two or more grains fusing together to form the cluster type of structure [10, 11].

VOLUME 20 : ISSUE 11 (Nov) - 202111 Page No:85



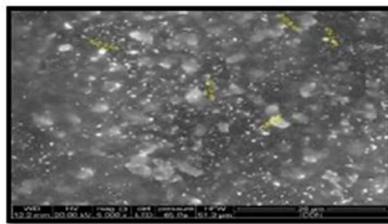


Fig.1: SEM image of deposited CdTe thin film

3.3 Energy Dispersive X-ray analysis (EDAX):

The EDAX techniques was used to determine elemental analysis of deposited CdTe thin film. Fig.2 shows EDAX pattern of CdTe thin film deposited by spray at substrate temperature 300°C. The presence of well-defined peaks related to Cd and Te confirms the successful preparation of CdTe films. From EDAX analysis conform that the presence of Cd and Te in prepared film with elemental stoichiometry of Cd and Se was 50.28% and 49.72% respectively. It is close to 1:1 for prepared CdTe film. The average weight and atomic percentage of Cd and Te is shown in table.

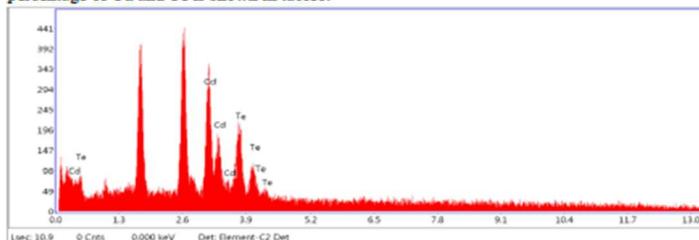


Fig.2: EDAX image of CdTe thin film

cZAF Smart Quant Results									
Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
CdL	47.52	50.28	308.46	5.09	0.4856	1.0263	0.0600	0.0730	1.0300
TeL	52.86	49.72	197.74	12.71	0.4300	0.9737	1.0082	0.8226	1.0100

Table-1: Compositional Analysis CdTe thin film

3.4 UV-Visible Optical Spectroscopy:

Fig.3 shows the optical absorption spectra of CdTe thin film recorded in the range 400 to 1100nm by UV-vis spectroscopy. The absorption spectra reveals the decrease in absorbance with increase in wavelength near the band edge in the range 400-700 nm. The optical



absorbance was highly sensitive to the distribution of grains and their height variation on the surface of the layers which indicated semiconducting nature of films [20]. In the strong absorption region, optical absorption coefficient was estimated by using Beer-Lambert equation [21];

$$\alpha = \frac{1}{t} \ln \left(\frac{I_0}{I} \right) \dots \dots \dots (2)$$

Where t is the film thickness and T is transmittance of the film. The value of absorption coefficient is order of 10⁵, which is decrease with increase in wavelength. It is good agreement with earlier report [22]. The optical band gap was calculated by assuming a direct transition using Tauc plot given by equation [21];

$$\alpha h\nu = A(h\nu - E_g)^2 \dots \dots \dots (3)$$

Where, α-absorption coefficient, hν-incident photon energy, E_g-optical band gap energy. From the linear fit of the plot (αhν)² versus photon energy (E) as shown in fig 4, we estimate the value of 1.45 eV. The value of bandgap obtained agrees with the previously results [23, 24].

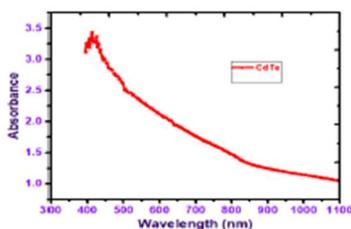


Fig.3: shows the optical absorption spectra of CdTe thin film

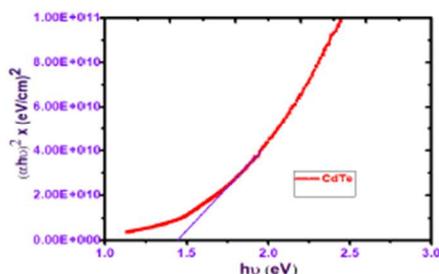


Fig.4: Energy band gap spectra of CdTe thin film

4. Conclusion:

The CdTe thin film deposited by homemade spray pyrolysis technique at substrate temperature 300°C result as follows:



- i) The thickness of the deposited CdTe thin film was found that 446nm.
- ii) From the SEM micrograph shows the film was uniform coverage, large number of densely packed grain whose sizes ranging from 474nm to 1.64 μ m.
- iii) From EDAX analysis conform that the presence of Cd and Te in prepared film with elemental stoichiometry of Cd and Se was 50.28% and 49.72% respectively.
- iv) The optical absorption coefficient of the film of order of 10^6 and band gap of the film 1.45eV.

From this result, homemade spray pyrolyzed deposited CdSe film is suitable for various applications such as photosensitive device includes hetero junction solar cells by avoiding use of Si, photovoltaic cell, thin film transistors, sensors etc.

Acknowledgement

One of the authors A.D. Kanwate is grateful to the CSIR, New Delhi, India for the financial assistance through the Junior Research Fellowship (File No. 08/595(0002)/2015-EMR-I).

References:

- 1) Youn-Ok Choia, Nam-Hoon Kimb, Ju-Sun Parka, Woo-Sun Lee, *Materials Science and Engineering B* 171 (2010) 73–78.
- 2) Subhash Chander, M.S.Dhaka, *Materials Science in Semiconductor Processing* 40 (2015) 708-712.
- 3) S.D. Gujral, Y.B. Kholam, S.R. Jadhkar, T. Shripathi, V.G. Sathe, P.N. Shelke, M.G. Takwale, K.C. Mohite, *Solar Energy* 106 (2014) 56–62.
- 4) V.V. Ison, A. Ranga Rao, V. Dutta, *Solid State Sciences* 11 (2009) 2003–2007.
- 5) V. M. Nikale, S. S. Shinde, C. H. Bhosale, and K.Y. Rajpure, Vol. 32, No. 3 *Journal of Semiconductors* March 2011.
- 6) Huizhen Yao, Jinwen Ma, Yunnan Mu, Shi Su, Pin Lv, Xiaoling Zhang, Liying Zhou, Xue Li, Li Liu, Wuyou Fu, Haibin Yang, *Journal of Alloys and Compounds* 634 (2015) 19-25.
- 7) Laxman Gouda, Yelameli Ramesh Aniruddha, Sheela K. Ramasesha, *Journal of Modern Physics*, 2012, 3, 1870-1877.
- 8) Jun Wang, Qian Li, Yunnan Mu, Siyu Li, Lihua Yang, Pin Lv, Shi Su, Tie Liu, Wuyou Fu, Haibin Yang, *Journal of Alloys and Compounds* 636 (2015) 97–101.
- 9) P. Saha, J. Ganguli, N. Sharma, *Chemical Science Transactions*, ISSN: 2278-3458 2016, 5(3), 657-660.
- 10) N. Samarth, H. Luo, J.K. Furdyna, S.B. Qadri, Y.R. Lee, A.K. Ramdas, N. Otsuka, *Appl. Phys. Lett.* 2680 (1989) 54.
- 11) R. Wahab, G. Ansari, Y. Kim, H. Seo, G. Kim, G. Khang, et al., *Mater. Res. Bull.* 42, (2007), 1640-8.
- 12) S. Mahato, A.K. Kar, *J. Elec. Che.* 742, (2015), 23–29.
- 13) S. D. Gujral, Y. B. Kholam, M.T. Sarode, S.A. Arrote, P.N. Shelke, K. C. Mohite, *IJCPS* ISSN: 2319-6602, Vol. 3 *Special Issue – NCETNN Dec-2014*.
- 14) Jun Wang, Qian Li, Yunnan Mu, Siyu Li, Lihua Yang, Pin Lv, Shi Su, Tie Liu, Wuyou Fu, Haibin Yang, *Journal of Alloys and Compounds* 636 (2015) 97–101.



Original Article: Synthesis of (\pm)-Baclofen using Wittig Olefination–Claisen Rearrangement



Deekshaputra R. Birkhade^{a,*} Rohit G. Shinde^b Mahendra N. Lokhande^c Milind D. Nikalje^b

^aDepartment of Chemistry, Shri Vyankatesh Arts, Commerce and Science College, Deulgaon Raja, Dist. Buldana, Maharashtra, India

^bDepartment of Chemistry, Savitribai Phule Pune University, Pune, Maharashtra, India

^cDepartment of Chemistry, Arvayyar Government College for Women, Karalkal, Puducherry, India



Deekshaputra R. Birkhade^{a,*}, Rohit G. Shinde^b, Mahendra N. Lokhande^c, Milind D. Nikalje^b, Synthesis of (\pm)-Baclofen using Wittig Olefination–Claisen Rearrangement. *J. Appl. Organomet. Chem.*, 2021, 1(3), 109-115.

<https://doi.org/10.22004/jaoc.2021.284219.1018>



Article info:

Received: June 17, 2021

Accepted: July 5, 2021

Available Online: July 5, 2021

ID: JAOC-2105-1018

Checked for Plagiarism: Yes

Peer Reviewers Approved by:

Dr. SUNIL V. GAIKWAD

Editor who Approved Publication:

Professor Dr. Abdelkader Zarrouk

Keywords:

Wittig reaction, Claisen rearrangement, Ozonolysis, Azido acid, GABA, Baclofen, Neurotransmitter, Agonist.

ABSTRACT

Baclofen, a lipophilic derivative of GABA (Gamma-Aminobutyric Acid), which acts as an inhibitory neurotransmitter in CNS (Central Nervous System) was synthesized by Wittig olefination-Claisen rearrangement protocol. 4-Chlorobenzaldehyde was subjected to Wittig reaction with ((allyloxy)methylene)triphenyl-phosphane to give 1-(2-(allyloxy)vinyl)-4-chlorobenzene which on heating under reflux condition in toluene underwent Claisen rearrangement to give 2-(4-chlorophenyl)pent-4-enal. Aldehyde was reduced to corresponding alcohol 2-(4-chlorophenyl)pent-4-en-1-ol as an important precursor which can be used for the synthesis of Baclofen and different GABA derivatives. Further, tosylation, formation-reduction of azide group and oxidative ozonolysis of terminal double bond yields 4-amino-3-(4-chlorophenyl)butanoic acid (Baclofen) in excellent yield. Therefore, an efficient method was developed for the synthesis of (\pm)-Baclofen in a simple seven step procedure.

Introduction

Baclofen (Figure 1) is an analog of GABA which can cross the blood brain barrier while GABA cannot. Baclofen is a selective and potent agonist for bicuculline-insensitive GABA_B receptors. Baclofen is also used clinically as an antispastic as well as muscle relaxant agent [1]. Baclofen reduces the excitatory effect of active compounds such as barbiturates,

benzodiazepine, etc[2,3]. Baclofen is also one of the most promising drugs in the control and treatment of the paroxysmal pain of trigeminal neuralgia [4]. Along with this Baclofen is also used for spasticity of spine without influencing the sedation[5]. Significant increment in gastric acid secretion was also observed in rats through the activation of central cholinergic mechanisms. Baclofen is commercialized in its racemic form [6] though R-enantiomer shows

*Corresponding Author: Deekshaputra Ramrao Birkhade (dbkhabirkhade@gmail.com)



biological activity exclusively [7]. The pharmacodynamic and toxicological properties. enantiomers of Baclofen differ in their

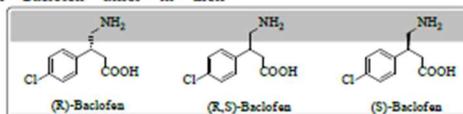


Figure 1. Baclofen Stereoisomer's

Several specific agonists or antagonists at GABA receptor sites have been developed, but 3-(4-chlorophenyl)-4-aminobutyric acid, i.e. Baclofen, is the only clinically useful selective GABA agonists [8]. Baclofen is used in the treatment of paroxysmal pain of trigeminal neuralgia and spasticity of spinal [9].

Enantioselective synthesis of R and/or S form of Baclofen along with their analogues number of methods are reported in the literature. Han *et al.* (2011) used efficient Rh-catalyzed asymmetric 1,4-addition of arylboronic acids to ethyl- γ -phthalimidocrotonate by using bis-sulfoxide ligand for the synthesis of γ -aminobutyric acid (GABA) derivatives [10]. Bae *et al.* (2011) used highly enantioselective bio mimetic Michael addition reactions of malonic acid half thioesters (MAHTs) to a variety of nitro olefins to produce (S)-(+)-Baclofen-HCl salt [11]. Anna *et al.* (2010) developed an enantioselective biocatalytic reduction of β -aryl- β -cyano- α,β -unsaturated carboxylic acids from anaerobic bacteria for (S)-Baclofen synthesis [12]. Vaselyet *al.* (2008) used a novel organocatalytic highly enantioselective nitrocyclopropanation reaction of α,β -unsaturated aldehydes as a key step for the synthesis of (S)-Baclofen [13]. Kozo *et al.* (1998) used Lipase mediated asymmetric acetylation of δ -symmetrical 2-aryl-1,3-propanediols as a key step for the synthesis of (S)-Baclofen [14]. Mahendraet *al.* (2015) used asymmetric Michael addition of diethyl malonate to 1-chloro-4-(2-nitrovinyl) benzene in the presence of scandium triflate and sparteine as organo catalyst to produce R-(-)-Baclofen [15]. Yang *et al.* (2012) used the Pd-catalyzed asymmetric allylic alkylation (AAA) reaction of nitromethane with (E)-3-(4-

chlorophenyl)allyl methyl carbonate (monosubstituted allyl substrates) as a key step for the synthesis of (R)- Baclofen [16]. Yongcaner *al.* (2008) used the enantioselective Michael addition reaction of nitromethane to 3-(4-chlorophenyl)-acrylaldehyde (α,β -unsaturated aldehydes) under the catalysis of (R)-2-(diphenyl(trimethylsilyloxy)methyl)-pyrrolidine and lithium acetate as additive to make (R)-Baclofen [17]. Nikaljeet *al.* (2003) synthesized (R)-(-)-Baclofen using Ru(II)-(S)-BINAP catalyzed asymmetric hydrogenations of C=C and C=O groups introducing stereogenic centre into the molecule constitute the key step [18]. Mazzini *et al.* (1997) developed the strategy for the synthesis of (R)-Baclofen involved a microbiologically mediated Baeyer Villiger oxidation of the prochiral 3-(4'-chlorobenzyl)-cyclobutanone obtained from 4-chlorostyrene and trichloro acetyl chloride as a key step [19]. Fabricio *et al.* (2015) used Michael addition reaction of 1,3-dicarbonyl compound (Meldrum's acid) to nitrostyrene effectively promoted by hydrotalcite [Mg-Al] to afford the respective γ -nitroester through a one pot domino process, which was further converted to (±)-Baclofen [20]. Kallolmayet *al.* (2014) synthesised (±)-Baclofen by using Suzuki coupling reaction as a key step between mucochloric acid and 4-chlorophenylboronic acid [21]. Chang *et al.* (2006) used MCPBA epoxidation and Baeyer Villiger oxidation reaction for the synthesis of (±)-Baclofen [22]. Ravi *et al.* (2006) synthesized Baclofen using Pd(II)-bipyridine catalyzed conjugative addition of 4-chloroboronic acid as key step [23]. Zhenliang *et al.* (2005) used Rh(II) catalyzed intramolecular C-H insertion of diazoacetamides for the synthesis of (±)-Baclofen [24]. Mohammad *et al.* (2003) used



condensation of β -nitro styrene with diethyl malonate as a key step for the synthesis of (\pm)-Baclofen [25]. Meng-Yang *et al.*(2003) reported a facile [3+2] annulation reaction as key step between sulfonyl-acetamide derivatives and α -bromo substituted unsaturated alkyl esters to synthesize (\pm)-Baclofen [26]. Marcos *et al.*(2002) used Heck arylation of N-Boc-3-pyrroline with 4-Chlorophenyl-diazonium tetrafluoroborate using palladium acetate under phosphine free condition to produce (\pm)-Baclofen [27]. Alcindo *et al.*(2001) introduced 1,4-Michael addition reaction of 2,4,4-trimethyl-2-oxazoline cyanocuprate to the commercially available *p*-chloro- β -nitrostyrene for the synthesis of (\pm)-Baclofen [28]. Fernando *et al.*(1997) synthesized (\pm)-Baclofen using [2+2] cycloaddition reaction between 4-chlorostyrene and trichloro acetyl chloride [29].

However these methods suffer from many drawbacks such as use of expensive reagents or catalysts and low overall yield. In this context, we report a novel route for the synthesis of (\pm)-Baclofen.

Experimental Section

Synthesis of 1-(2-(allyloxy)vinyl)-4-chlorobenzene (2)

To a suspension of 4-chlorobenzaldehyde 1 (5 g, 35.56 mmol) and allyloxy methylene triphenylphosphoniumchloride (19.68 g, 53.35 mmol) in dry toluene (60 mL), potassium-*tert*-butoxide (4.2 g, 53.35 mmol) was added in small amounts over the period of 10 min. at 0 °C. Further for 1h, the reaction mixture was stirred at the room temperature. After the completion of reaction (TLC check, 10% ethyl acetate: pet ether), toluene was removed on rotary evaporator under reduced pressure. Water was added and the crude product was extracted thrice with ethyl acetate (3x 25 mL). Water washing was given to the combined organic layer. Organic fractions of ethyl acetate combined was dried with Na₂SO₄ and concentrated on rotary evaporator under reduced pressure. The crude product was further purified by column chromatography using ethyl acetate:pet ether (2:98) as a mobile

phase to give pure allyl vinyl ether 2 as colorless thick liquid. The product in hand was the mixture of *E* and *Z* isomers (12.5 g, 89.2%).

Synthesis of 2-(4-chlorophenyl)pent-4-enal (3)

Toluene (30mL) was added in the isomeric mixture of allyl vinyl ether 2 (12.5 g) and solution was refluxed for 10h at 120 °C. After the completion of reaction (TLC check, 20% ethyl acetate: pet ether), toluene was removed on rotary evaporator under reduced pressure. The crude product aldehyde 3 obtained was the viscous liquid, a mixture of two inseparable enantiomers which was used for the further reaction without any purification (12.4g, 99% yield).

Synthesis of 2-(4-chlorophenyl)pent-4-en-1-ol (4)

Aldehyde 3 (5 g, 25.64 mmol) was dissolved in 5% aqueous methanol (50 mL). Sodium borohydride (0.96 g, 25.64 mmol) was added in the reaction mixture portion wise at 0 °C over a period of 10 min and stirred for 30 min. After completion of reaction (TLC check, 30% ethyl acetate: pet ether), methanol was removed on rotary evaporator under reduced pressure.

Ethyl acetate (20mL) was added in the crude residue followed by water (10 mL). Organic layer was collected separately and aqueous layer was extracted with ethyl acetate (3x10mL). Combined organic was dried over anhydrous sodium bisulphate and concentrated on rotary evaporator under reduced pressure. Column chromatography technique was used for purification with ethyl acetate/pet ether (5:95) as a solvent system to give the alcohol 4 (4.8 g, 96% yield).

Synthesis of 2-(4-chlorophenyl)pent-4-en-1-yl 4-methylbenzenesulfonate(5)

Under a nitrogen atmosphere excess of pyridine (18 g) and catalytic amount of DMAP was added to a solution of alcohol 4 (9 g, 45.91 mmol) in dry DCM at 0 °C. After stirring for 15 min, *p*-toluenesulfonyl chloride (13.15 g, 68.87 mmol) was added portion wise and stirring was continued for 8h. After completion of reaction (TLC check, 20% ethyl acetate: pet ether),



2021, Volume 1, Issue 3

Journal of Applied Organometallic Chemistry

solvent was removed on rotary evaporator. In the crude product water was added and extraction was done with ethyl acetate (3x10 mL). Na_2SO_4 was used for drying combined organic layer. Dried organic layer was concentrated on rotary evaporator. Further purification was done using column chromatography (hexane/EtOAc, 96:4) to give white solid tosylated compound 5 (15 g, 93%).

Synthesis of 1-(1-azidobut-3-en-2-yl)-4-chlorobenzene (6)

Tosylate 5 (8 g) was dissolved in dry DMF and NaN_3 (4 g) was added. Reaction mixture was stirred for 10h at 60 °C. After completion of reaction (TLC check), reaction mixture was allowed to cool. Water was added and extraction was done with ethyl acetate. The combined organic layer was washed with brine solution and dried with anhydrous Na_2SO_4 . Solvent was removed under reduced pressure to get crude product which was purified by column chromatography (hexane/ethyl acetate, 97:3) to give azide 6 as a yellow viscous liquid (4g, 80%).

Synthesis of 4-azido-3-(4-chlorophenyl)butanoic acid (7)

To a stirred solution of azide 6 (1g) in dry DCM, ozone gas was passed at -78 °C for 15 minutes till complete conversion of the reactant into corresponding ozonide. After complete conversion of reactant into ozonide (TLC

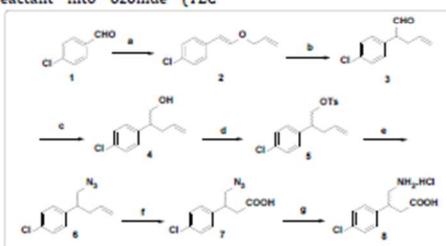
check), hydrogen peroxide (2 eq.) was added in the reaction mixture to convert ozonide into corresponding acid. Under reduced pressure, DCM was evaporated on rotary evaporator. Extraction was done by ethyl acetate (2x10 mL). The crude product obtained was purified with base/acid treatment followed by column chromatography (hexane/ethyl acetate, 80:20) to give azido acid 7 as a yellow viscous liquid (0.70g, 65%).

Synthesis of 4-amino-3-(4-chlorophenyl)butanoic acid hydrochloride (8)

A mixture of azido acid 7 (200 mg) in MeOH (15 mL) and 10 % Pd/C (10 mg) was hydrogenated at balloon pressure for 10 h at room temperature. The reaction mixture was filtered off through celite using vacuum pump. The filtrate was evaporated on rotary evaporator to give (±)-Baclofen as colourless solid (0.149g, 84%). The HCl gas was passed through the solution of residue dissolved in DCM/MeOH for 15-30 minutes. The precipitate thus formed was collected by filtration to obtain salt of (±)-Baclofen hydrochloride 8.

Result and Discussion

The present strategy for the synthesis of (±)-Baclofen starting from commercially available 4-chlorobenzaldehyde is depicted in Scheme 1.



Scheme 1. Reagent and conditions: (a) $\text{ClPh}_2\text{PCH}_2\text{-O-CH}_2\text{CH=CH}_2$, t-BuOK, Toluene, 0 °C, 1h, 90%; (b) Toluene, 120 °C, 10h, 98 %; (c) NaBH_4 , MeOH, 0 °C, 1h, 96% (d) TsCl, Pyridine, DMAP, DCM, 0 °C,

112



Journal of Applied Organometallic Chemistry	2021, Volume 1, Issue 3
<p>7h, 93%; (e) NaN₃, DMF, 60 °C, 10h, 80%; (f) O₃, H₂O₂, DCM, 0 °C, 10 min, 65%; (g) H₂, Pd/C, MeOH, HCl, 84%</p> <p>The Wittig reagent was powdered and dried under vacuum at 100 °C. Allyloxy-methylene-triphenyl phosphonium chloride salt (1.5 eq.) was treated with 4-chloro benzaldehyde 1 (1 eq.) and t-BuOK (2 eq.) in dry toluene at 0 °C for 1h to get allyl vinyl ether [30-34]. The isomeric mixture of allyl vinyl ether 2 as such was refluxed in toluene to carry the Claisen rearrangement to produce 4-pentenal 3 in enantiomeric form [35]. Enantiomeric mixture of aldehyde 3 was reduced to get alcohol 4 using sodium borohydride at 0 °C[35]. Alcohol 4 was protected to achieve 5 using tosyl chloride and excess of pyridine in DCM solvent [36-40].Tosyl ether was heated with sodium azide at 60 °C to produce corresponding azide6[41].Double bond from the azide6 was transformed to corresponding acid functionality using oxidative ozonolysis to get azido acid 7[42-45].Azido acid 7 was hydrogenated with 10% Pd/C under balloon pressure in presence of hydrogen gas to reduce azide functionality to corresponding amine [41] to gave (±)-Baclofen as product. (±)-Baclofen was treated with HCl to get corresponding hydrochloride salt i.e. (±)-Baclofen hydrochloride 8 as final product in 84% yield.</p> <p>Conclusion</p> <p>In summary, we have described a new and efficient method for the synthesis of (±)-Baclofen using Wittig Olefination-Claisen rearrangement as a key step. The overall yield of the reaction is 35%. The synthesis involved easy, reproducible reaction to afford desired product</p> <p>Acknowledgements</p> <p>The authors thank CSIR, New Delhi, for research fellowships, and Department of Chemistry, Savitribai Phule Pune University, Pune for infrastructural facility.</p> <p>Funding</p>	<p>We have not gotten any sort of funding for the exploration work</p> <p>Conflict of Interest</p> <p>The authors declared that they do not have any conflict of interest regarding this research article.</p> <p>Orcid:</p> <p>Deekshaputra R. Birkhade: https://www.orcid.org/0000-0003-4007-0057 Rohit G. Shinde: https://www.orcid.org/0000-0002-9227-9891 Mahendra N. Lokhande: https://www.orcid.org/0000-0002-9226-119X Milind D. Nikalje: https://orcid.org/0000-0001-6184-1987</p> <p>References</p> <ol style="list-style-type: none"> 1. I.A. Mohamed, H. Claus, B.O. Hans, <i>Molecules</i>, 2013, 18, 10266-10284.[Crossref], [Google Scholar], [Publisher] 2. F.K. Pier, P.Zimmerman, <i>Brain Res.</i> 1973, 54, 376.[Crossref], [Google Scholar], [Publisher] 3. P.Polc, W.Haefely, <i>NaunynSchmiedbergs Arch Pharmacol</i>, 1976, 294, 121.[crossref], [Google Scholar], [Publisher] 4. G.H. Fromm, C.F.Terrenc, H.S.Chaftha, J.D. Glass, <i>Arch Neural</i>,1980, 37, 768.[crossref], [Google Scholar], [Publisher] 5. B.A.Sachais, J.N. Logue, <i>Arc Neural</i>.1977, 34, 422. [crossref], [Google Scholar], [Publisher] 6. V.V. Thakur, A.S.Paraskar, A.Sudalai <i>Indian Journal of Chemistry-Section B</i>, 2007,46B(2), 326-330.[crossref], [Google Scholar], [Publisher] 7. E.M.Jorgensen,GABA (August 31, 2005), WormBook. [crossref], [Google Scholar], [Publisher] 8. W.Sieghart,<i>Pharmacol Rev.</i>,1995,47(2), 181-234. PMID: 7568326.[PDF], [Google Scholar], [Publisher] 9. L. Ji, Y. Ma, J. Li, L. Zhang, L.Zhang,<i>Tetrahedron Letters</i>, 2009, 50, 6166-6168. [crossref], [Google Scholar], [Publisher]



Lectotypification of six names in the genus *Sida* (Malvaceae)

Nimbalkar V.V.¹, Tambde G.M.² & M.M. Sardesai^{1*}

¹Department of Botany, Savitribai Phule Pune University, Pune, Maharashtra – 411 007, India

²Department of Botany, Shri. Vyankatesh Arts, Commerce and Science College, Deulgaon Raja, Maharashtra – 443 204, India

*E-mail: sardesaiimm@gmail.com

Abstract: Six names in *Sida* L., viz., *S. cuneifolia* Roxb., *S. mysorensis* Wight & Arn., *S. ovata* Forssk., *S. repens* Dombey ex Cav., *S. scabrida* Wight & Arn. and *S. schimperiana* Hochst. ex A.Rich. are lectotypified here. Of these names, *S. mysorensis* Wight & Arn. and *S. schimperiana* Hochst. ex A.Rich. involve second-step lectotypification.

Keywords: India, Lectotypes, Malvaceae, *Sida*, Typification.

Introduction

The genus *Sida* L. was established by Linnaeus (1753) to include ten species, of which four, viz., *S. spinosa* L., *S. rhombifolia* L., *S. alnifolia* L. and *S. cordifolia* L. are now retained in *Sida*: two species in *Wissadula* Medik. and one each in *Abutilon* Mill., *Herissantia* Medik., *Anoda* Cav. and *Malachra* L. *Sida* is one of the largest genera in the family Malvaceae, and distributed mainly in tropical and subtropical regions of the world with c. 250 species (Mabberley, 2017; POWO, 2019). Paul and Nayar (1988) and Paul (1993) reported 12 species of *Sida* from India, subsequently Sivarajan and Pradeep (1996) recorded 17 species from southern Peninsular India. Two new species were described by Tambde *et al.* (2016, 2020) while the occurrence of *S. angustifolia* Medik. in India is discussed by Gavade *et al.* (2020). With these reports, the genus is represented by 22 species in India. In the present paper lectotypes are

designated for six names in *Sida*, viz., *S. cuneifolia* Roxb., *S. mysorensis* Wight & Arn., *S. ovata* Forssk., *S. repens* Dombey ex Cav., *S. scabrida* Wight & Arn. and *S. schimperiana* Hochst. ex A.Rich. in accordance with the ICN (Turland *et al.*, 2018) after having consulted the original material.

Typification

Sida cuneifolia Roxb., Fl. Ind. 3: 170. 1832.

Lectotype (designated here): *Sida cuneifolia* Roxb. drawing in *Icones Roxburghianae* no. 341 (K digital image¹).

Fig. 1

Notes: The name *S. cuneifolia* was proposed by Roxburgh (1832), in '*Flora Indica*'. According to Stafleu and Cowan (1983) Roxburgh's specimens and types are known to be placed at BM, BR, E, G, K and LIV; small set at B (Willd.), C, DBN, E, FI, NY, OXF, P, PH, UPS (Thunb.). Stafleu and Cowan (1983) also stated that Roxburgh's drawings are of great importance for the typification of Roxburgh's species. As Roxburgh's collection or specimens referred for description could not be traced for the name *S. cuneifolia*, Roxburgh's drawing with 'Roxburgh number 341' is referred to study as an original material which depicts the characters mentioned in the protologue, and it is designated here as lectotype.

Sida mysorensis Wight & Arn., Prodr. Fl. Ind. Orient. 1: 59. 1834.

Lectotype (first-step designated by Borssum, 1966; second-step designated here): INDIA, Karnataka, Mysore, 14.05.1800, Heyne 183 (K [K000659370

Received: 21.09.2020; Revised & Accepted: 19.03.2021
Published Online: 30.06.2021





Fig. 1. Lectotype of *Sida cuneifolia* Roxb. drawing in *Icones Roxburghianae* no. 341 (K) (<http://apps.kew.org/floraindica/img/illustration/large/23372.jpg>) © Copyright of the Board of Trustees of the Royal Botanic Gardens, Kew. Reproduced with permission.



Fig. 2. Lectotype of *Sida mysorensis* Wight & Arn. (K000659370 <http://specimens.kew.org/herbarium/K000659370>) © Copyright of the Board of Trustees of the Royal Botanic Gardens, Kew. Reproduced with permission.

digital image!]; *isolecto* K [K000659371 digital image!]).

Fig. 2

Notes: Wight and Arnott (1834) described *S. mysorensis* based on collections by different collectors. They can be considered as syntypes. Among which, Borssum (1966) cited Wight's specimen with number '183' which is from Heyne's herbarium as mentioned by Noltie (2005) and connected to Wallich catalogue no. 1855. Two sheets of Heyne's collection from Mysore are housed at K, one with number '183' and the other without a number, but the date of collection (14th May, 1800) for both specimens indicates that the specimens are part of a single gathering. Moreover, the sheet with number '183' has two specimens mounted on it with two different barcode numbers (K000659370, K000659371). One of them (K000659370) is designated here as the second-step lectotype considering the type

citation by Borssum (1966) as a first-step lectotypification.

Sida ovata Forssk., *Fl. Aegypt.-Arab.* 124. 1775.

Lectotype (designated here): ARABIA, Surdud, February 1763, *P. Forsskal* 1728 (C [C10003059 digital image!]).

Fig. 3

Notes: Forsskal (1775) in the protologue cited his collection from Surdud, Arabia. Two relevant specimens could be traced at C (C10003059, C10003061) and one at BM (BM000603910). Of those, C10003059 with fruits is designated here as the lectotype. The specimen is determined as 'proposed lectotype' by O.A. Leistner in May, 1967, but this has not been seen as published so far and this cannot be considered as effective publication (Art. 7.10 of ICN, Turland et al., 2018).





Fig. 3. Lectotype of *Sida ovata* Forssk. (C10003059 <http://digit.snm.ku.dk/www/ctyp/full/C10003059.jpg>) © Copyright of the Natural History Museum of Denmark, University of Copenhagen. Reproduced with permission.



Fig. 4. Lectotype of *Sida repens* Dombey ex Cav (MA656279 <http://161.111.171.57/herbario/visorVcat.php?img-MA-01-00656279>) © Copyright of the MA Herbarium, Real Jardín Botánico Madrid. Reproduced with permission.

Sida repens Dombey ex Cav., Diss. 1, Diss. Bot. Sida 7. 1785.

Lectotype (designated here): PERU, *s.l.*, Dombey J. *s.n.* (MA [MA656279 digital image!]). Fig. 4

Notes: The herbarium and types of Cavanilles are at MA, and many of his names are based on specimens in P, P-LA, and P-JU (Stafleu and Cowan, 1976). As the name *S. repens* is published based on Dombey's collection, search for the specimen was attempted in MA as well as P. Two specimens of *S. repens* collected by Dombey at P could be traced which matches well with the protologue description. Moreover, one specimen (MA-656279) from 'Cavanilles Type collection' section was found at MA and as per the discussion with Eva Garcia Ibanez, Curator of the herbarium,

Joseph Dombey was part of Ruiz & Pavon's expedition to Peru, which took place between 1778 and 1788. Some of the herbarium specimens of this expedition were taken out by Cavanilles in order to create his separate 'Type collection'. With this in mind, the specimen which is part of 'Cavanilles type collection' is selected here as lectotype.

Additionally, the specimen (MA-656279) bears the number '29787' on a small label, which was added to the specimen at the beginning of the 20th century, when it was on loan to the Field Museum (USA). The number '29787' was used in some publications (Fryxell, 1985) and electronic database (Tropicos), but it is added to the sheet when the specimens was lodged and renumbered at the Field Museum (USA), and it is neither a 'collection



number' nor an accession number or barcode number added by MA.

Sida scabrida Wight & Arn., Prod. Fl. Ind. Orient. 1: 57. 1834.

Lectotype (designated here): INDIA, Tamil Nadu, (Madras), *s.d.*, Wight 198 (K [K000659357 image!]).

Fig. 5

Notes: A specimen at K (K000659357), part of the Wight Herbarium is identified as type material of the name *Sida scabrida* Wight & Arn., supported by Wight's catalogue No. 198 as mentioned in the protologue and it precisely matches with it. Therefore, the specimen is designated here as lectotype. Sivarajan and Pradeep (1994) cited the type of *S. scabrida* as 'Wight 166', but the specimen cited in the protologue is 'Wight! cat. n. 198' and

should only serve as type material. Noltie (2005) also noted that the type material for this name is 'WC 198'. He also commented that he could not trace a specimen at K. However, the specimen referred to in the protologue was traced at K and an image of the same is provided here.

Sida schimperiana Hochst. ex A.Rich., Tent. Fl. Abyss. 1: 66. 1847.

Lectotype (first-step designated by Vollesen, 1986; second-step designated here): ABYSSINIA (Ethiopia), 04.06.1837, G.H.W. Schimper 282 (P [P00761807 digital image!]).

Fig. 6

Notes: While describing *Sida schimperiana*, Richard (1847) cited collections of G.H.W. Schimper, Richard Quartin-Dillon and Anton Petit in the protologue. Vollesen (1986) inadvertently



Fig. 5. Lectotype of *Sida scabrida* Wight & Arn. (K000659357 <http://specimens.kew.org/herbarium/K000659357>) © Copyright of the Board of Trustees of the Royal Botanic Gardens, Kew. Reproduced with permission.



Fig. 6. Lectotype of *Sida schimperiana* Hochst. ex A.Rich. (MNHN-P-P00761807 <http://collections.mnhn.fr/catalognumber/mnhn/p/p00761807>) © Copyright of the Muséum National d'Histoire Naturelle, Paris. Reproduced with permission.



lectotypified the name (Art. 7.11 of ICN, Turland *et al.*, 2018) by citing Schimper's collection at P as the type. There are five such relevant specimens at P (*viz.*, P00761802, P00761804, P00761805, P00761806 and P00761807, of the same gathering Schimper 282) and it cannot be ascertained which particular specimen was designated as lectotype. Thus, we have considered the type citation of Vollesen (1986) as first-step lectotypification and one of the specimens (P00761807) is designated here as the second-step lectotype, which bears fruit and a label indicating the specimen from Schimper's herbarium.

Acknowledgements

We are thankful to the authorities of herbaria (BM, BR, C, CAL, E, G, K, LIV, MA, OXF, P) consulted for the information provided. We also thank the Head, Department of Botany, Savitribai Phule University, Pune and Principal, Shri. Vyankatesh Arts Commerce and Science College, Deulgaon for providing necessary facilities. VVN and MMS are grateful to RUSA-MHRD, Government of India, for financial assistance. Authors also express gratitude to anonymous reviewers for important comments which helped to improve the manuscript.

Literature Cited

- FORSSKAL P. 1775. *Flora Aegyptiaco-Arabica*. Haunia (Copenhagen): ex officina Mølleri.
- FRYXELL P.A. 1985. *Sida sidarum* — V. The North and Central American species of *Sida*. *Sida* 11(1): 62–91. <https://www.jstor.org/stable/23909127>
- GAVADE S.K., NIMBALKAR V., LEKHAK M.M. & M.M. SARDESAI 2020. Identity, occurrence and typification of *Sida angustifolia* (Malvaceae), a neglected species in India. *Annales Botanici Fennici* 57: 279–284. <https://doi.org/10.5735/085.057.0411>
- LINNAEUS C. 1753. *Species Plantarum*. Volume 2. Impensis Laurentii Salvii, Stockholm.
- MABBERLEY D.J. 2017. *Mabberley's Plant-Book: a portable dictionary of plants, their classification and uses*. Fourth Edition. Cambridge University Press, Cambridge.
- NOLTIE H.J. 2005. *The Botany of Robert Wight*. Regnum Vegetabile 145. A.R.G. Gantner Verlag, Ruggell.
- PAUL T.K. 1993. Malvaceae. In: SHARMA B.D. & M. SANJAPPA (eds.), *Flora of India*. Volume 3. Botanical Survey of India, Kolkata. pp. 257–394.
- PAUL T.K. & M.P. NAYAR 1988. Malvaceae. In: NAYAR, M.P., THOTHATHRI K. & M. SANJAPPA (eds.), *Fascicles of Flora of India*. Fascicle 19 Botanical Survey of India, Kolkata. pp. 64–233.
- POWO 2019. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Available at: <http://www.plantsoftheworldonline.org/> (Accessed on 19.03.2021).
- RICHARD A. 1847. *Tentamen Florae Abyssinicae seu Enumeratio Plantarum in plerisque Abyssinia*. Volume 1. Parisii: Artus Bertrand.
- ROXBURGH W. 1832. *Flora Indica*. Volume 3. Printed for W. Thacker & Co., Kolkata and Parbury, Allen and Co. London.
- SIVARAJAN V.V. & A.K. PRADEEP 1994. Taxonomy of the *Sida rhombifolia* (Malvaceae) complex in India. *Sida* 16(1): 63–78. <https://www.jstor.org/stable/41967083>
- SIVARAJAN V.V. & A.K. PRADEEP 1996. *Malvaceae of southern Peninsular India: a taxonomic monograph*. Daya Publishing House, New Delhi.
- STAFLEU F.A. & R.S. COWAN 1976. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*. Volume 1: A–G. Second Edition. Bohn, Scheltema & Holkema Utrecht.
- STAFLEU F.A. & R.S. COWAN 1983. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*. Volume 4: P–Sak. Second Edition. Bohn, Scheltema & Holkema, Utrecht.
- TAMBDE G.M., SARDESAI M.M. & A.K. PANDEY 2020. *Sida sivarajanii* (Malvaceae): a new species from India. *Phytotaxa* 428(2): 104–112. <https://doi.org/10.11646/phytotaxa.428.2.4>
- TAMBDE G.M., NIMBALKAR V.V., LEKHAK M.M. & M.M. SARDESAI 2016. *Sida pradeepiana* sp. nov. (Malvaceae) from India. *Nordic Journal of Botany*. <https://doi.org/10.1111/njb.01147>
- TURLAND N.J., WIERSEMA J.H., BARRIE F.R., GREUTER W., HAWKSWORTH D.L., HERENDEEN P.S., KNAPP S., KUSBER W.-H., LI D.-Z., MARHOLD K., MAY T.W., MCNEILL J., MONRO A.M., PRADO J., PRICE M.J. & G.F. SMITH (eds.) 2018. *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Regnum Vegetabile 159, Volume 38. Koeltz Botanical Books, Glashütten. <https://doi.org/10.12705/Code.2018>
- VAN BORSSUM WAALKES J. 1966. Malvaceae revised. *Blumea* 14: 1–213.
- VOLLESEN K. 1986. The *Sida cuneifolia*-complex (Malvaceae) in Africa. *Kew Bulletin* 41(1): 91–98. <https://doi.org/10.2307/4103035>
- WIGHT, R. & G.A.W. ARNOTT 1834. *Prodromus Florae Peninsulae Indiae Orientalis*, Volume 1. Parbury, Allen & Co., London.





'RESEARCH JOURNEY' International E- Research Journal
Impact Factor - (SJIF) - 6.625 (2019),
Special Issue - 261 (B) : Use of ICT in Teaching - Learning
Peer Reviewed Journal

E-ISSN :
2348-7143
March 2021

The Use of ICT in Political Science Teaching

Dr. Anant Madan Awati,

Associate Professor & Head, Department of Political Science,
Shri Vyankatesh Arts, Commerce and Science College,
Deulgaon Raja, Dist. Buldhana (Maharashtra) Pin Code- 443204
E-mail- awatianant@gmail.com

Abstract

The emerging 21st Century is a technological era. The ICT plays a pivotal role to impart education with equity and quality in learning and teaching modes. A teacher can use online teaching tools to enhance and enliven learning of political science of their students. Education can effectively function using next-generation tools. The Corona Virus pandemic has changed the world of education seemingly overnight, and making decisions about the software for remote working you use to create a virtual classroom directly impacts your success as an educator during this time. Video conferencing software has replaced not only classroom learning, but also education administration, parent-teacher conferences, and staff and college council meetings.

Keywords:-

Information Communications Technology (ICT), Social Media, Virtual classroom, Digital Library, Digital Media, Corona virus, Pandemic, **Conference Apps**, Online Learning Platforms, Learning Management System (LMS), **SaaS (software as a service)**, Online Assessment Tools.

Introduction: -

Humans and technology have a very old relationship. Man has been using or developing the technology since ancient age. In the 21st century, technology has taken over all areas of human life. Technology affects the way individuals communicate, learn, and think. It helps society and determines how people interact with each other daily. Technology plays an important role in society today. It has positive and negative effects on the world and it impacts daily lives. We are living in an era where technological advances are common (वैद्य, 2020). The internet and cell phones are some examples. Ministry of Human Resource Development has initiated many projects to assist teachers, scholars and students in their pursuit of learning like DIKSHA platform, Swayam Prabha TV Channel, Online MOOC courses, On Air – Shiksha Vani, DAISY by NIOS for differently-abled, e-PathShala, National Repository of Open Educational Resources (NROER) to develop e-content and energized books, telecast through TV channels, E-learning portals, webinars, chat groups, distribution of books and other digital initiatives along with State/ UT Governments (Economic Times, 30 July, 2020).

Objectives

- To elaborate the use of ICT in Political Science subject.
- To understand online teaching tools.
- To study the advantages of ICT in Learning Political Science subject.

1. Teaching and Technology :-

As the Indian education system goes through a period of transition, the use of technology is on the rise. If technology is used properly in teaching process, it can certainly be enjoyable.





'RESEARCH JOURNEY' International E-Research Journal
Impact Factor - (SJIF) - 6.625 (2019),
 Special Issue - 261 (B) : Use of ICT in Teaching - Learning
Peer Reviewed Journal

E-ISSN :
2348-7143
March 2021

Proper use of technology helps to broaden the field of thought. The use of technology is advantageous for both teachers and students. New technology can help a teacher as a supplement to quality and effective teaching. Computers, projectors, tablets, mobiles, etc. can be used in the teaching & learning process.

Technology is a very effective medium in distance learning. Today, students are also using technology to enhance their knowledge. Teachers are reaching out to remote areas through technology to satisfy the student's hunger for knowledge. The use of technology in teaching and learning certainly brings about the expected changes in students.

The usefulness of technology depends on the effective use of tools. Every element working in the field of education should take initiative for this. The educational movement is taking root on WhatsApp. There are many informative educational pages available on Facebook. You can also use them as a reference. Technology has indeed revolutionized teaching and learning, but what is needed now is for teachers to identify their own and students' needs and develop the technology themselves and to motivate other teachers to do the same. Google search engine should be used as a useful educational material.

Well-known scientist Thomas Edison predicted many years ago that "Books will soon be obsolete in the public school our education system will be changed inside of ten years". It took a long time for the prediction made for America to come true. But today that prediction is coming true. The concept of tablet school, digital school and E-class room is slowly taking root. This is an easy way to reduce the burden on the backpack. Any tool will have its limitations but technology is very important to explain the concept. We have to shape the future of the students, only then we will be recognized in society as smart teachers who use real smartphones.

Technology means the technology required for this education. These include computers, smartphones, cameras on it, internet and social media platforms (WhatsApp, Facebook, Twitter, etc.), learning management systems; It includes a variety of useful services (information search, e-mails, Google Docs, classrooms, etc.) like Google. Most of these systems/services are available for free. Services that are not free to the general public are also available free of charge to many schools and Colleges. However, students will need to have at least a Smartphone, a computer if possible, and a reliable and high-speed internet connection. Following ICT tools are useful to students and teachers.

2. Use of Computers and Internet in Teaching, Learning, and research :-

The computer helps the teachers in the teaching, research and administration of college. The computer helps in the classification of children according to their abilities and evaluating their performance. Computers help in preparing time-table, schedules, etc. Computers maintain progress cards and preserve them efficiently and confidentially. A computer can play effectively the role of the tutor. It helps the teacher in engaging students in tutorial work. Very tech-savvy teachers are making great use of Microsoft PowerPoint. Computers help the teacher in providing immediate feedback to students for better interaction and motivation.

The measures of political science has evolved to the contemporary status of the world's development and advancement in information, communication, and technology. Considering the importance of technology, political science discipline concise concretely on using computers for integrated research and programs. The field of academics requires comprehensive data or information in analyzing and examining facts and figures before reaching an evident conclusion. Also, the knowledge of gathering sample and methodologies on tackling complex issues are





'RESEARCH JOURNEY' International E- Research Journal
Impact Factor - (SJIF) - 6.625 (2019),
 Special Issue - 261 (B) : Use of ICT in Teaching - Learning
Peer Reviewed Journal

E-ISSN :
2348-7143
March 2021

majorly gotten from the computer application. Many scopes of political science which includes election has witnessed a lot of technical revolution in the electoral process (voting). Public administrators and the masses engage solely with computer knowledge and its application which tremendously affects society both negatively and positively. International relations also range in computer involvement in accessing people's origins and objectives. Census in the nation includes computer importance for the proper individual population in the country. Political science is very vast on the typical path of society and its associations with human attributes and behavior require a computer for proper analysis. The importance of the internet in education to the students means that makes it easier for them to research things, and relearn the content taught in the college. People use it according to their needs and interests.

3. Website and Blog :-

Teachers can use the website and blog as a teaching tool by posting their teaching materials (notes and videos) on it. The learning process becomes interesting and diverse with the use of tutorial videos and notes. Political Science teachers can teach a subject with the use of animation, PowerPoint slides, and images to capture the students' attention. A teacher can teach difficult concepts (like the Presidential election) and make it easy for students with help of ICT.

The web portal facilitates the management to update information about examinations, results, events, admission, and many other things. With the help of an educational web portal, a teacher can easily update course material online, right from a computer screen. The website enables the students to share a strong bond by connecting through the alumni network. Your website can be a strong link between old friends and their community.

Education websites are used for education. They are inclusive of all forms of technology, used for research and learning. There are a large number of educational websites are available. These type of websites plays a very important role to reduce their college work and also help their studies.

Some students have a habit of writing daily, the teacher should create their blog and motivate them to write on it. A teacher can also create a blog for his class or college. By linking all the colleges in the taluka and district to the Twitter account, you can view or share the activities of any school.

4. The Use of Social Media as an Educational Tool :-

The internet has allowed students to be in constant touch with their teachers or with other classmates with the help of social media, messaging apps, and chat forums like Whatsapp, Facebook, Messenger, Telegram, Twitter, and LinkedIn. Parents can interact as well as communicate with teachers and college authorities about student's performance in the college. Interaction with like-minded people on forums can help students to explore new ideas and enrich their knowledge. Each social media platform offers many different ways to be used in the classroom, from sharing announcements to holding live lectures, and so much more. Social media provides a smoother, more direct communication tool between students, teachers, and parents. Social media allows for more e-learning opportunities as well as remote jobs. Online classes are becoming more popular with the help of social media (West, 2019). It's important to understand the impact of social media on education before using it, but we're of the firm belief that it will help advance students in technology.

- **WhatsApp:-** WhatsApp has more than one billion users worldwide. WhatsApp is a mobile app that can be used anywhere. WhatsApp offers free video calls and audio calls.





Users can send free text messages, images, videos, PDF, Word, Excel, PowerPoint Files. The use of WhatsApp in India has increased more than any other learning tool. With the help of WhatsApp, Political Science teachers can easily interact with students. WhatsApp can be an effective medium for students to resolve their doubts.

Virtual classrooms can be created by creating class-wise groups of students in WhatsApp. Political Science teachers can share video lessons, audio lessons, notes, e-books, charts, graphics, diagrams, YouTube links to the students via WhatsApp. Using WhatsApp, teachers can send online lectures, exam schedules, notifications to the students. WhatsApp can be used to conduct online surveys through questionnaires

As college shut down abruptly and teachers suddenly realized that they needed a means to immediately communicate with their students, they turned to WhatsApp. Mainly because it was right there, easily accessible, inside the palms of students, teachers, and parents alike.

• **Facebook :-**

Facebook is an app that can be used on computers and mobiles. Images of video lessons, diagrams, articles, notes, summaries can be shared with students by creating a Facebook account. Facebook can be used to create online classrooms. Political Science teachers can give online lectures, exam schedules, notifications, important information, and documents to the students using Facebook. Through Facebook, students can take advantage of online lectures around the world. Facebook can be used to study elections, interact with candidates, to conduct online surveys through questionnaires. Facebook is a very useful tool for teaching and learning.

• **YouTube :-**

YouTube is a digital library and virtual classroom. Students can easily access quality education materials like tutorial videos on YouTube for free or pay fees online for more quality study materials. It allows students to watch a video over and over again. Being able to learn at home on YouTube saves time and money. Difficult concepts are easily explained on YouTube. It is possible to increase students' understanding of difficult concepts and increase their interest in the study. Students can enjoy learning with the help of YouTube. Teachers can upload video lessons on YouTube. E-learning is possible through YouTube. Teachers can upload lectures, ideas, opinions on YouTube through videos. Digital newspapers, TV channels, audio clips on the radio, videos related to enlightening concepts are uploaded on YouTube which is useful for the students of Political Science. From the video on YouTube, political science students can understand the discussion on political issues, analysis of events, the causal relationship of events, and analysis of concepts. Videos on YouTube are useful for the training of teachers.

• **Twitter :-**

Twitter makes the education world smaller, connecting principals, teachers, and other education professionals. Political Science teachers often need to teach the importance of brevity in writing, and Twitter is such a great tool for that, with its 280 character limit per tweet. Through the service, teachers assign tweets as a way to encourage understanding and efficient use of language. Students can also use Twitter to practice writing thesis statements, too. Twitter is very useful tool for politicians. Wise politicians know that listening to the





people is their most important job, and as such, so many have jumped on Twitter to connect with constituents and voters, particularly during campaign season.

5. Interaction with Digital Media :-

Regular use of digital media is one of the most basic parts of our lives. Digital boards/Interactive Classboards save paper, allow displaying of videos and audio to attract the attention of students. Nowadays, many paid sites provide educational resources that are rich in quality and easily understandable to the masses.

The Coronavirus pandemic has changed the world of education seemingly overnight, and making decisions about the software for remote working you use to create a virtual classroom directly impacts your success as an educator during this time (Li & Lalan, 2020). Video conferencing software has replaced not only classroom learning, but also education administration, parent-teacher conferences, and staff and college council meetings.

6. Conference Apps:-

There are many Conference Apps to use for remote teaching like Zoom, Google Meet, Skype, Webex, AnyMeeting, GoTo Meeting, YouTube Streaming, Facebook Live, BlueJeans, BigBlueButton, Google Hangouts, Sococo, Microsoft Teams, Whereby, Yotribe, Discord, Miro, Twitch, Vimeo, Loom, hopin.to.

Zoom, the popular video conferencing software that has seen exponential increases in downloads within the past month. Teachers can host a series of short Zoom or Google Meet sessions throughout the day focused on different skills or topics. Zoom and Google Classroom works with staples like Blackboard, Moodle, Canvas, and others — so teachers will still be able to use the tools and students have come to rely on in the classroom. These online sessions are an excellent way to continue teaching and connecting with learners. Even if teachers cannot require that students attend a live meeting due to concerns around access, connectivity, and availability, these sessions can be recorded and posted on class websites, Google Classroom, or a learning management system.

7. Online Learning Platforms/Virtual Classroom

A Learning Management System as the name implies is a **SaaS (software as a service)** that works as an **online classroom**. This type of system is designed to be a solution for distance learning, a place where teacher and student could interact without being in the same room. Through an LMS, the teacher can offer their courses and online classes. By accessing the platform, students have access to the material and other resources that support learning, such as chats to discuss the content. LMS is the ideal tool to create and administer online courses, host a virtual classroom, assign homework, and monitor student progress—all from your computer, tablet, or phone. Distance Learning tool, the main goal of a Learning Management System makes teaching and learning online possible. The best online learning management systems are Google Classroom, Edmodo, Canvas, Moodle, Schoology, Sakai, Showbie, iTunes, etc.

• Google Classroom and Edmodo:-

Google Classroom is a favorite with teachers because it is quick and easy to set up and integrates with various web tools and apps. Google Classroom is an app to send messages and links to students (and they can respond), assign homework, collect homework students have submitted, and it has a grade book (which I don't use; instead I use Google Sheets or spreadsheets). It's a learning management system; it's not a teaching platform. Edmodo is another safe platform that enables teachers to share content, distribute assignments and quizzes, award digital badges, and quickly communicate with students and parents.





8. Online Assessment Tools :-

A teacher can use online assessment tools (like Kahoot!, Testmoz, PearDeck, Quizizz and Google forms, Quizlet and ClassTools) to enhance and enliven learning of political science of their students. Education can effectively function using next generation tools. Teaching a large number of students in different classes and let students take a test or quiz is a tough challenge. Teachers not only find it time-consuming to conduct assessments such as assignments, tests, quizzes and surveys through manual processes, but also could not communicate the results with students and parents in real-time. Uploading and sharing assignments, conducting online tests, assigning grades, storing study materials, and creating lesson plan is a breeze! Using automated tools is the easiest way to streamline the academic and administrative processes. Online examination are highly interactive, customizable, trustworthy, secure, and can be accessed in multiple devices.

Conclusion:-

Technology is a very effective medium in distance learning. Technology has indeed revolutionized teaching and learning, but what is needed now is for teachers to identify their own and students' needs and develop the technology themselves and to motivate other teachers to do the same. Considering the importance of technology, political science discipline concisely on using computers for integrated research and programs. Teachers can use the website and blog as a teaching tool by posting their teaching materials (notes and videos) on it. The internet has allowed students to be in constant touch with their teachers or with other classmates with the help of social media, messaging apps, and chat forums like Whatsapp, Facebook, Messenger, Telegram, Twitter, and LinkedIn. LMS is the ideal tool to create and administer online courses, host a virtual classroom, assign homework, and monitor student progress—all from your computer, tablet, or phone. Distance Learning tool, the main goal of a Learning Management System makes teaching and learning online possible. ICT can enhance the quality of education in several ways, by increasing learner motivation and engagement, and by enhancing teacher training. ICTs, especially computers, mobiles and Internet technologies, enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way.

References:-

- Chauhan, Ashutosh, 2018, 11 Digital Education Tools For Teachers And Students, March 31, 2018, <https://elearningindustry.com/digital-education-tools-teachers-students>
- Kumar, Mahesh, 2005, Modern Teaching of Information Technology, New Delhi, Anmol Publications Pvt Ltd.
- Economic Times, HRD Minister launches 'India Report on Digital Education 2020, Economic Times, 30 July, 2020
- Li, Cathy & Lalan, Farah, 2020, The COVID-19 pandemic has changed education forever. This is how, 29 Apr 2020 <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>
- West, Chloe, 2019, 12 Ways to use social media for education, 6 November, 2019, <https://sproutsocial.com/insights/social-media-for-education/>
- बाम, रा., 2018, माहिती व संप्रपण तंत्रज्ञान – भावी शिक्षकांसाठी, पुणे, निराली प्रकाशन
- वैद्य, सुब्रत, 2020, शिक्षण, तंत्रज्ञान, बदल आणि आपण, अक्षरनामा, 10 June 2020



**भारत आणि चीन संबंध
डॉ. अनंत मदन आवटी**सहयोगी प्राध्यापक आणि प्रमुख, राज्यशास्त्र विभाग,
श्री व्यंकटेश महाविद्यालय, देऊळगाव राजा, जि.बुलढाणा (महाराष्ट्र).**सार (Abstract)**

भारत व चीन या दोन्ही देशांत प्राचीन काळापासून सांस्कृतिक आणि आर्थिक संबंध असले तरी आज या संबंधात सीमावाद, तिबेटचा प्रश्न, दलाई लामा यांना दिलेला आश्रय, सीमेवरील सैनिकांच्या हालचालीमुळे निर्माण होणारे ताणतणाव, दहशतवाद, चीन आणि पाकिस्तानमधील लष्करी आणि आण्विक क्षेत्रांमधील सहकार्य, ब्रह्मपुत्रेसारख्या नद्यांच्या पाण्यासंबंधीचे वाद, चीनचा हिंद महासागरावरील प्रकल्प, भारत-अमेरिकेचे वाढते मैत्रीपूर्ण संबंध, अणु-पुरवठादार समूहात (एनएसजी) भारताच्या प्रवेशाला चीनचा विरोध या महत्त्वाच्या समस्या आहेत.

Keywords :- सीमारेषा, सीमावाद, बफर स्टेट, दहशतवाद, पंचशील करार, एनएसजी, लष्करी सहकार्य, आण्विक क्षेत्रांमधील सहकार्य, संयुक्त राष्ट्र, सुरक्षा परिषद, व्हेटो, आयात, सागरी सुरक्षा प्रस्तावना :-

भारत आणि चीन हे दोन्ही शेजारी राष्ट्र जगातील उदयोन्मुख शक्ती आहेत. या दोघांमध्ये प्राचीन काळापासून सांस्कृतिक आणि आर्थिक संबंध आहेत. भारत हा लोकशाहीप्रधान देश आहे तर चीनमध्ये साम्यवादी राजवट आहे. वैचारिकदृष्ट्या दोन देशांमध्ये प्रचंड फरक आढळतो.

सन १९४९ मध्ये साम्यवादी चीनची स्थापना झाल्यानंतर भारताने चीनशी राजनैतिक संबंध प्रस्थापित केले. भारताने पीपल्स रिपब्लिक ऑफ चाईनाला एक सार्वभौम राष्ट्र म्हणून मान्यता दिली आणि चीनला संयुक्त राष्ट्र संघटनेचे सभासदत्व मिळावे यासाठी पाठिंबा देऊन प्रयत्नही केले. भारत आणि चीन यांच्यातील मैत्रीपूर्ण संबंधास तडा जाणारी घटना म्हणजे चीनचे तिबेटवर केलेले आक्रमण होय. या व्यतिरिक्त भारत आणि चीनमध्ये वादाची अनेक कारणे आहेत.

उद्दिष्ट्ये :-

१. भारत-चीन संबंधांचे सविस्तर अध्ययन करणे.
२. भारत-चीन संबंधातील समस्यांचा शोध घेणे.
३. भारत-चीन यांच्यातील संबंध सुधारण्यासाठी झालेल्या प्रयत्नांचा आढावा घेणे
४. भारत-चीन संबंध सुधारण्यासाठी उपाय सुचविणे.

१. तिबेट प्रश्न व दलाई लामा यांना आश्रय :-

भारत आणि चीन यांच्यातील मैत्रीपूर्ण संबंधास तडा जाणारी घटना ऑक्टोबर १९५० मध्ये घडली. ती घटना म्हणजे या दोन्ही देशांदरम्यान असलेले बफर स्टेट म्हणजे तिबेटवर चीनचे केलेले आक्रमण होय. चीनच्या या आक्रमक धोरणाचा भारताने निषेध केला (देवळाणकर, २२९). तेव्हा चीनने भारतास धमकावण्याचा प्रयत्न केला की, तिबेटसारख्या प्रश्नाबाबत भारताने हस्तक्षेप करू नये. कारण तिबेटवरील आक्रमण म्हणजे चीनच्या अंतर्गत व्यवहाराचा भाग आहे. चीनच्या तिबेटवरील आक्रमणास भारताने जो विरोध दर्शविला त्याबाबत चीनने तीन नापसंती व्यक्त केली. चीनची अशी भूमिका असतानाही भारताने चीनशी मैत्रीपूर्ण संबंध ठेवण्याचा प्रयत्न केला. यावरून भारताची चीनशी जुळवून घेण्याचीच भूमिका होती असे आढळून येते. भारत व चीन यांच्यातील संबंध सुरक्षित होण्यासाठी या दोन्ही देशांच्या दरम्यान करण्यात आला. १९५४ यावर्षी पंडीत





नेहरूंनी चीनला भेट दिली. चीनचे पंतप्रधान चौ-एन-लाय यांनी १९५४ यावर्षी भारतास भेट दिली. भारत व चीन या दोन देशांच्या पंतप्रधानांनी आपापसात सैद्धांतिक स्वरूपाच्या करारास मान्यता दिली. या दोन देशातील संबंधांना तात्विक बैठक असावी असा प्रयत्न ज्या करारानुसार झाला त्यास पंचशील करार या नावाने ओळखले जाते.

१९५८ मध्ये तिबेटी जनतेने स्वायत्ततेसाठी चीनविरुधी आंदोलन सुरु केले. हे आंदोलन चिनी फौजेने दडपून टाकण्यास सुरुवात केली. या कारवाईत भारताने कोणत्याही प्रकारचा हस्तक्षेप केला नाही. स्वतःचा जीव वाचविण्यासाठी तिबेटचे धर्मगुरु दलाई लामा आपल्या सहकार्यांसोबत भारताच्या राजकीय आश्रयाला आले. भारतानेही त्यांना राजकीय आश्रय दिला. ही घटना चिनला आवडली नाही. त्यानंतर चीनने तिबेटमध्ये मोठ्या प्रमाणात सैन्यांची जमवाजमव करून भारतीय प्रदेशात घुसखोरी करण्यास सुरुवात केली. लडाखमधील अक्साई चीन व अरुणाचल प्रदेशातील काही भाग आमचेच आहेत असे सांगून चीनने तिथे रस्ते बांधण्यास सुरुवात केली. त्याचबरोबर या दोन प्रदेशातील जवळजवळ ५० हजार चौरस मैल प्रदेशांवर चीनने आपला हक्क सांगितला.

२. सीमाप्रश्न (सीमावाद) :-

भारत आणि चीन यांच्यातील सीमावाद हा प्रचंड गुंतागुंतीचा आणि दोन्ही देशांच्या निर्मितीपासून प्रलंबित प्रश्न आहे. यामुळे १९५० च्या दशकापासूनच दोन्ही देशांमधील संबंध तणावपूर्ण बनण्यास सुरुवात झाली. तीन मुद्द्यांवरून भारत आणि चीन यांच्यामध्ये सीमावाद आहे. मॅकमोहन सीमारेषा, अक्साई चीन आणि अरुणाचल प्रदेश व सिक्कीम म्हणजेच या सीमावादाची तीन भागात विभागणी झालेली दिसते. भारताच्या जवळपास ९० हजार वर्ग किलोमीटर व्याप्तीच्या भूखंडावर चीनने आपला दावा सांगितलेला आहे. मॅकमोहन सीमारेषेवरून मोठा वाद दोन्ही देशांदरम्यान आहे. १९१३ मध्ये भारतातील तत्कालीन ब्रिटिश शासन, तिबेट आणि चीनचे प्रतिनिधी यांच्यादरम्यान झालेल्या बैठकीमध्ये ही सीमारेषा निर्धारित करण्यात आली. पण आता चीनला ती पूर्णपणे अमान्य आहे. कारण १९४९ च्या पूर्वी ती तयार करण्यात आलेली आहे. सन १९५५ नंतर सीमावादाच्या प्रश्नावरून भारत-चीन संबंधांमध्ये तणाव निर्माण झाला. चीनकडून प्रकाशित करण्यात आलेल्या नकाशांमध्ये भारताच्या हद्दीतील बराच मोठा भाग चीनने आपल्या सीमारेषेत दाखविला होता. याच काळात चीनने लडाख आणि नेफा क्षेत्रात घुसखोरी करून भारतातील काही क्षेत्रांवर ताबा मिळवला. चीनच्या घुसखोरीचा भारताने स्पष्ट विरोध केला. १९६२ च्या युद्धामध्ये चीनने भारताच्या लडाख प्रांतातील ३८ हजार वर्ग किलोमीटर एवढा प्रदेश बेकायदेशीरपणे गिळंकृत केला. त्यानंतर १९६३ मध्ये चीन आणि पाकिस्तानमध्ये एक सीमा करार झाला. त्यानुसार पाकिस्तानने पाकव्याप्त काश्मीरमधील ५१८० वर्ग किलोमीटरचा भूप्रदेश हा चीनला देऊ केला. त्यामुळे भारत आणि चीनचा सीमावाद अधिकच गंभीर बनला. संपूर्ण अरुणाचल प्रदेशावर चीन आपला दावा सांगतो. अरुणाचल प्रदेशामधील जलविद्युत प्रकल्पासाठी एशिया विकास बँकेकडून कर्ज घेण्यास चीनने विरोध केला. दोन्ही देशांतील मतभेदांचे मूळ कारण असलेला सीमावाद मिटवणे आवश्यक आहे. पण हा वाद कसा मिटवायचा हा खरा पेचात टाकणारा प्रश्न आहे. चीनने १९६२ च्या युद्धात ताब्यात घेतलेला लडाखचा प्रदेश तर सोडलेला नाही पण भारताच्या ताब्यात असलेल्या लडाखच्या प्रदेशावर दावा सांगितला आहे. शिवाय प्रत्यक्ष नियंत्रण रेषा संदिग्ध करून टाकली आहे. प्रत्यक्ष नियंत्रण रेषा नेमकी कुठून कुठे जाते याबद्दलही दोन्ही देशांमध्ये मतभेद आहेत (देशपांडे, २०१७). भारत आणि चीन यांच्यातील सीमारेषा ही अधोरेखित (रिमार्केशन) करण्यात आलेली नाही. त्यामुळे अनेकदा चीनकडून सीमेचे उल्लंघन होते आणि चिनी सैन्य भारतीय हद्दीमध्ये येते. अशाच प्रकारचे आरोप चीन भारतावर करते.





भारताकडूनही चीनच्या सीमेचे उल्लंघन होते, असे चीनचे मत आहे. यातील मूळ प्रश्न म्हणजे तो सीमेचे अधोरेखिकरण हा आहे, सीमा अधोरेखित न केल्यामुळे हे प्रश्न निर्माण होतात.

३. १९६२ मध्ये चीनने केलेले आक्रमण :-

१९६२ मध्ये चीन व भारत यांच्यात झालेल्या युद्धाची दोन कारणे आहेत. पहिले कारण म्हणजे या दोन देशातील ४०५० किलोमीटर लांबीची सीमारेषा निश्चित झालेली नाही त्यातील परिचमेकडील लडाखजवळची सीमारेषा आणि पूर्वेकडील अरुणाचल प्रदेशाला लागून असणावी सीमारेषा याबाबत वाद आहे. ह्या दोन्ही सीमारेषा बदलून मोठा प्रदेश चीनला मिळवा, अशी चीनची मागणी आहे. दुसरे कारण म्हणजे तिबेट आहे. या ४०५० किलोमीटर सीमारेषेच्या उत्तरेला तिबेट असून १९५१ मध्ये चीनने त्याच्या बळवर तिबेटवर नियंत्रण प्रस्थापित केले. दलाई लामा यांना भारताने दिलेला राजाश्रय आणि तिबेट प्रश्न या गोष्टींचा बदल घेण्यासाठी चीनने भारतावर आक्रमण केले.

४. नकाशाचा प्रश्न :-

चीन नेहमी कुठला तरी कृत्रिम नकाशा तयार करून, सामरिक दृष्टीकोनातून महत्वपूर्ण क्षेत्रावर आपला दावा प्रस्थापित करतो. उदाहरणार्थ भारताच्या अरुणाचल प्रदेशाला दक्षिण तिबेटचा भाग संबोधणे, १९६८ मध्ये चीन-सोव्हिएत युनियन सीमा क्षेत्रात असलेल्या उसुती नदी चा 'जेनबाओ द्वीप' विवाद, इ. आहेत.

भारत व चीन या दोन देशांच्या दरम्यान नकाशाच्या प्रश्नावरून तणावाचे वातावरण निर्माण झाले. भारत व चीन या दोन देशातील सीमा रेषेवरूनही या दोन देशात तणाव निर्माण झाला. नकाशाच्या प्रश्नावरूनही वातावरण निर्माण होण्याचे कारण म्हणजे चीनच्या नकाशात भारतातील सीमेलगतचा बराचसा भाग चीनने चीनच्या नियंत्रणाखाली (आधिपत्याखाली) दाखविला होता.

५. चीन आणि पाकिस्तानमधील लष्करी आणि आण्विक क्षेत्रांमधील सहकार्य :-

भारतविरोध या समान भाग्यावर पाकिस्तान आणि चीन यांच्यातील मैत्री दृढ झालेली आहे. भारताविरोधात चीन पाकिस्तानचा प्यादे म्हणून वापर करतो. भारतासमोर पाकिस्तानला आव्हान म्हणून उभे करून चीन आशियातील शक्तिशाली राष्ट्र होऊ इच्छितो. १९६३ मध्ये चीन आणि पाकिस्तानमध्ये एक सीमा करार झाला आहे. या करारानुसार पाकिस्तानने पाकव्याप्त १९४२ वर्ग किलोमीटरचा भूभाग चीनला हस्तांतरित केला आहे. यानंतरच चीन लद्दाख आणि उत्तर काश्मीरमधील शेकडो वर्ग किलोमीटर भूभागावर आपला दावा सांगत आहे.

चीन आणि पाकिस्तानमधील संबंधांना ७० वर्षांपेक्षा जास्त काळ झाला आहे. दिवसेंदिवस यांच्यातील संबंध सुदृढ होत आहेत. चीन पाकिस्तानचा सर्वात मोठा शस्त्रास्त्र पुरवठादार आहे. १९५० राजकीय करार, १९६६ लष्करी सहायता, १९७९ आर्थिक संबंध, १९७२ संरक्षण करार, ३०० मेगावॅटचे अणुशक्ती संयंत्र पंजाब प्रांतात उभारण्यासाठी चीनची पाकला मदत, १२ अब्ज डॉलरपेक्षा जास्त किमतीचा चीन-पाकिस्तानमधील व्यापार, ३० अब्ज डॉलरपेक्षा जास्त रकमेचे करार दोन्ही देशांमध्ये २०१० मध्ये झाले आहेत, १० कोटी डॉलरची गुंतवणूक चीनने लाहोरमधील गृहप्रकल्पामध्ये केली आहे (वैदिक, २०१३).

पाकिस्तानला आण्विक शक्ती होण्यासाठी चीनने प्रत्यक्ष किंवा अप्रत्यक्षरीत्या मदत केली आहे. चीनच्या मदतीला अणू कार्यक्रमाचे जनक अब्दुल कदीर खान यांनी याला दुजोरा दिला होता. अण्वस्त्र प्रसारव्दी कराराशी संलग्न असणारा चीन अशी मदत करू शकत नसताना चीनने ही मदत केली. उत्तर कोरियानेसुद्धा पाकिस्तानला अण्वस्त्र निर्मितीसाठी मदत केली. चीनच्या सूचनेवरूनच हे काम झाले.





भारताशी शत्रुत्वाने वाणगार्या आणि भारताची शक्ती दुर्बल करण्याचे सातत्याने प्रयत्न करणार्या पाकिस्तानशी चीनची जवळीक हे एक कारण आहे चीनला अरबी समुद्रातून निर्यात व्यापार करण्यासाठी पाकिस्तानमधून रस्ता बांधावयाचा आहे. यासाठी चीनने प्रचंड मोठी अशी आर्थिक गुंतवणूक केली आहे. यामुळे पाकिस्तानला दुखवून चीन भारताला पाठिंबा देऊ इच्छित नाही.

६. **भारत-अमेरिकेचे वाढते मैत्रीपूर्ण संबंध :-**

भारताने अमेरिकेशी आण्विक करार केल्यानंतर २००८ नंतर चीन अधिकच आक्रमक झाला. भारताने १९९८ मध्ये अण्वस्त्र चाचणी केल्यानंतर मोठ्या राष्ट्रांनी अणुशक्ती आणि सुरक्षाविषयक उच्च तंत्रज्ञान भारताला मिळू नये यासाठी प्रयत्न केले. भारताला अणुइंधन मिळू नये यासाठी अडचणी निर्माण केल्या. भारताने अमेरिकेशी सावधपणे जवळीक साधून ह्या समस्येवर मात केली. यामुळे भारताची प्रतिष्ठा वाढून २००८ पासून अवकाश संशोधन, सुरक्षाविषयक उच्च विज्ञान व तंत्रज्ञान क्षेत्रात भारताला नवे तंत्रज्ञान प्राप्त करता आले. या करारामुळे सामरिक दृष्ट्या भारत व अमेरिका संबंध दृढ होत गेले. अमेरिका, ऑस्ट्रेलिया, जपान व भारत त्यांच्यात सुरक्षाविषयक सहकार्याची सुरुवात झाली. या चार देशांच्या नोंदलांच्या मलबार कवायतीही होऊ लागल्याने भारताचे हिंदी महासागरातील महत्त्व वाढले (वागल, २०२०).

अमेरिका-भारत संबंधामधील पूर्वीचा दुरावा झपाट्याने कमी होत आहे. अफगाणिस्तान प्रश्नाच्या निराकरणामुळे अमेरिकेला भारताच्या सहाय्याची गरज आहे. भारत-अमेरिका या दोहोंच्या एकत्र येण्यामध्ये अडचणी निर्माण करण्याचा प्रयत्न करणे अशी चीनची भूमिका आहे.

७. **ब्रह्मपुत्र नदीवर बंधारे :-**

ब्रह्मपुत्र नदीवर चीन अनेक बंधारे बांधत असून पाणी कालव्याद्वारे उत्तर चीनच्या भागात वळवू इच्छित आहेत. तसेच चीनने या पाण्यावर जम हायड्रो पाँवर स्टेशनची निर्मिती केली आहे. वुलानमधील या स्टेशनवर १.५ अरब डॉलरची गुंतवणूक केली आहे. भविष्यात हा मुद्दा मोठा वाद होण्याची शक्यता लक्षात घेऊन भारत द्विपक्षीय चर्चेत हा मुद्दा उपस्थित केला. एका गैरशासकीय संघटनेच्या अहवालानुसार चीनने छोट्या-मोठ्या २६ बंधारांची निर्मिती केली आहे. भारत-चीन असा संघर्ष जर झाला तर त्यावेळी चीन ब्रह्मपुत्र नदीतून अतिरिक्त पाणी सोडून भारतात संकट निर्माण करू शकतो किंवा दुष्काळाच्या वेळी धरणातून पाणी न सोडता ते अडवून भारतातील दुष्काळसमयी संकट निर्माण करू शकतो.

८. **नद्यांच्या पाण्याचा वाद :-**

कैलास पर्वतामधून उगम पावलेल्या ४ नद्यांमुळे सुद्धा दोन्ही देशात वाद निर्माण झाला आहे. यामध्ये ब्रह्मपुत्र नदीचा सुद्धा समावेश आहे. याव्यतिरिक्त मा-चा-खबब, लॅंगचग खबब आणि सेंगे खबब या तीन नद्या चीनमधून उगम पावतात आणि भारतात येतात मा-चा-खबब उत्तर कैलास पर्वतावरून नेपाळमधून उत्तर भारतात येते. लॅंगचग खबब नदी उत्तर कैलास पर्वतातून पुढे धापा व नागरी भागात पोहोचते. त्यानंतर किन्नोर व्हॅली आणि रामपूर मार्गे ती भारतात प्रवेश करते. ही नदी भारतात सतलज नदी म्हणून ओळखली जाते. ही नदी नंतर हिमाचल मार्गे पंजाब व नंतर पाकिस्तानात जाते. सेंगे खबब नदी जी पश्चिम कैलास पर्वतातून उगम पावून लडाख आणि काश्मीरमध्ये प्रवेश करते. यानंतर ती पाकिस्तानातून अरबी समुद्रात विलीन होते. या नद्यांवर चीनचे वर्चस्व असून चीन यावर मोठा बंधारा बांधण्याची योजना आखत आहे. चीन या नद्यांतील पाण्यावर आपला अधिकार सांगतो. त्यामुळे या नद्यांच्या पाण्याचा वाद दोन्ही देशांतील संघर्षाचे कारण आहे.



**१. हिंद महासागरवरील प्रकल्प :-**

गेल्या काही वर्षांत चीनने हिंद महासागरातील आपल्या कामांमध्ये मोठ्या प्रमाणात वाढ केली आहे. पाकिस्तान, म्यानमार आणि श्रीलंका यांच्याशी भागीदारी करून प्रकल्पाव्दारे भारताची कोंडी करण्याची रणनीती चीन आखत आहे.

१०. दक्षिण चीन समुद्रात वर्चस्वाचे प्रयत्न :-

आपली उर्जा गरज लक्षात घेऊन चीन हा दक्षिण चीन सागरी प्रदेशात आपले वर्चस्व प्रस्थापित करण्याचा प्रयत्न करीत आहे. येथे त्याला व्हिएतनाम, जपान आणि फिलिपिन्सच्या आढ्यांना सामना करावा लागला आहे. व्हिएतनामच्या दोन आईल ब्लॉक प्रकल्पांमध्ये सहभागी असलेल्या भारतीय कंपन्यांना दक्षिण समुद्रापासून दूर राहण्याचा इशारा चीनने दिला होता.

११. अणु-पुरवठादार समूहात (एनएसजी गटात) भारताला प्रवेश देण्याला चीनचा विरोध :-

भारताला आण्विक पुरवठादार गटात (एनएसजी) प्रवेश देण्याच्या प्रस्तावाला चीनने विरोध केला आहे. यासंदर्भात जोपर्यंत एखादी विशिष्ट योजना तयार केली जात नाही तोपर्यंत विरोध केला जाईल आणि याबाबत पुढे कोणतीही चर्चा केली जाणार नाही अशी चीनची भूमिका आहे. एनएसजी सदस्यांमध्ये "सहमतीचा अभाव" असल्याचे नमूद करून चीनने भारताला एनएसजीमध्ये समाविष्ट करण्याचा प्रत्येक प्रयत्न रोखला आहे.

भारताच्या एनएसजी प्रवेशाला असलेल्या करण्याच्या चीनच्या भूमिकेमागे दोन कारणे आहेत. एक म्हणजे भारताला एनएसजीचे सभासदत्व मिळू नये ही पाकिस्तानची भूमिका आहे. भारत एनपीटीला बांधील नाही या सबबीवर चीनने भारताच्या एनएसजी प्रवेशाला विरोध केला आहे (चौगुले, २०१६). भारत आणि पाकिस्तान या दोन्ही देशांनी जवळपास एकाच वेळी अणु-परीक्षण केले होते. त्यानंतर भारताने अमेरिकेशी नागरी अणुकरार केला आणि आण्विक गटात भारताचे वेगळे स्थान तयार केले. त्याचा अर्थ असा घेता येईल की, अमेरिका तसेच एनएसजीने भारताच्या विकसित केलेल्या अण्वस्त्र-क्षमतांना मान्यता देऊन अणुऊर्जा निर्मितीसाठी भारताशी व्यापार करण्याचा मार्ग मोकळा केला. मात्र अमेरिकेने पाकिस्तानशी नागरी अणुकरार झाला नाही. पाकिस्तानच्या अण्वस्त्र-क्षमतांना अद्याप जागतिक मान्यता मिळालेली नाही. भविष्यात आंतरराष्ट्रीय समूहाकडून पाकिस्तानवर अण्वस्त्र कार्यक्रम गुंडाळून ठेवण्याचा दबाव येण्याची शक्यता नाकारता येत नाही. भारताला एनएसजीचे सदस्यत्व मिळाले, तर भारतावर हा दबाव येऊ शकणार नाही. यामुळे भारताला हे सदस्यत्व मिळू नये यासाठी पाकिस्तानचा आत्यंतिक जवळचा मित्र या नात्याने चीनने विरोध दर्शवला आहे.

१२. चीनचे विस्तारवादी धोरण :-

केवळ भारतच नाही तर चीनच्या शेजारी असलेले सर्व देश आणि आजूबाजूच्या एकूण १८ देशांच्या भूभागांवर आपला दावा ठोकला आहे. चीनची १४ देशांशी सीमा भिडत असूनही चीनचे क्षेत्रीय वादातून १८ देशांशी वाद आहेत. यात संपूर्ण दक्षिण चीन समुद्र आणि काहीवेळा आंतरराष्ट्रीय पाण्याचा प्रश्न देखील समावेश आहे. चीनच्या या विस्तारवादी भूमिकेमुळे चीनच्या आजूबाजूला असलेले भारतासह ब्रुनेइ, भूतान, कंबोडिया, इंडोनेशिया, जपान, लाओस, मलेशिया, मंगोलिया, नेपाळ, उत्तर कोरिया, फिलीपाईन्स, रशिया, सिंगापूर, दक्षिण कोरिया, तजाकिस्तान, तैवान, व्हिएतनाम, असे जवळपास १८ देश त्रस्त आहेत. भारत आणि चीन दरम्यान सुध्दा दीर्घकाळापासून सीमाविवाद सुरू आहे. भारताच्या लडाख आणि अरुणाचलमधील मोठ्या भागावर चीन दावा करतो. त्यावरून दोन्ही देशांमध्ये १९६२ मध्ये युद्धही झाले होते. लडाखमधील गलवान खोऱ्यात झालेला संघर्ष हा सुद्धा चीनच्या विस्तारवादी धोरणाचाच भाग आहे. चीनने भूतानच्या मोठ्या भूभागावर आपला दावा सांगितला आहे. येथील आंतरराष्ट्रीय सीमेवर चीनने बंकरही



उभारलेले आहेत. सद्यस्थितीत भारत आणि भूतान यांच्यात चांगले संबंध असून, भारत भूतानला वेळोवेळी सहकार्यही करतो.

१३. डोकलाम वाद :-

भूतान आणि चीन हे दोन्ही देश डोकलाम आपला भाग असल्याचे सांगतात. भारत भूतानच्या दाव्याचे समर्थन करतो. भारत आणि चीनमधील तणाव डोकलाम वादाने आणखी वाढला. सन २०१७ मध्ये चीनने भूतानला लागून असलेल्या वादग्रस्त डोकलाममध्ये रस्ता तयार करण्याचा प्रयत्न केला. चीन आणि भूतानच्या मधील वर्षामध्ये हा डोकलाम परिसर वादग्रस्त होता. हे खरे तर चीन, भारत आणि भूतानच्या सिमेवर आहे, जिथे भारताच्या सिक्कीमची सीमा देखील आढळते. चीनला या वादग्रस्त क्षेत्रापासून भारत सीमेपर्यंत रस्ता तयार करायचा होता. चीनने जेव्हा चुंबी खोऱ्यात यातुंगमध्ये डोकलाम परिसरात रस्ते बांधणीचे काम हाती घेतले. त्यावेळी भारताने त्याचा कडाडून विरोध केला. पण चीनने या विरोधाला वाटाण्याच्या अश्रुता दाखवल्या. यानंतर या भागावर लश्च ठेवण्यासाठी भारताने दोन बंकर उभारले. पण चिनी सैन्याने भारताचे हे दोन्ही बंकर उद्धवस्त केली. त्यानंतर भारतीय सैन्याने एक मोठी तुकडी या भागात तैनात केली. पुढे दोन्ही देशांच्या सैन्यात सामना सुरू झाला. शेवटी चीनला माघार घ्यावी लागली आणि आणि अखेर चीनला आपला रस्ता बनविणे थांबवावे लागले. हा रस्ता तयार केल्याने भारताच्या सुरक्षेस धोका आहे, असे सांगत भारताने रस्त्याचे काम थांबवले. विशेषतः सिलिगुडी कॉरिडोरला भारताचे चिकन-मान असे म्हणतात. दुसरे कारण म्हणजे भारत आणि भूतान दरम्यान झालेल्या करारानुसार भारत भूतानचे संरक्षण व संरक्षण करेल.

भारत आणि चीनमध्ये असलेला सीमेवर शांतता प्रस्थापित करण्याचा करार हा भूतान आणि चीनच्या सीमेला लागू आहे की नाही या प्रश्नावरून डोकलामचा वाद निर्माण झाला होता. भारताचे मत आहे की, भूतानशीही २०१२ मध्ये तसाच एक करार झाला आहे. चीनचे मत आहे की, चीन-भूतान यांच्यात डोकलाममधील सीमेबाबत काहीच वाद नाही. कारण हा प्रदेश चीनचा असल्याचे १८९० च्या ब्रिटिश भारताबरोबर झालेल्या करारातच मान्य करण्यात आले आहे. पण हा करार सिक्कीम, भूतान आणि चीन यांच्या सीमा ज्या ठिकाणी एकत्र येतात त्या प्रदेशाबाबतचा आहे. सिक्कीम हे भारतात समाविष्ट झाल्यानंतर भारत या वादाचा एक भाग बनला आहे. त्यामुळे भारत-चीन सीमेचा वाद सुटपर्यंत सीमेवर शांतता प्रस्थापित करण्याचा व तेथील सद्यस्थितीत कोणताही बदल न करण्याचा करार या या प्रश्नालाही लागू आहे असे भारत आणि भूतानचे मत आहे. त्यामुळेच या प्रदेशात रस्ता बांधून त्याच्या सद्यस्थितीत बदल करण्याच्या चीनच्या कृतीला भूतानच्या वतीने भारताने हरकत घेतल्याने हा वाद शिगेला पोहोचला होता. सैन्यबळाचा वापर करून या वादावर तोडगा काढला गेला असता तर संपूर्ण सीमेवरील शांतता धोक्यात आली असती व दोन्ही देशांतील संघर्षात अजून भर पडली असती.

१४. संयुक्त राष्ट्र सुरक्षा परिषदेत भारताला विरोध :-

सुरक्षा परिषदेत भारताला व्हेटोच्या अधिकारासह स्थायी दर्जा मिळवा या मागणीला इंग्लंड, फ्रांस, अमेरिका (ओबामाच्या कारकिर्दीत) ह्यांचा पाठिंबा आहे. परंतु चीनचा विरोध आहे. चीनच्या विरोधामुळे सुरक्षा परिषदेत भारताला व्हेटोच्या अधिकारासह स्थायी सदस्यत्वाचा दर्जा मिळण्यास विलंब लागत आहे. अमेरिका, रशिया, चीन, इंग्लंड व फ्रांस या राष्ट्रांमध्ये सुरक्षा परिषदेच्या रचनेत बदल करण्याबाबत एकमत होत नाही तोपर्यंत सुरक्षा परिषदेत कोणताही बदल होऊ शकत नाही. संयुक्त राष्ट्र संघटनेच्या निर्मितीसंबंधी झालेल्या सर्व चर्चा, नेत्यांची पत्रे आदी ऐतिहासिक दस्तऐवजांचा अभ्यास करून काही तज्ज्ञ अभ्यासकांनी ग्रंथ (पुस्तक) लिहिले आहेत. त्या ग्रंथानुसार १९५० ते ६० ह्या दशकात भारताला सुरक्षा परिषदेच्या रचनेत व्हेटोच्या अधिकारासह स्थायी



स्वरूपाचा सदस्य होण्याची संधी होती. भारताने ह्या संधीचा उपयोग केला नाही तर संयुक्त राष्ट्रे ही खऱ्या अर्थाने जागतिक संघटना व्हावी यासाठी सर्वाधिक लोकसंख्या असणाऱ्या चीनला ह्या आंतरराष्ट्रीय संघटनेचे सदस्य करून घ्यावे यासाठी सातत्याने १४-१५ वर्षे प्रयत्न केले. भारताने केलेल्या नैतिक प्रयत्नांचे स्मरण न करता भारत सुरक्षा परिषदेचा स्थायी सदस्य होऊ नये अशी चीनची भूमिका आहे.

चीन संयुक्त राष्ट्र सुरक्षा परिषदेचा कायम सदस्य या नात्याने आंतरराष्ट्रीय व्यासपीठावरसुद्धा भारताला सतत विरोध करीत असतो, मग तो अणुपुरवठादार संघटनेच्या सदस्यत्वाचा प्रश्न असो की, मसूद अजहरला आंतरराष्ट्रीय दहशतवादी ठरविण्यासंबंधीचा ठराव असो. पाकिस्तान आणि पाकव्याप्त काश्मीरमध्ये राहणारा मसूद अजहर हा भारतीय भूमीवर झालेल्या अनेक दहशतवादी कृत्यांसाठी जबाबदार आहे. उदा. संसदेवर हमला, पठाणकोटमधील लष्करी छावणीवर झालेला हल्ला इत्यादी. या सर्व बाबींसंबंधीचे पुरावे (दस्तऐवज) भारताने संयुक्त राष्ट्र संघटनेत सादर केले. परंतु मसूद अजहरचे नाव आंतरराष्ट्रीय दहशतवाद्यांच्या यादीमध्ये समाविष्ट होऊ नये यासाठी चीनने आपल्या व्हेटोच्या अधिकाराचा उपयोग केला. चीनच्या ह्या भारतविरोधी भूमिकेमुळे अद्यापही मसूद अजहरचे नाव संयुक्त राष्ट्र संघटनेच्या दहशतवाद्यांच्या यादीत समाविष्ट होऊ शकले नाही. विशेषतः चीन पाकिस्तानचा वापर आशियात भारताशी सत्ता समतोल स्थापन करण्यासाठी करीत असल्यामुळे भारताने त्याच कारणासाठी दक्षिण पूर्व आशियायी देशांशी संपर्क साधणे सुरू केले आहे. चीनचा उदय आक्रमकपणे होत असल्यामुळे अमेरिका, ऑस्ट्रेलिया, जपान हे देशही बिभरले आहेत व त्यांना चीनविरोधी आघाडी करणे आवश्यक वाटते, या आघाडीत भारत सामील असणे त्यांच्यासाठी अत्यंत आवश्यक आहे कारण चीनला थेट आव्हान देण्याची क्षमता फक्त भारतातच आहे आणि ते चीनलाही माहीत आहे. त्यामुळे दोन्ही देशांतला संपर्क वाढत गेला आहे.

१५. नेतृत्वाची आकांक्षा :-

चीनला आशिया खंडाचे नेतृत्व करावयाचे आहे. पण चीनला थेट आव्हान देण्याची क्षमता फक्त भारतातच आहे, हे चीनही जाणून आहे. त्यामुळे चीन भारताला स्पर्धक मानतो. आशिया खंडातील राजकारणावर वर्चस्व ठेवण्याच्या चढाओढीने दोन्ही देशात तणाव निर्माण होतो. आंतरराष्ट्रीय राजकारणात चीन भारताला शत्रू मानतो. आशिया खंडात चीनचे नेतृत्व प्रस्थापित व्हावे यासाठी चीनने १९६२ मध्ये भारतावर आक्रमण केले.

भारत-चीन व्यापार संबंध :-

भारतात चीनमधून मोठ्या प्रमाणात होणारी आयात हा अतिशय गंभीर विषय आहे. भारतातील १४ टक्के आयात चीनकडून होते. त्यामध्ये इलेक्ट्रॉनिक उपकरणे, मोबाईल फोन, औषधी रसायने इत्यादी प्रमुख आहेत. ह्या वस्तू स्वस्त असल्याने लोकप्रिय आहेत. भारत आणि चीनमध्ये सुमारे १०० अब्ज डॉलर्स किंमतीचा द्विपक्षीय व्यापार असला तरी त्यामध्ये आयातीचे प्रमाण जास्त आहे. भारत चीनकडून ७५ अब्ज डॉलर्सचा माल खरेदी करतो. या व्यापारात हजारो व्यापारी, कामगार आणि लक्षावधी ग्राहक गुंतले आहेत. या गोष्टी आत्मनिर्भर होण्याच्या राष्ट्रीय आकांक्षाविरुद्ध आहेत. आत्मनिर्भरता हाच एकमेव मार्ग आहे. स्वाभिमान हा त्याचा आधार आहे. शत्रू देशावर कोणत्याही बाबीसाठी अवलंबून राहणे हा एक कमकुवतपणाच आहे. भारताने टीकटॉक्सह शेकडो चीनी अॅप्लेवर निर्बंध टाकले आहेत. भारतानंतर जगाने त्या दिशेने पावले टाकली. अमेरिकेनेही भारतानंतर टीकटॉकवर बंदी घातली. एवढेच नव्हे तर चीनच्या विस्ताववादाविषयी पंतप्रधान नरेंद्र मोदी यांनी भाष्य केल्यानंतर अनेक देश त्या आशयाने बोलू लागले आहेत (देवळाणकर, २०२०).





१९६२ चा भारत आणि २०२१ चा भारत यात फरक जरी असला तरीही चीनची सैन्यशक्ती भारतापेक्षा जास्त आहे यात शंका नाही. चीनने भारताच्या सीमेपर्यंत रस्त्यांचे जाळे वाढविले आहे. चीनने व्हासापर्यंत रेल्वे आणून त्यांचे सामर्थ्य वाढवले आहे. त्यांच्या सैन्याच्या हालचाली आता भारतापेक्षा जलद होऊ शकतात. चीनला सध्या अनेक आघाड्यांवर संघर्ष करावा लागत आहे, तो भारताशी युद्ध करेल अशी शक्यता कमी आहे. वादविवादावर शांततेच्या मार्गाने तोडगा काढण्यासाठी भारत उत्सुक आहे.

भारत-चीन सहकार्य :-

पंतप्रधान राजीव गांधी यांनी सन १९८८ मध्ये चीनला भेट दिली. तेव्हा दोन्ही देशांनी सीमाप्रश्न सोडविण्यासाठी आणि इतर क्षेत्रात द्विपक्षीय संबंध सक्रियपणे विकसित करण्यास सहमती दर्शविली. सन १९९२ मध्ये भारताचे राष्ट्रपती आर. वेंकटरमन हयांनी चीनला भेट दिली. सन २००३ मध्ये पंतप्रधान वाजपेयी यांनी चीनला भेट दिली आणि दोन्ही देशांनी सर्वसमावेशक सहकार्याच्या घोषणेवर स्वाक्षरी केली. सन २००८ मध्ये पंतप्रधान डॉ. मनमोहन सिंग यांनी चीनला भेट दिली आणि दोन्ही सरकारांनी 'एकविसाव्या शतकातील एक समान दृष्टीकोन' यावर सहमती दर्शविली. सन २०११ हे 'चीन-भारत विनिमय वर्ष' आणि २०१२ हे 'चीन-भारत मैत्री आणि सहकार्याचे वर्ष' म्हणून साजरे केले गेले. सन २०१५ मध्ये पंतप्रधान मोदी यांनी चीनला भेट दिल्यानंतर चीनने भारतीय अधिकृत यात्रेकर्त्यांसाठी नाथू ला खिंड उघडण्याचा निर्णय घेतला. सन २०१८ मध्ये बुहानमध्ये चीनचे राष्ट्रपती आणि भारताचे पंतप्रधान यांच्यात अनौपचारिक शिखर परिषद आयोजित करण्यात आली होती. सखोल चर्चेनंतर दोन्ही देशांमध्ये जागतिक व द्विपक्षीय धोरणात्मक मुद्द्यांसह देश-परराष्ट्र धोरणांशी संबंधित त्यांच्या दृष्टिकोनावर व्यापक सहमती झाली. सन २०१९ मध्ये चेन्नईला भारताचे पंतप्रधान आणि चीनचे राष्ट्रपती यांच्यात 'द्वितीय अनौपचारिक शिखर परिषद' पार पडली ज्यामध्ये पहिल्या बैठकीत झालेल्या सहमतीला आणखी बळकटी मिळाली (यादव, २०२०).

निष्कर्ष :-

प्राचीन काळापासून भारत व चीन यांच्यात परस्पर संबंध होते. आज या संबंधात सीमावाद ही अत्यंत महत्त्वाची समस्या आहे. भारत आणि चीन यांच्यातील सीमावाद हा प्रचंड गुंतागुंतीचा आणि दोन्ही देशांच्या निर्मितीपासून प्रलंबित प्रश्न आहे. मॅकमोहन सीमारेषा, अक्साई चीन आणि अरुणाचल प्रदेश या तीन मुद्द्यांवरून भारत आणि चीन यांच्यामध्ये सीमावाद आहे. भारत आणि चीन या दोन्ही देशांदरम्यान असलेले बफर स्टेट म्हणजे तिबेटवर चीनने ताबा मिळवल्याने दोन्ही देशांच्या सीमा परस्परांना भिडल्या. चीनच्या या आक्रमक धोरणाचा भारताने निषेध केल्याने आणि दलाई लामा यांना भारताने दिलेला राजाश्रय दिल्याने या गोष्टींचा बदल घेण्यासाठी चीनने भारतावर आक्रमण केले. भारतासमोर पाकिस्तानला आव्हान म्हणून उभे करून चीन आशियातील शक्तिशाली राष्ट्र होऊ इच्छितो. भारताचे अमेरिकेशी मैत्रीपूर्ण संबंध प्रस्थापित झाल्याने चीन अधिकच आक्रमक झाल्याचे दिसून येते. चीन ब्रह्मपुत्र नदीवर अनेक बांधारे बांधत असून पाणी कालव्याद्वारे उत्तर चीनच्या भागात वळवू इच्छित आहेत. भारत-चीन असा संघर्ष जर झाला तर त्यावेळी चीन ब्रह्मपुत्र नदीतून अतिरिक्त पाणी सोडून भारतात संकट निर्माण करू शकतो किंवा दुष्काळाच्या वेळी धरणातून पाणी न सोडता ने अडवून भारतातील दुष्काळसमयी संकट निर्माण करू शकतो. गेल्या काही वर्षांत चीनने हिंद महासागरातील आपल्या कामांमध्ये मोठया प्रमाणात वाढ केली आहे. पाकिस्तान, म्यानमार आणि श्रीलंका यांच्याशी भागीदारी करून प्रकल्पांद्वारे भारताची कोंडी करण्याची रणनीती चीन आखत आहे. भारताला आण्विक पुरवठादार गटात (एनएसजी) प्रवेश देण्याच्या प्रस्तावाला चीनने विरोध केला आहे.





भारत-चीन या दोन्ही देशांमध्ये नियमितपणे उच्च स्तरीय सामरिक आणि आर्थिक संवादासाठी बैठकी आयोजित होणे आवश्यक आहे. संयुक्त राष्ट्रे आणि इतर प्रादेशिक संघटनांमध्ये दोन्ही देशांनी समन्वय ठेवणे. दोन्ही देशांनी एकमेकांच्याप्रति सकारात्मक प्रतिमा जोपासण्यासाठी प्रयत्न करणे, दोन्ही देशांनी सागरी सुरक्षा सहकार्य अशा पारंपारिक सुरक्षा विषयावर काम करणे, तिबेटी स्वातंत्र्य चळवळ आणि दक्षिण चीन समुद्र यासारख्या संवेदनशील मुद्द्यांची काळजीपूर्वक हाताळणी करावी. दोन्ही देशांतील व्यापार वाढविणे आवश्यक आहे. दहशतवादाचा सामना करण्यासाठी भारत आणि चीन यांच्यात सहकार्य वाढवावे तसेच संयुक्त दहशतवादविरोधी सराव आयोजित केले पाहिजे.

संदर्भ :-

- **Lin, Wu & Fujian, Li**, 2013, India-China Relations: How Can They Be Improved?, Future Directions International, 9 SEPTEMBER 2013
<https://www.futuredirections.org.au/publication/india-china-relations-how-can-they-be-improved/>
- चौगुले, प्रवीण, ह्यज्ये, भारत व एनएसजी सदस्यत्व, दै. लोकसत्ता, २० डिसेंबर २०१६
- तोडकर, बी.डी., २०१०, भारत आणि जग, पुणे, डायमंड पब्लिकेशन्स.
- देवळाणकर, शैलेंद्र, २००७, भारतीय परराष्ट्र धोरण : सातत्य आणि स्थित्यंतर, पुणे, प्रतिमा प्रकाशन.
- देवळाणकर, शैलेंद्र, २०१४, भारत आणि जग भारताचे परराष्ट्र धोरण आणि सुरक्षा संबंध, पुणे, डायमंड पब्लिकेशन्स.
- देवळाणकर, शैलेंद्र, २०२०, चीन महाकोंडीच्या दिशेने, ३१ जुलै २०२०, लोकशासन न्यूज नेटवर्क, लोकशासन <https://lokshasan.com/china-towards-mahakondi-dr-shailendra-devlankar-15014/>
- देशपांडे, दिवाकर, २०१७, धुमसती सीमा, महाराष्ट्र टाईम्स, ७ डिसेंबर, २०१७
- परिमल, मा.सु., एनएसजी सदस्यत्वाचा तिढा, २०१६ महाराष्ट्र टाईम्स, १४ जून २०१६
- वागल, सतीश, २०२०, चीन आणि भारत : स्पर्धा, संघर्ष की सहकार्य?, २४ ऑक्टोबर २०२०, सा. साधना
- यादव, तनुजा, २०२०, भारत-चीन के बीच कूटनीतिक संबंध के ७० साल पूरे, अमर उजाला, २७ मे २०२०
- वैदिक, वेदप्रकाश, २०१३, चीन-पाक मैत्री, सावधान इंडिया, दिव्य मराठी



BIOINFOLET 18 (1B) : 199 - 200, 2021

OPTIMIZATION OF MEDIA COMPOSITION AND PHYSICO-CHEMICAL CONDITIONS FOR MAXIMUM PHENAZINE-1-CARBOXYLIC ACID (PCA) PRODUCTION BY *PSEUDOMONAS* RSM35.

P. B. Pawar,*S. M. Inchure and *D. V. Vedpathak

Department of Microbiology, Shri Vyankatesh College, Deulgaon Raja (India)
*Department of Microbiology, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous), (India)

ABSTRACT

Phenazine-1-carboxylic acid (PCA) is a phenazine compound produced by *Pseudomonas* species. Present study deals with optimization of medium composition and physico-chemical conditions for increased production of PCA by *Pseudomonas* RSM35. Maximum yield of PCA (965.5 mg/l) was obtained with 30 g/l glucose as a source of carbon, 40 g/l Soya peptone as nitrogen source, at pH 7.0 and 28°C.

Key words : PCA, Optimization, *Pseudomonas* RSM35

Introduction

Pseudomonas, a ubiquitous bacterial genus with biocontrol aptitude, is of immense importance as number of rhizosphere pseudomonad species are termed as plant growth-promoting rhizosphere (PGPR). This bacterium improve plant growth, indirectly by producing antifungal secondary metabolites, such as phenazine-1-carboxylic acid (PCA), Pyrrolnitrin (PRN), pyoluteorin (Pit) and the c-acetyl-phloroglucinols (David and O'Gara, 1994). Present study was undertaken on optimizing carbon (C) and nitrogen (N) in the medium on which *Pseudomonas* is grown, improving PCA production by *Pseudomonas* sp. RSM35.

Material and Methods

The RSM 35 strain of *Pseudomonas* ssp. was obtained from Pomegranate rhizospheric soil and used during present study. The organism was grown on fresh King's Medium B (Shtark et al. 2003) for 10 h and a loop of single colony culture was used for inoculation, aseptically, into a 250-ml Erlenmeyer flask containing 100ml KMB broth. The flasks were kept on a rotary shaker at 190 rpm for 24 hr at

28°C.

The PCA production medium in the experimental designs composed of carbon source, nitrogen source, MgSO₄, NaCl, K₂HPO₄. For batch culture, the 100 mL of the production medium inoculated with 5% of inoculum in 250-mL flasks then flasks were kept on a rotary incubator shaker at 190 rpm at 28°C (Li He, 2008).

The yield of PCA from *Pseudomonas* sp. RSM35 was investigated using different carbon sources: glucose, fructose, lactose, sucrose, maltose and glycerol, using PCA production medium containing 30 g carbon source (Li He, 2008). The effect of nitrogen source was studied using peptone, soy peptone, beef extract, and yeast extract. The fermentation medium contained 40 g nitrogen source per liter of the broth.

The supernatant was collected after centrifuging at 8000g for 7 min. For PCA extraction, supernatant was acidified to pH 4 with HCl and then the addition of chloroform (50 ml) for 100 ml, finally dried in a vacuum. PCA concentration was determined by spectrophotometric assay by using different concentration of Standard phenazine (0-1000µg/ml) were employed for recording absorbance at 248 nm on UV-VIS



BIOINFOLET

200

spectrophotometer (Systronics 2202) (Yihe Ge, 2004).

Results and Discussion

The maximum synthesis of PCA (965.5 mg / l) was observed when glucose was used as a source of carbon, followed by that with fructose (854 mg/l). Minimum PCA production was observed with Maltose as a source carbon (Table 1). Data presented in Tables 2 and 3 indicated that Soya Peptone (Hi-Media, India) proved to be the best nitrogen source for maximum PCA production (965.5 mg/L), while optimum pH for maximum PCA production was found to be 7.0 (965.5 mg /l). On the other hand the optimum temperature was found to be 28 °C, as shown in table 4 with the yield of 965.5 mg /l PCA.

Table 1: Optimization of Carbon sources for PCA Production

Carbon Source	Yield of PCA (mg/L)
Sucrose	560.2
Maltose	452.1
Glycerol	665.2
Glucose	965.5
Fructose	854.0
Lactose	675.0

Table 2: Optimization of Nitrogen sources for PCA Production

Nitrogen Source	Yield of PCA (mg/L)
Peptone	653.2
Soya Peptone	965.5
Beef Extract	530.8
Yeast Extract	620.2

Table 3: Optimization of pH for PCA Production

pH	Yield of PCA (mg/L)
4.0	73.2
6.0	540.2
7.0	965.5
9.0	430.8

Table 4: Effect of temperature on PCA Production

Temperature(°C)	Yield of PCA (mg/L)
20° C	304.0
28° C	965.5
37° C	665.2
45° C	80.2

Acknowledgements:

The authors acknowledge UGC, New Delhi for financial support for Junior Research Fellowship. They also wish to extend deep sense of gratitude towards Shri Vyankatesh College, Deulgaon Raja and Rajarshi Shahu Mahavidyalaya (Autonomous), Latur for providing laboratory facilities and continuous encouragement.

References

David, N. Dowling and Fergal O’Gara (1994), *TIBTECH* 12: 133
 Shtark O, Shaposhnikov AI, Kravchenko LV (2003) *Mikrobiologiya* 72:645
 Yihe Ge, Xianqing Huang, Sulian Wang, Xuehong Zhang, Yuquan Xu (2004) *FEMS Microbiology Letters* :237-41
 Li He, Yu-Quan Xu, Xue-Hong Zhang (2008). *Biotechnology and Bioengineering*, 100 (2) :250



BIOINFOLET 18 (1 A) : 55 - 56, 2021

ISOLATION AND BIOCHEMICAL CHARACTERIZATION OF *XANTHOMONAS AXONOPODIS* PV. *PUNICAE* CAUSING BACTERIAL BLIGHT OF POMEGRANATE

P. B Pawar, S. M. Inchure* and D. V. Vedpathak*

Department of Microbiology, Shri Vyankatesh Arts, Commerce and Science College, Deulgaon Raja, M.S. (India)

*Department of Microbiology, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous), (India)

ABSTARCT

Present investigation was undertaken for isolation of *Xanthomonas axonopodis* pv. *punicae* from pomegranate growing at Solapur, Latur, Osmanabad and Jalna districts of Maharashtra state. Seven isolates showed characters of *X. axonopodis* pv. *punicae* with yellow mucoid shining colonies.

Key Words: Isolation, Identification, *Xanthomonas axonopodis* P.V. *Punicae*

Introduction

Bacterial blight is a major constraint caused by *Xanthomonas axonopodis* pv. *punicae* on pomegranate cultivation and production (Hingorani and Mehta, 1952). *Xanthomonas* species are Gram's negative, aerobic, rod-shaped forming mucoid, convex, and yellow colonies when grown on nutrient agar or sucrose peptone agar media. All members of the genus *Xanthomonas* are catalase positive and oxidase negative. Present investigation was carried out with an objective to isolate and assess cultural, morphological and biochemical characters of *Xanthomonas axonopodis* pv. *Punicae*.

Material and Methods

Collection of samples from field was undertaken in Solapur, Latur, Osmanabad and Jalna districts of Maharashtra state. Infected Pomegranate plants were diagnosed as on the basis of symptoms for bacterial blight, which include yellow water soaked lesions at early stages and corky, dark oily spots at later stages of infection (Plate 1). The infected plant parts were collected in sterile container and brought to the laboratory for the further investigation.

Leaf samples were surface sterilized with 0.1 per cent HgCl₂ for about 60 - 90 sec. and washed with sterile distilled water. The leaf margins soaked in saline water were

macerated on clean surface sterilized glass slide, and a loop-full of macerate was streaked on Nutrient Sucrose Agar (NSA) medium (Hi-media, India Pvt. Ltd.) and incubated at 28 ± 1 °C for 48 hour (Dye, 1962; Swaranjali 2016).

The morphological characters of the pathogen such as cell shape, Gram nature, pigmentation, were recorded. The causative agent of bacterial blight was identified on the basis of colony and biochemical characteristics as per standard microbiological procedures described by Schaad (1992) and Chowdappa (2018).

Various biochemical tests such as Gram staining, catalase test, Citrate utilization test, Starch hydrolysis, Lysine utilization, Urease production, Phenylalanine deamination, Nitrate reduction, H₂S production, Carbohydrates utilization, KOH solubility test, indole production test, and Gelatin liquefaction test were also undertaken by following the standard protocols (Schaad, 1992, Aneja, 2003; Bhure, 2019)

Results and Discussion :

Seven isolates were obtained during present investigation, in the samples collected from Pandharpur, Mohol (Solapur district), Ausa (Latur district), Tuljapur (Osmanabad district) and Ghanwangi (Jalna districts). The pure cultures were stored in the refrigerator at 4°C, which served as a stock culture for further investigation.



BIOINFOLET

56

The isolates showed yellow mucoid shining colonies on NSA medium, which is a peculiar character of *X. axonopodis* pv. *punicae*. The isolated bacteria were rod shaped, Grams negative, showing positive results for catalase, Starch hydrolysis, Indole Production, Catalase test, KOH test, Gelatin liquefaction, Lysine utilization test, Ornithine utilization, Nitrate reduction, H₂S production and glucose utilization tests, while negative for citrate utilization test, Indole production test, Urease test and Phenylalanine deamination test.

It was thus confirmed that the causal agent of bacterial blight of pomegranate was *Xanthomonas axonopodis* pv. *Punicae* as was earlier reported by Hingorani and Singh (1959).

Acknowledgements:

The authors deeply acknowledge the financial support granted by UGC-New Delhi, Raja rshi Shahu Mahavidyalaya (Autonomous), Latur and Shri Vyankatesh College, Deulgaon Raja for Laboratory facilities.

References:

Chowdappa, A. A., Kamalakannan, S., Kousalya, C. G., K. Venkatesan and G.

Shali Raju (2018) *Journal of Pharmacognosy and Phytochemistry*; 7(4): 3485

Aneja, K. R. (2003). "Experiment in microbiology, plant pathology and biotechnology". New Age. Int. Pub., Haryana, pp 607

Bhure, S. S., S. B. Bramhankar, K. D. Thakur, D. G. Wasnik, R. D. Pawar, A. A. Labhasetwar, S. A. Kakad, T. Ravali and C. A. Sarode (2019). *International Journal of Chemical Studies* 7(1): 1941

Bradbury, J. F. (1970) *Review of Plant Pathology*. 49: 213.

Dye D.W.,(1962). *New Zealand Journal of Science* 5:393.

Hingorani, M.K. and Mehta, P.P.(1952) *Indian Phytopathol.*, 5: 55.

Hingorani, M.K. and Singh, N.J (1959). *Indian J. Agric. Sci.*, 25: 45

Schaad, N. W. (1992). "Laboratory Guide for Identification of Plant Pathogenic Bacteria". Second Edn. International Book Distributing Co, Lucknow, pp 165.

Swaranjali Kishor Gadhe, . Suresh Haribhau Antre, Bhausaheb Babanrao Ghorpade, Rishikesh Haribhau Autade and Rushil Ramesh Mandlik (2016) *Int. J. Pure App. Biosci.* 4 (3): 160

Plate 1 :

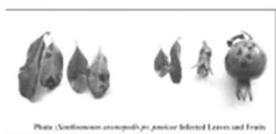


Plate 1: *Xanthomonas axonopodis* pv. *punicae* Infected Leaves and Fruits

Plate 1 :



Plate 1: Bacterial cultures of *Xanthomonas axonopodis* Pv. *Punicae*



Volume-2 (2020)
Issue-1 (January-2020)

RESEARCH HUB

International Peer-Reviewed Multi-Disciplinary E-Journal

**WILLIAM WELLS BROWN'S ESCAPE OR A LEAP FOR
FREEDOM: THE FIRST PUBLISHED AFRICAN AMERICAN
PLAY**

Dr. Eknath Bhalerao
Department of English,
Shri Vyankatesh College,
Deulgaon Raja,
Buldana-443204

Abstract : William Wells Brown's play underlines the inhuman practice of slavery system in contemporary Southern part of the American. It also lights on complicated religious and racial struggle among the southerners. In addition to this, sexual atrocities of African American mistress from the white masters and their sons are also crucial issue of the play. The play reveals the social, cultural & moral decadence of the Whites in relation to African American slavery.

Key Words: African American Theatre.

Introduction :

The beginning of African American theatre in America is most significant phenomenon in connection of African American freedom movement. It is believed that the roots of African American theater lies in early 'minstrel'¹ however, these early minstrel shows performed by white Americans with black masks only for white audiences. These shows posed the African Americans as superstitious, buffoonish, ignorant, stupid and lazy. In due course time the African Americans slaves began to perform dance to get relaxation form the heavy plantation work on the farm of their white masters and obviously they involved in minstrel shows. But simultaneously they had to entertain to their master and also work on plantation. In real sense, they have to act as entertainers and also plantation workers. Though their shows were controlled by the white's cultural tradition, they themselves have a great heritage of their own culture from Africa. Because when they brought to America as commercial slaves they brought with them their own fables, spirituals, blues & folklore in short the oral tradition of their African culture. As James V. Hatch notes:

Many people believe that black theater began with Lorraine Hansberry's *A Raisin in the Sun* (1959) and that whatever preceded Hansberry did not amount to much. They are wrong. Black theater stretches back into antiquity, and for Afro-Americans, shared glory with the dark-skinned pharaohs of Egypt is as legitimate as shared glory with the Greeks for Western Caucasians. However, until recently, Egypt, the site of the most ancient monuments where religious ritual flourished, was excised politically from the African continent by Western historians who labeled the culture of the pharaohs not an African but a Semitic-Hamitic triumph. With Egypt and Arab North Africa skimmed off the top of the continent, the world's most ancient rituals (the Memphite dramas and the birth and death of Osiris) disappeared from African history to become objects of Middle Eastern studies or a separate



www.researchhub.org.in

Email : researchhubjournal@gmail.com

73



Volume-2 (2020)
Issue-1 (January-2020)

RESEARCH HUB

International Peer-Reviewed Multi-Disciplinary E-Journal

area of study, Egyptology. Only in the late twentieth century have scholars again identified the "Negroid" features of the pharaohs of the Upper Nile with the people south of the Sahara.²

James V. Hatch observation clearly shows that the origin of African American theatre goes back to old African culture. Hence, the African American who brought various fables and oral tradition of history with them are reflected in the African American theatre. The 'Negroid'³ features of the *Pharaohs*⁴ at upper side of Nile indicate the cultural tradition of the African Americans. There are many Signs of African cultural heritage we can find in the oral tradition of African Americans. Besides this cultural background of the African Americans, to understand the theatre we have to go at first African American known play by James Brown's *King Shotaway* (1823). This play credited to be the first known play by African American dramatist.

In New York Brown established the first black theater company known as *African Grove Theater*. The theatre performed Shakespeare plays developed the career of the first African American actor Ira Aldridge. However, the theatre was closed after its little success implementing the charges of misbehavior. The theater closed for five years. Brown also tried to perform *King Shotaway* on the stage. Today there are no copies of the play is available. However, Brown is credited to become the first known playwright in the African American theater.

Escape or a Leap for freedom (1858) is a first African American published play by William Wells Brown (1814-1884). He was born as slave to an African American slave woman and white slaveholder father. In his early days he served to various white slaveholders. Then he escaped in the year 1834 from his masters and changed his name as Quaker Well Brown. Then he joined abolition movement and writes many books as well as delivered various antislavery lectures. He also credited to be the first writer of slave narrative, travel book and novel among the African American ethnic minority in the US. He wrote verity of literary books: *Narrative of William W. Brown, a Fugitive Slave* (1847), *Clotel* (1853), *The Black Man* (1863), *The Negro in the American Rebellion* (1867), *The Rising Son* (1873) and *My Southern Home* (1880). This variety of writings contains the slave life, racism and abolitionism regarding the African American people and their exploitation in slavery system, their predicament and plight to get rid from their masters.

Escape or a Leap for freedom (1858) is most significant and pioneering contribution in the African American theater. The present play is a story of two protagonists, Glean and Melinda. Both are African American slaves who married to each other but their marriage was not approved by their masters. Glean was owned by Mr. Hamilton (Dr. Gaines' brother-in-law) and Melinda was owned by Mr. Gaines who is doctor by profession, slaveholder and proprietors of the farm at Muddy Creek, Missouri in the South America. Melina is his house slave hence, he understand her as his private property. He tries to seduce her sexually but she refuses her and wishes to live with another slave Glean who is working at another plantation owner named Mr. Hamilton. Glean is aware of Mr. Gains intention about Melinda hence; he wishes to protect her at the cost of his life. When Mr. Gains exploits Melinda his actual wife Mrs. Gains becomes jealous about her and she also exploits her psychologically. Mr. Gains


www.researchhub.org.in

 Email : researchhubjournal@gmail.com

74



Volume-2 (2020)
Issue-1 (January-2020)**RESEARCH HUB**

International Peer-Reviewed Multi-Disciplinary E-Journal

brought Melinda in cottage ten miles away at his farm and ask her for sexual submission in exchange he provides her separate cottage as well as clothes. However, Melinda prefers to live with Glean a slave at another plantation. Thereafter, Mr. Gains becomes furious and try to kill Melinda giving her poison in the cottage and promised to murder Glean. To get rid from the terror from Mr. Gains Glean and Melinda both try to escape from their master and succeeded to runaway to Canada with the help of Ohio Crackers of Underground Rail Road. Besides this the play is panoramic depiction of contemporary slave life and the immoral life of their masters.

The play *Escape or a Leap for freedom* exposes the tyranny of slavery system in South America. Through the play it is clear that to exploits slaves sexually and physically the whites masters deliberately makes the separation of slave families to different plantation owners. In the present play separation of Melinda and Glean is also the part of same tactics of white master. Regarding the character of Glean and Melinda Abramson, Doris M observes: "*The chief antagonists are a white couple, Dr. and Mrs. Gains, who mouth Christian sentiments while threatening to whip their slaves.*"⁵ The White master uses their religion to mislead the African American slaves. In the present play Mr. and Mrs. Gains refuses to give the acceptance to the marriage of Melinda and Glean they use the religious tactics to destroy their marriage and separate them from sentimental union. Hence, there is conflict between white's religious hypocrisy and African Americans. The protest of Glean and Melinda against Mr. Gains and his wife is a sign of freedom movement of the slave. The whites masters always discriminate among the slave women, they gave favor to attractive woman in order to sexually exploit them. "It is common knowledge that the whites plantation owner took attractive Negro woman as concubines. It is also true that the white masters or his son often discriminated in favor of the Negro mistress"⁶ it seems to us the inhuman approach of the Whites towards African American slave women. They never treated these women with respect and honor they just understood them as a thing created by God for their pleasure. These women's life, sentiments and self are nothing for them. If the slave woman does not behave as per the mood of her master, he was free to sell her to other slaveholder. Melinda opposed to Dr. Gains her master hence; definitely Dr. Gains sell her as an animal to another slaveholder. The discussion of Glean and Melinda in the play is as:

MELINDA: But we could never succeed in the attempt to escape.

GLEN: We will make the trial, and show that we at least deserve success. There is a slave trader expected here next week, and Dr. Gains would sell you at once if he knew that we were married. We must get ready and start, and if we can pass the Ohio river, we'll be safe on the road to Canada (ELFF- pp. 52)⁷

Melinda and Glean are slaves who want happy life but it is not accepted by their master hence, they decided to run away from plantation to Canada. This event shows the subhuman treatment to slaves from their masters.

The play explores the theme of Northerners Verses Southerners. There was conflict between these two parts of the same country. South Americans were very traditional by their


www.researchhub.org.in

 Email : researchhubjournal@gmail.com

75



Volume-2 (2020)
Issue-1 (January-2020)

RESEARCH HUB

International Peer-Reviewed Multi-Disciplinary E-Journal

ideology on the other hand Northerners were against the slavery system. In the play southern slaves run to North to take shelter and get rid from slavery system. "*Brown handling of Glen's leap is significant in that act not only define Glen but also prescripts racial roles in cultural drama of antislavery efforts*"⁸ William Wells Brown's characters Glen and Melinda represents the escape of many African American slaves from racial discrimination of contemporary time hence, the tray of Brown to showcase the sorrow of slaves through dramatic art is significant.

The play underlines the inhuman practice of slavery system in contemporary South American society. It also lights on the complicated racial and religious struggle among the southerners. In addition to this, sexual atrocities of African American mistress from white masters and their sons are also crucial issue of the play. "*Dr. Gains attempted violation of Melinda is not an original act but, rather, a part of large cultural history of violence*"⁹ Dr. Gains act is motivated by the history of violence and tradition of exploitation of the African Americans slave families. The play reveals the social, cultural & moral decadence of the Whites in relation to African American slavery.

The play also has literary values because it is full of irony and humor also. The technique of Brown to showcase the sorrow through humor and irony is innovative. Being the first African American Playwright the struggle William Wells Brown is most significant for the whole African American community. After William wells Brown there were many African Americans Wrote plays not to their career as playwright but for the contribute in African American freedom movement.

References:

- Minstrel: It is early development of the African American theatre. in this show audiences creates round around the characters to watch the dramatic performance when there were no commercial theatres
- James V. Hatch, "*Introduction: Two Hundred Years of Black and White Drama*" (ed.) Leo Hamalian and James V. Hatch, "*An Anthology of Early Plays, 1858- 1938*" Detroit, Michigan: Wayne State University Press, - 1991, P.15
- Negroid: It is the term is used in forensic and physical anthropologists it is refer to individual group of people which have morphological and skeletal feat
- Pharaoh: is the common title of the monarchs of ancient Egypt from the First Dynasty (3150 BC) to the annexation of Egypt by the Roman Empire in (30 BC) ures that are common among Sub-Saharan African population.
- Abramson, Doris M. "William Wells Brown: America's First Negro Playwright." *Educational Theatre Journal*, vol. 20, no. 3, 1968, pp. 370-375.
- JSTOR, www.jstor.org/stable/3205178. Accessed 20 Apr. 2020.
- James V. Hatch, "*Introduction: Two Hundred Years of Black and White Drama*" (ed.) Leo Hamalian and James V. Hatch, "*An Anthology of Early Plays, 1858-1938*" Detroit, Michigan: Wayne State University Press, - 1991, PP.52
- Ernest, John. "The Reconstruction of Whiteness: William Wells Brown's *The Escape; Or, A Leap for Freedom*." *PMLA*, vol. 113, no. 5, 1998, pp. 1108-1121.
- JSTOR, www.jstor.org/stable/463245. Accessed 20 Apr. 2020.



www.researchhub.org.in

Email : researchhubjournal@gmail.com

76



B.Aadhar International Peer-Reviewed Indexed Research Journal
Impact Factor -(SJIF) -7.675, Issue NO, 314 (CCCXIV)
ISSN : 2278-9308
September, 2021

गिरोली बु. येथील शेतकऱ्यांच्या आर्थिक स्थितीचे अध्ययन
डॉ. नरेंद्र हरीभाऊ शेंगेकार
हायस्क प्राध्यापक (वाणिज्य विभाग), श्री व्यंकटेश कला, वाणिज्य व विज्ञान महाविद्यालय, देऊळगांवराजा
जि. बुलडाणा मो. 9422989632.

भारतीय अर्थव्यवस्था ही कृषिवर आधारित असून देशाच्या एकूण लोकसंख्येपैकी जवळपास 58% लोकसंख्या ही कृषि क्षेत्रावर अवलंबून आहे. देशाच्या जी.डी.पी.मध्ये कृषि क्षेत्राचा वाटा 2020 मध्ये 18.32% एवढा आहे. (Statistics Research Department January 2021) त्यामुळे कृषि क्षेत्र हा भारतीय अर्थव्यवस्थेचा कणा समजला जातो. पन्नास पंचवार्षिक योजनेच्या माध्यमातून देशाचा आर्थिक विकास घडवून आणण्याचे नियोजन केलेले आहे. पहिल्या पंचवार्षिक योजनेमध्ये कृषि क्षेत्राला प्राधान्य देण्यात आले होते. स्वातंत्र्योत्तर काळांतर भारतातील कृषि क्षेत्र व कृषि क्षेत्रासंबंधीत लोकसंख्या व त्याचा आर्थिक विकास हा भाग महत्वपूर्ण होता. 1991 नंतर खुल्या आर्थिक धोरणाचा प्रभाव कृषि क्षेत्रामध्ये होणारी गुंतवणूक, कृषि मूल्य आयोग, शेतमालाच्या आधारभूत किंमती, आधुनिक तंत्रज्ञानाच्या सोयी सुविधा, बाजारपेठेची उपलब्धता इत्यादी घटक विचारात घेऊन देऊळगांवराजा तालुक्यातील गिरोली बु. येथील शेतकऱ्यांच्या आर्थिक स्थितीवर होणाऱ्या परिणामांचे अध्ययन करण्याकरीता या गावाची निवड करण्यात आली आहे. गिरोली बु. या गावातील शेतकऱ्यांच्या मुलाखत अनुसूचीद्वारे मुलाखती घेऊन त्याद्वारे प्राप्त झालेली माहिती या शोध प्रबंधामध्ये नमूद करण्यात आलेली आहे.

2021 च्या जनगणनेनुसार बुलडाणा जिल्ह्यातील एकूण लोकसंख्या 27,67,419 एवढी आहे. Estimates as per Aadhar uidai.gov.in Dec. 2020 data. बुलडाणा जिल्हा हा 13 तालुक्यांमध्ये विभागलेला आहे. बुलडाणा जिल्ह्यात एकूण 1444 खेड्यांचा समावेश आहे. (The district head quarter 20 March 2020). देऊळगांवराजा तालुक्यात हा त्पापैकी एक तालुका असून या तालुक्यामध्ये 65 खेड्यांचा समावेश होतो. <https://www.indiagrowing.com> (<https://vlist.in>)

क्र.सं.	तहसिल	एकू ण गावांची संख्या
1.	बुलडाणा	99
2	चिखली	145
3	देऊळगांवराजा	65
4	जळगांव जामोद	125
5	खामगांव	149
6	लोणार	91
7	मलकापूर	74
8	मेहकर	161
9	मोताळा	123
10	नांदुरा	113
11	संग्रामपूर	122
12	शेंगांव	74
13	सिंदखेडराजा	114

गिरोली बु. हे गाव देऊळगांवराजा तालुक्यामध्ये समाविष्ट आहे. या गावाची लोकसंख्या ही जवळपास 600 एवढी आहे. या गावातील जवळपास 80% लोकसंख्या ही कृषि व कृषिशी संबंधीत व्यवसायावर आधारित आहे. उर्वरीत 20% **True Copy**
Assistant Professor

57 Website – www.aadharsocial.com Email – aadharsocial@gmail.com





लोकसंग्रहा ही नोकरी, खाजगी व्यवसाय, शेतीपुरक व्यवसाय व मजूरी यामध्ये कार्यरत दिसून येते. गिरोली यु. येथील असाणाच्या शेतकरी कुटुंबाची आर्थिक स्थिती कशा स्वरूपाची आहे या संबंधीचा आढ्याय करण्यासाठी गिरोली यु. येथील शेतकऱ्यांची मुलाखत अनुसूचीद्वारे मुलाखत घेण्यात आली आहे.

शोध निबंधाची उद्दीष्टे :-

या शोध निबंधाची उद्दीष्टे खालील प्रमाणे निश्चित करण्यात आली आहे.

- 1) गिरोली यु. येथील कृषि क्षेत्राचा आढ्याय करणे.
- 2) गिरोली यु. येथील शेतकऱ्यांच्या शेतीचा आकार, पांडवेल, सिंचन, उत्पादन, यानारपेठे इत्यादी माहितीचा आढ्याय करणे.
- 3) प्राय माहितीचा आढ्याय शेतकऱ्यांच्या आर्थिक स्थितीवर होणाऱ्या परिणामाचे आढ्याय करणे.
- 4) गिरोली यु. येथील शेतकऱ्यांसमोर असणाऱ्या समस्या व उपाय योजना यांचा आढ्याय करणे.

संशोधन पध्दती :-

गिरोली यु. येथील शेतकऱ्यांच्या आर्थिक स्थितीचे आढ्याय करण्यासाठी आवश्यक असणारी माहिती गोळा करण्याकरिता प्राथमिक व दुय्यम अशा दोन तथ्य संकलन पध्दतीचा उपयोग केला आहे. प्राथमिक स्त्रोताच्या माहितीमध्ये गिरोली यु. येथील 100 शेतकऱ्यांच्या मुलाखत अनुसूचीद्वारे मुलाखती घेण्यात आल्या आहेत. दुय्यम स्त्रोता-माहितीमध्ये लेखी अहवाल, कृषि क्षेत्राशी संबंधित वेबसाईट, कृषि अधिकारी, ग्रामसेवक, तलाठी यांच्याकडे असलेल्या माहितीचा समावेश करण्यात आला आहे.

नमुना निवड पध्दती :-

या शोध निबंधाशी निगडित असणारी माहिती प्राथमिक तथ्य संकलनाच्या माध्यमातून संकलीत करण्यासाठी साध्या नमुना निवड पध्दतीची निवड करण्यात आली आहे. संशोधनाचे कार्य निश्चित कालावधीमध्ये पूर्ण व्हावे या हेतूने 100 शेतकऱ्यांच्या मुलाखत अनुसूची भरून घेण्यात आल्या आहेत. गिरोली यु. येथील कृषि लागवडीखाली असणारे एकूण क्षेत्रफळ जवळपास 250 ते 300 हेक्टर एवढे आहे. या गावातील एकूण लोकसंख्या जवळपास 600 एवढी असून पुरुषांचे संख्या 325 व स्त्रीयांची संख्या 275 एवढी आहे. या गावामध्ये शेतीसाठी आवश्यक असणारा पाणी पुरवठा करण्याकरिता कोणतेही लहान किंवा मध्यम स्वरूपाचे धरण नाही. गावातील शेतकरी नैसर्गिक पाण्यावर, बिहीरीचा तसेच शेततळ्यांचा वापर करून शेतीचे सिंचन करतात. या गावातील शेतकरी शेतीसोबतच शेळीपालन, कुक्कुटपालन, दुग्ध व्यवसाय इत्यादी शेतपूरक व्यवसायांमध्ये गुंतलेला दिसून येतो.

मुलाखत अनुसूचीद्वारे प्राप्त झालेल्या माहितीचे विश्लेषण :-

1) कुटुंबातील एकूण सदस्य संख्या दाखविणारा तक्ता

कुटुंबातील एकूण सदस्य संख्या	कुटुंब संख्या	टक्केवारी
1 ते 3	55	55%
4 ते 6	30	30%
6 पेक्षा अधिक	15	15%

वरील तक्त्यावरून असे निदर्शनास येते की, 1 ते 3 सदस्य संख्या असणाऱ्या कुटुंबाचे प्रतिशत प्रमाण हे सर्वांत जास्त म्हणजे 55% असून 6 पेक्षा जास्त सदस्य संख्या असणाऱ्या कुटुंबाचे प्रतिशत प्रमाण हे सर्वांत कमी म्हणजे 15% एवढे आहे.

2) शिक्षण विषयक माहिती दाखविणारा तक्ता

शिक्षणाचा प्रकार	संख्या	टक्केवारी
प्राथमिक	45	45%
माध्यमिक	35	35%
पदवी	20	20%

True Copy

Website – www.aadharsocial.com

Email – aadharsocial@gmail.com

Assistant Professor

Assistant Professor





वरील तक्त्यावरून असे निदर्शनास येते की, प्राथमिक शिक्षक घेणाऱ्या शेतकऱ्यांचे प्रतिशत प्रमाण हे सर्वात जास्त म्हणजे 45% असून पदवी शिक्षण घेणाऱ्या शेतकऱ्यांचे प्रतिशत प्रमाण हे सर्वात कमी म्हणजे 20% एवढे आहे.

3) शेतीचा प्रकार दाखविणारा तक्ता -

शेतीचा प्रकार	संख्या	टक्केवारी
कोरडवाहू	60	60%
ओलीत	12	12%
दोन्ही	28	28%

वरील तक्त्यावरून असे निदर्शनास येते की, कोरडवाहू शेती करणाऱ्या शेतकऱ्यांचे प्रतिशत प्रमाण हे सर्वात जास्त म्हणजे 60% एवढे असून ओलीत शेती करणाऱ्या शेतकऱ्यांचे प्रतिशत प्रमाण हे सर्वात कमी म्हणजे 12% एवढे आहे.

4) भांडवलाचे स्रोत दाखविणारा तक्ता -

भांडवलाचे स्रोत	संख्या	टक्केवारी
स्वमालकीचे	25	25%
उधार (कर्जाऊ)	60	60%
दोन्ही	15	15%

वरील तक्त्यावरून असे लक्षात येते की, कर्जाऊ भांडवलाचा वापर करणाऱ्या शेतकऱ्यांची संख्या ही सर्वात अधिक म्हणजे 60 एवढी आहे. तर दोन्ही स्रोतांचा उपयोग करणाऱ्या शेतकऱ्यांची संख्या ही सर्वात कमी म्हणजे 15 एवढी आहे.

5) सिंचन सुविधा दर्शविणारा तक्ता -

सिंचन सुविधा	संख्या	टक्केवारी
ठिवक सिंचन	45	45%
तुषार सिंचन	25	25%
दोन्ही	30	30%

वरील तक्त्यावरून असे लक्षात येते की, ठिवक सिंचनाचा वापर करणाऱ्या शेतकऱ्यांची संख्या ही सर्वात अधिक म्हणजे 45 एवढी आहे. तर तुषार सिंचनाचा वापर करणाऱ्या शेतकऱ्यांची संख्या ही 25 एवढी आहे. तर दोन्हीचा वापर करणाऱ्या शेतकऱ्यांची संख्या 30 एवढी आहे.

6) उत्पादीत मालाची विक्री दर्शविणारा तक्ता -

विक्री साधने	संख्या	टक्केवारी
कृषि उत्पन्न बाजार समिती	55	55%
आठवडी बाजार	25	25%
घरगुती	20	20%

उपरोक्त तक्त्यावरून असे निदर्शनास येते की, शेतकरी आपल्या शेतामध्ये उत्पादीत होणाऱ्या मालाची विक्री कृषि उत्पन्न बाजार समितीमध्ये सर्वात जास्त म्हणजे 55% करतात तर घरगुती विक्री सर्वात कमी म्हणजे 20% एवढी करतात.

7) शेतकऱ्यांचे वार्षिक उत्पन्न दाखविणारा तक्ता -

वार्षिक उत्पन्न रुपये	संख्या	टक्केवारी
30,000	27	27%
30,001 ते 60,000	55	55%
60,000 पेक्षा जास्त	18	18%





उपरोक्ता तक्त्यावरून असे निदर्शनास येते की, 30,001 ते 60,000 रुपयांपर्यंत वार्षिक उत्पन्न प्राप्त करणाऱ्या शेतकऱ्यांची संख्या ही सर्वांत जास्त म्हणजे 55% करतात तर 60,000 रुपयांपेक्षा जास्त वार्षिक उत्पन्न प्राप्त करणाऱ्या शेतकऱ्यांची संख्या सर्वांत कमी म्हणजे 18% एवढी आहे.

समस्या :-

1) शैक्षणिक समस्या :-

मूलाखत अनुसूचीद्वारे प्राप्त झालेल्या माहितीच्या आधारे कृषि क्षेत्राशी संबंधित पदवी व पदविका धारण करणाऱ्या शेतकऱ्यांची संख्या ही 3 एवढी असून जी पदवी व पदविका मध्ये समाविष्ट केली आहे.

2) परंपरागत शेती लागवड पध्दती :-

या गावातील शेतकरी अजून सुध्दा परंपरागत शेती पध्दतीद्वारेय शेती करतात.

3) भांडवल विषयक समस्या :-

गिरोली वृ. येथील शेतकऱ्यांना शेती उत्पादनासाठी आवश्यक असणारे भांडवल योग्य वेळी व योग्य व्याजदराने सहजासहजी उपलब्ध होत नाही. कारण त्यांना त्यांचा उत्पादीत झालेला शेतपाल योग्य किमतीवर विकता येत नाही. त्यामुळे फारसे उत्पन्न मिळत नाही. त्यामुळे त्यांना स्वमालकीच्या भांडवलापेक्षा कर्जाक भांडवलाचा अधिक वापर करावा लागतो. त्यामुळे व्याजाच्या स्वरूपात आपल्या उत्पन्नाचा भाग खर्च करावा लागतो.

4) सिंचन विषयक समस्या :-

गिरोली वृ. या गावात लहान व मध्यम स्वरूपाचे कोणतेही धरण नसल्यामुळे शेतकऱ्यांना नैसर्गिक पाण्यावरच आपली शेती करावी लागते. त्यामुळे शेती उत्पादन हे नैसर्गिक लहरीवर अवलंबून असल्यामुळे त्याचा उत्पादनावर परिणाम होतो. पर्यायी त्यांचे उत्पन्न कमी होते.

5) मार्गदर्शनाचा अभाव :-

गिरोली वृ. या गावातील शेतकऱ्यांना आधुनिक पध्दतीद्वारे शेती उत्पादन करणे करावे याबाबत कृषि विभागाद्वारे योग्य ते मार्गदर्शन प्राप्त होत नसल्यामुळे शेतकऱ्यांच्या आर्थिक स्थितीमध्ये सुधारणा न होण्यामागील हे एक महत्त्वाचे कारण मानल्या जाते.

6) गोदाम सुविधांचा अभाव :-

शेतीमध्ये उत्पादीत झालेला माल बाजारपेठेतील किमतीचा अंदाज घेऊन त्यानुसार त्यांची विक्री करण्यासाठी पाहिजे त्या प्रमाणात गोदामाच्या सुविधा जवळच्या परिसरात उपलब्ध नाहीत.

निष्कर्ष :-

- 1) कृषि क्षेत्राशी संबंधित असणारी पदवी अथवा पदविका प्राप्त करणाऱ्यांची संख्या ही फार कमी आहे.
- 2) कृषि क्षेत्रासाठी आवश्यक असणारी संसाधने खरेदी करण्यासाठी आवश्यक असणारे भांडवल शेतकऱ्यांना कमी व्याजदराने व सहजासहजी उपलब्ध होत नाही.
- 3) 1 ते 2 एकरच्या दरम्यान शेतीधारण करणाऱ्या शेतकऱ्यांची संख्या ही जास्त आहे.
- 4) गिरोली वृ. या गावात सिंचन व्यवस्थेचा अभाव दिसून येतो.
- 5) गिरोली वृ. या गावात कोरडवाहू शेती करणाऱ्या शेतकऱ्यांची संख्या ही सर्वांत अधिक म्हणजे 60 एवढी आहे.
- 6) शेतीपुरक व्यवसाय करणाऱ्या शेतकऱ्यांची संख्या कमी आहे.

उपाय योजना :-

- 1) गिरोली वृ. या गावातील तरुणांनी कृषिशी संबंधित असणारी पदवी आणि पदविका प्राप्त केल्यास आधुनिक पध्दतीद्वारे शेती केली अस्ता त्यांच्या आर्थिक उत्पन्नात वाढ होईल.
- 2) पीक कर्ज व शेतीशी संबंधित सुधारणा करण्यासाठी आवश्यक असणारी साधने खरेदी करता यावे याकरिता माफक व्याजदराने कर्ज उपलब्ध झाल्यास व्याजाच्या स्वरूपात होणारा खर्च कमी होण्यास मदत होईल.

True Copy

True Copy

Assistant Professor
Shri Vyankatesh College

Website – www.aadharsocial.com

Email – aadharsocial@gmail.com

Assistant Professor



<p>B.Aadhar International Peer-Reviewed Indexed Research Journal Impact Factor -(SJIF) -7.625, Issue NO, 314 (CCCXIV)</p>	<p>ISSN : 2278-9308 September, 2021</p>
---	---

3) 1 ते 2 एकरच्या दरम्यान शेती असणाऱ्या शेतकऱ्यांनी गट शेती व अन्य शेती पध्दतीचा वापर करून शेती क्षेत्रास त्यांच्या उपभोगात घात होण्यास मदत होईल.

4) या गावात शेतकऱ्यांच्या आर्थिक स्थितीत सुधारणा होण्यासाठी शासकीय पातळीवर एखादे महत्त्व स्वरूपाचे धरण किंवा अन्य मिशन व्यवस्था उपलब्ध करून दिल्यास मिचनाची समस्या काही प्रमाणात कमी होण्यास मदत होईल.

5) शेतीपुरक व्यवसाय करणाऱ्या लोकांची संख्या वाढल्यास शेतीमुळे होणारे आर्थिक वृद्धतास कोटेशन पार प्रमाणात सहन करण्यास निश्चित मदत होईल.

6) गिरोली वू. या गावात शेतकऱ्यांनी उत्पादन केलेला शेती माल स्थानिक कृषि उद्योग वातावरण समिती सोबतच अन्य ठिकाणी विकल्यास त्यांना त्यांच्या शेतमालाचा योग्य किंमत प्राप्त होईल.

7) मुलाखत अनुसूचीद्वारे प्राप्त केलेल्या माहितीवरून असे लक्षात येते की, 60,000/- रुपयांपेक्षा जास्त वार्षिक उत्पन्न प्राप्त करणाऱ्या शेतकऱ्यांची संख्या ही 18 एकरा आहे.

गिरोली वू. येथील कृषि क्षेत्राची निगडीत असणाऱ्या 100 शेतकऱ्यांच्या मुलाखत अनुसूचीद्वारे घेतलेल्या मुलाखतीवरून असे निदर्शनास येते की, येथील शेतकऱ्यांच्या आर्थिक उत्पन्नत घात होण्यासाठी शेती व शेती क्षेत्राची संघर्षीत पध्दती व पदांत्रिका मिळान प्राप्त करणाऱ्या लोकांची संख्या वाढल्यास, मिचनाची सोपी-सुविधा, शेतीसाठी आवश्यक असणाऱ्या भांडवल कमी व्याजदराने उपलब्ध झाल्यास, शेती पुरक व्यवसायात घात झाल्यास, शेतमालाचा योग्य वातावरण उपलब्ध झाल्यास या सर्व सोपी-सुविधांचाच कृषि क्षेत्राची संघर्षीत असणाऱ्या शेतकऱ्यांनी, आधुनिक तंत्रज्ञानाचा शेतीमध्ये वापर करून करावा याचात योग्य मार्गदर्शन करण्यास या गावातील शेतकऱ्यांच्या आर्थिक स्थितीत सुधारणा होण्यास निश्चित मदत होईल अशा आशा आहे.

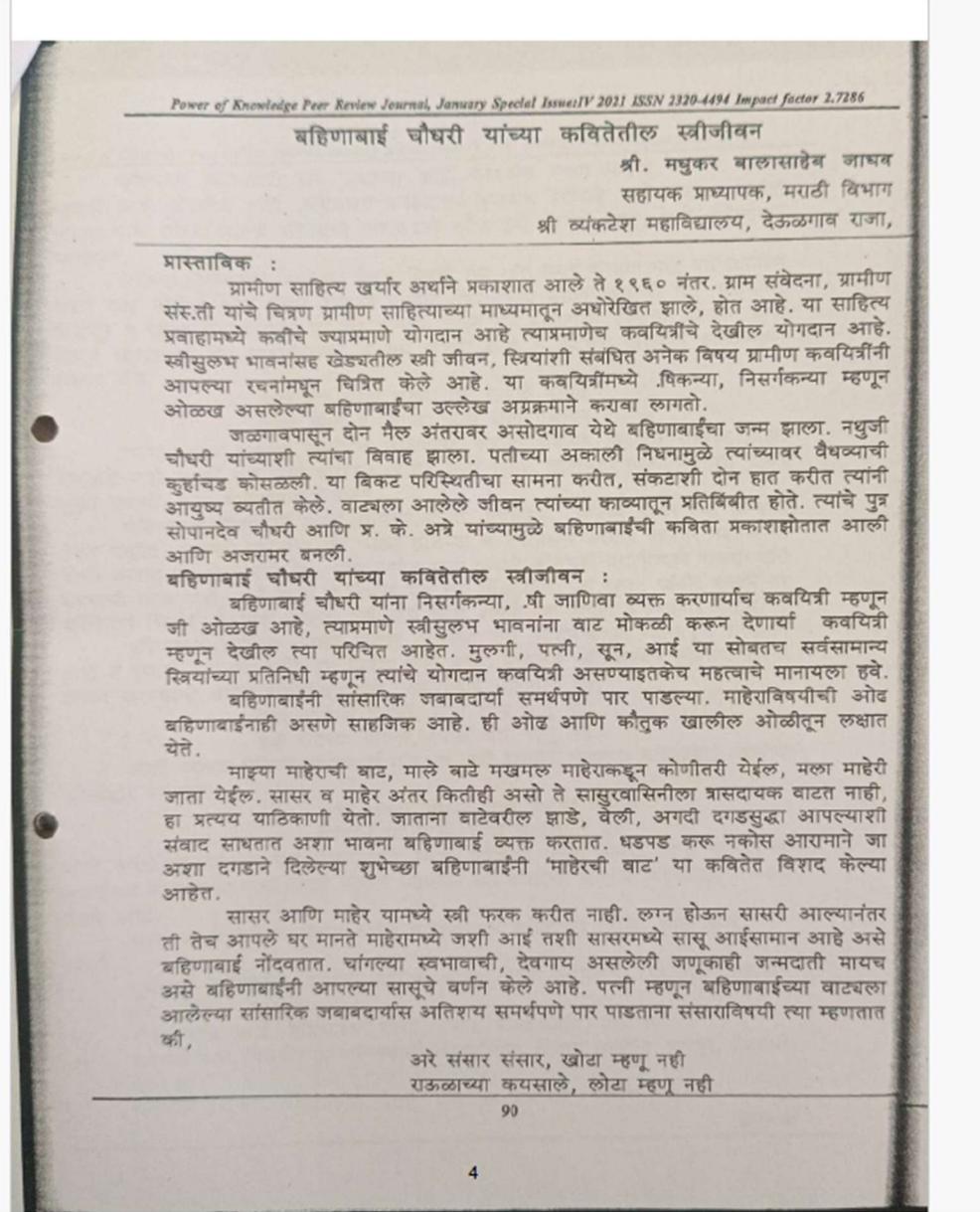
संदर्भ :-

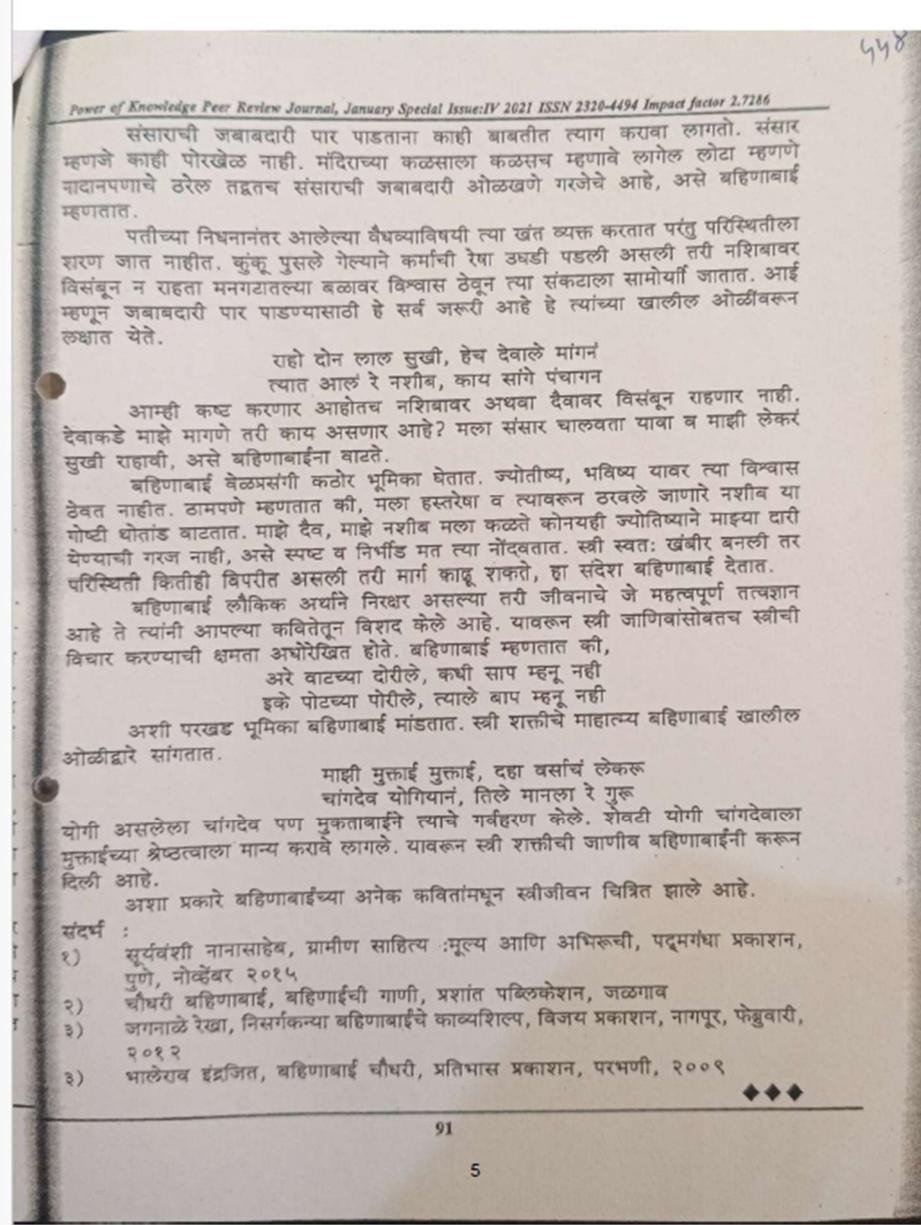
1. Statistics Research Department January 2021
2. Estimates as per Aadhar uidai.gov.in Dec. 2020 data.
3. The district head quarter 20 March 2020
4. <https://www.indiagrowing.com>
5. <https://vlist.in>district>
6. प्रारंभिक स्थिति (मुलाखत अनुसूची)

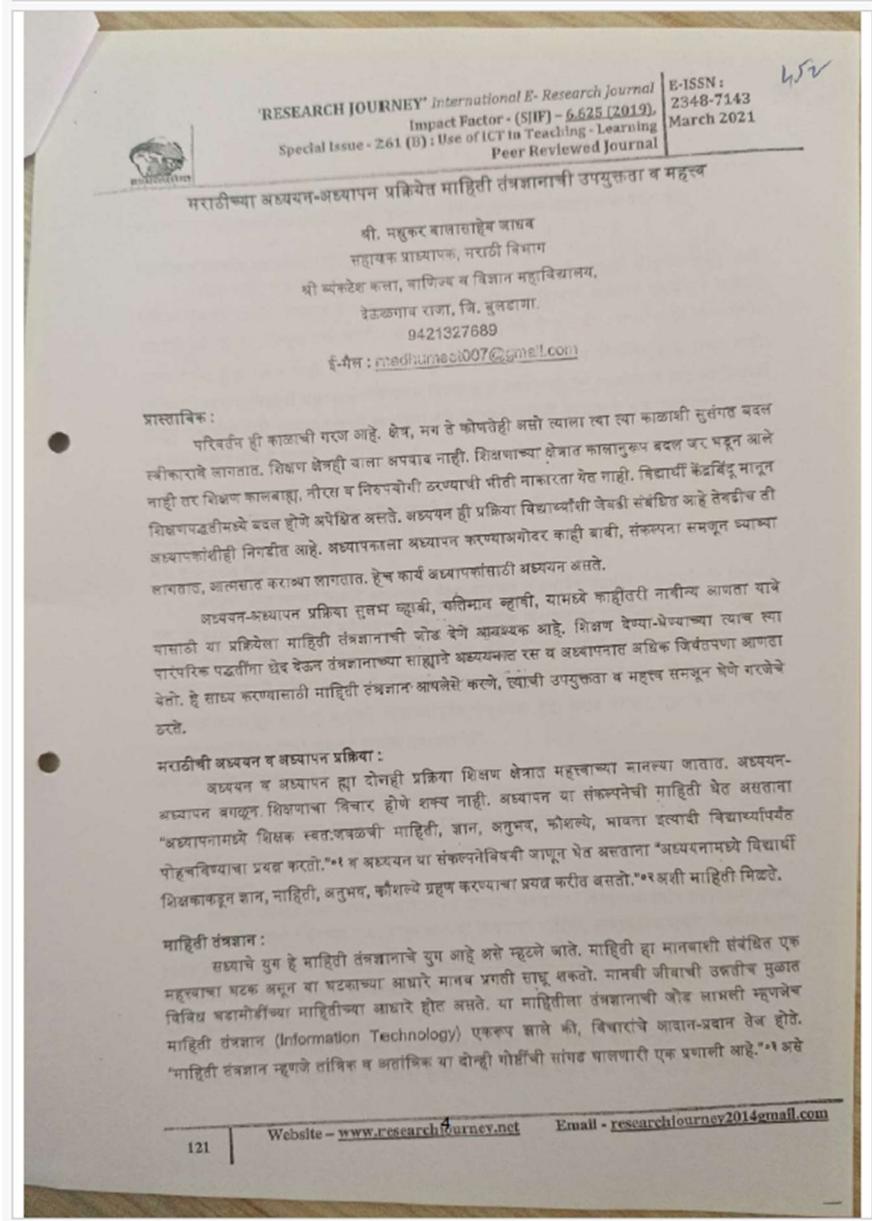
True Copy

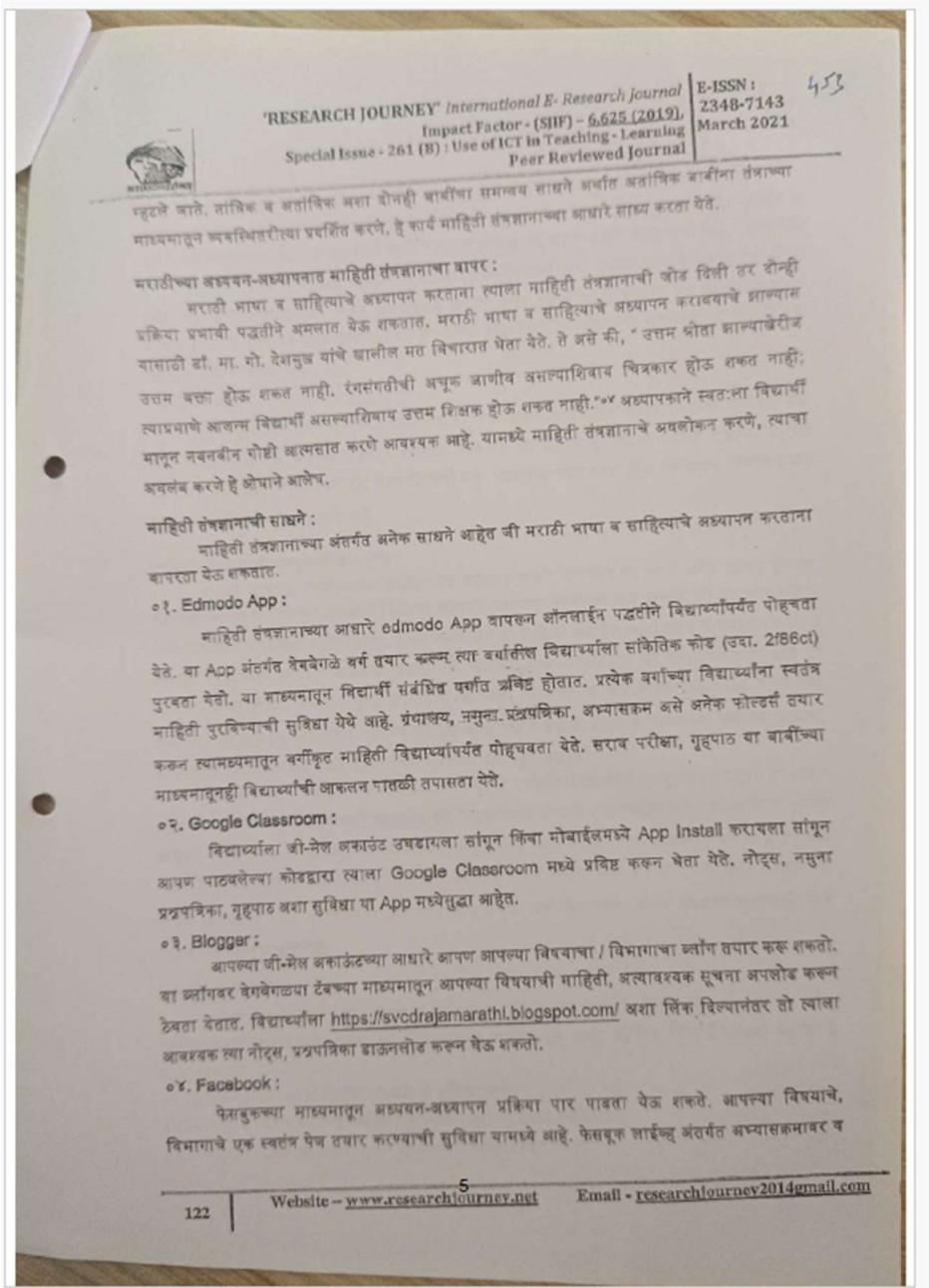
101 | Website – www.aadharsocial.com | Email – aadharsocial@gmail.com Assistant Professor
Shri Vyankatesh College

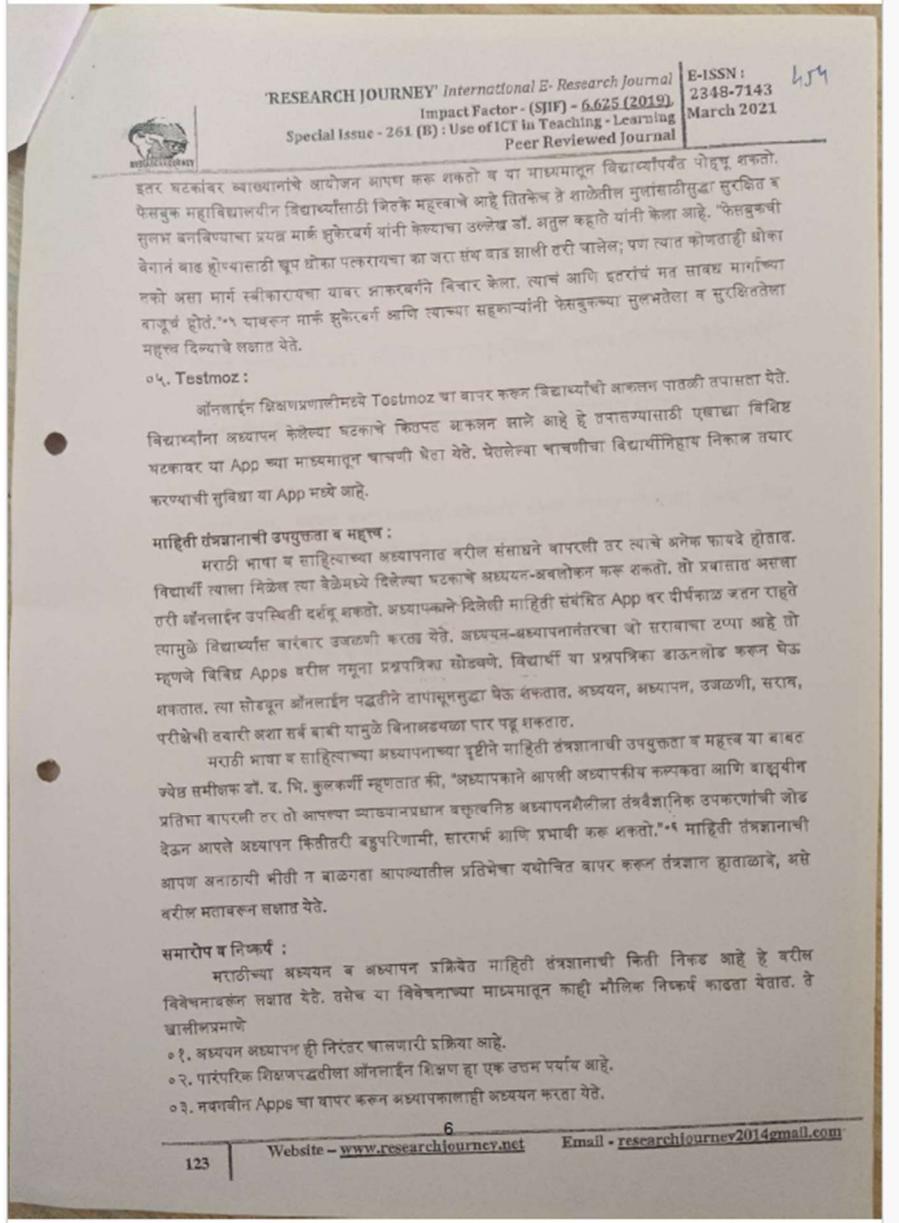


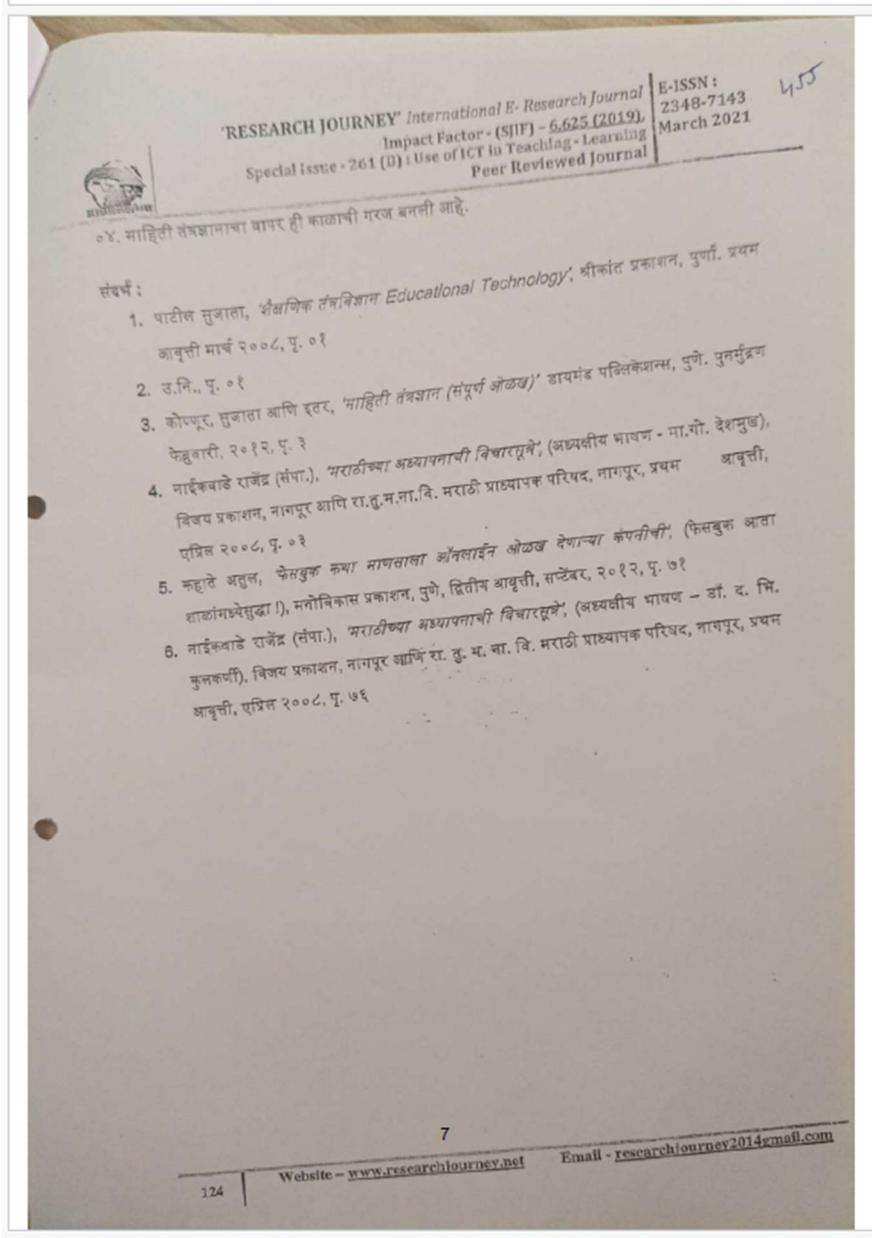


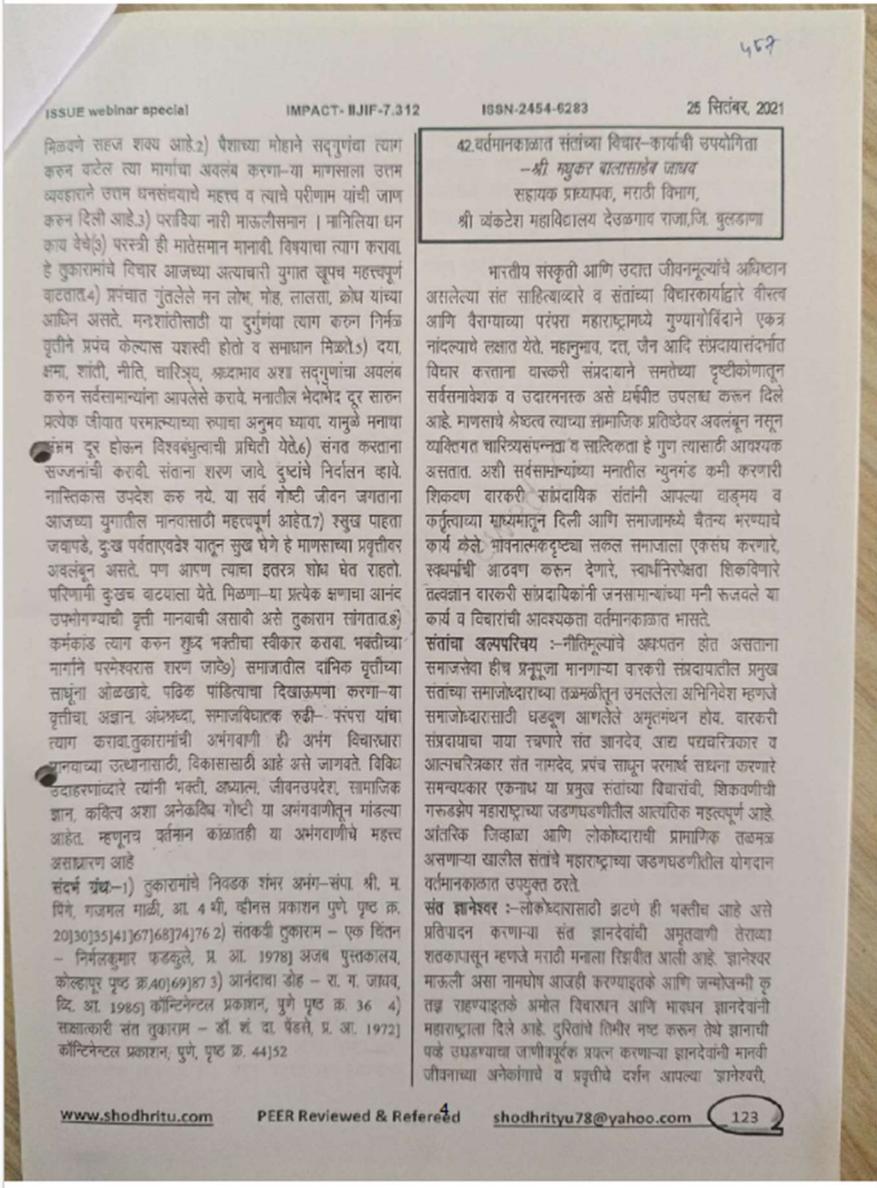


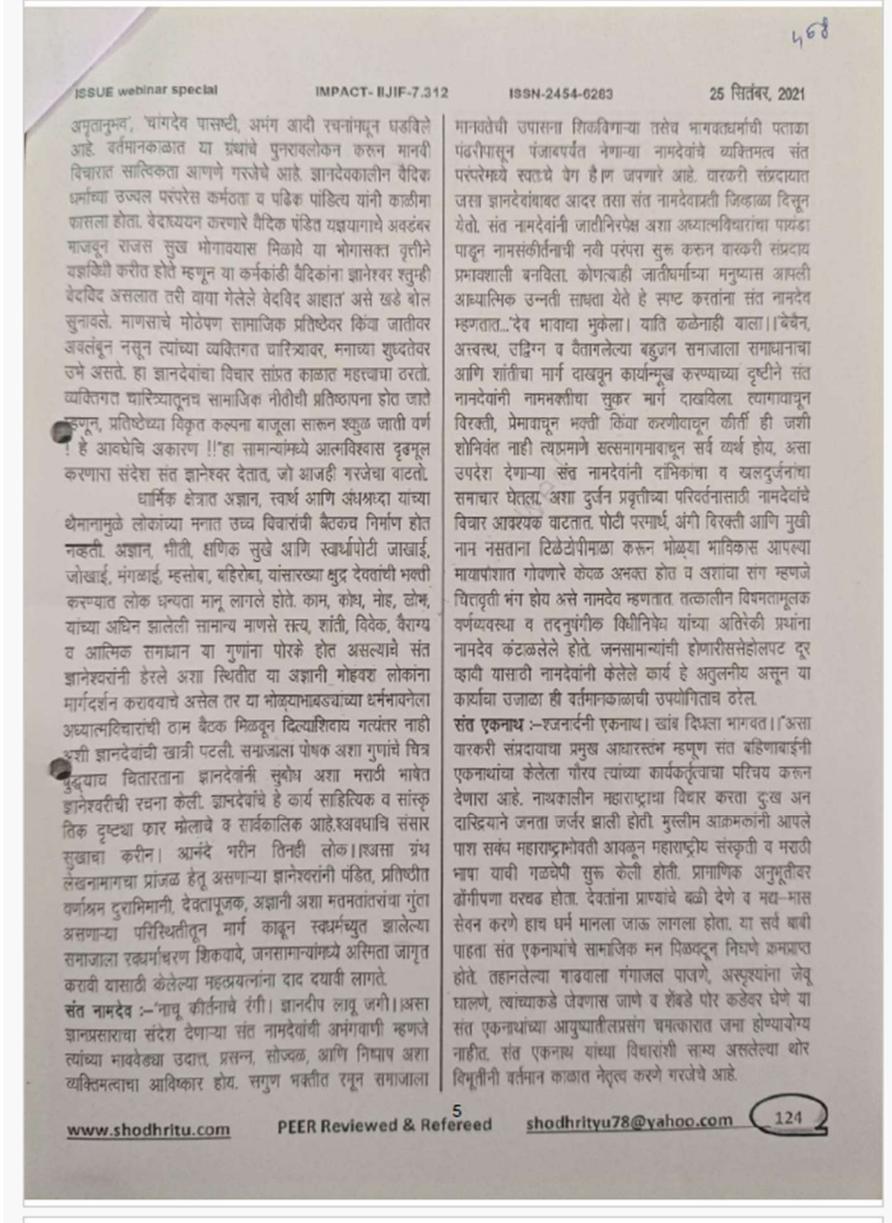


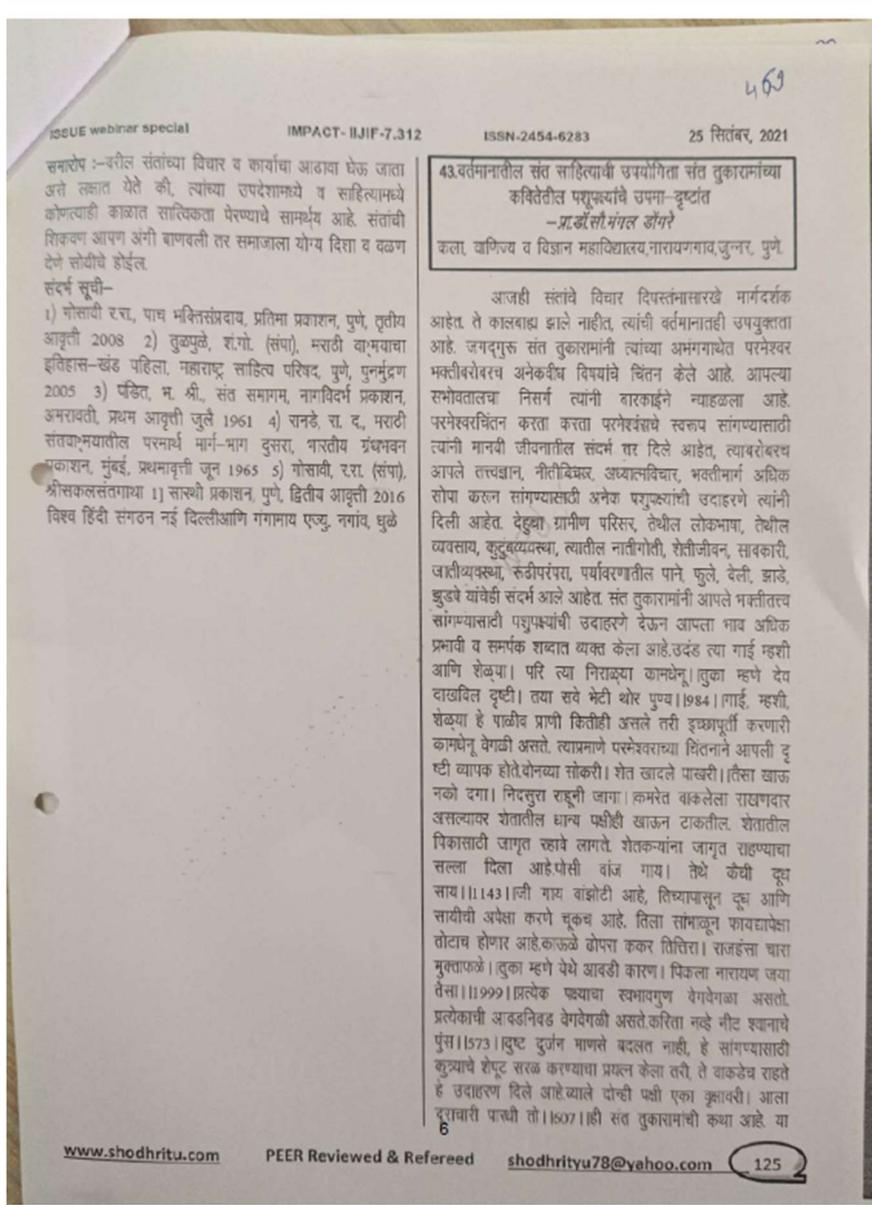


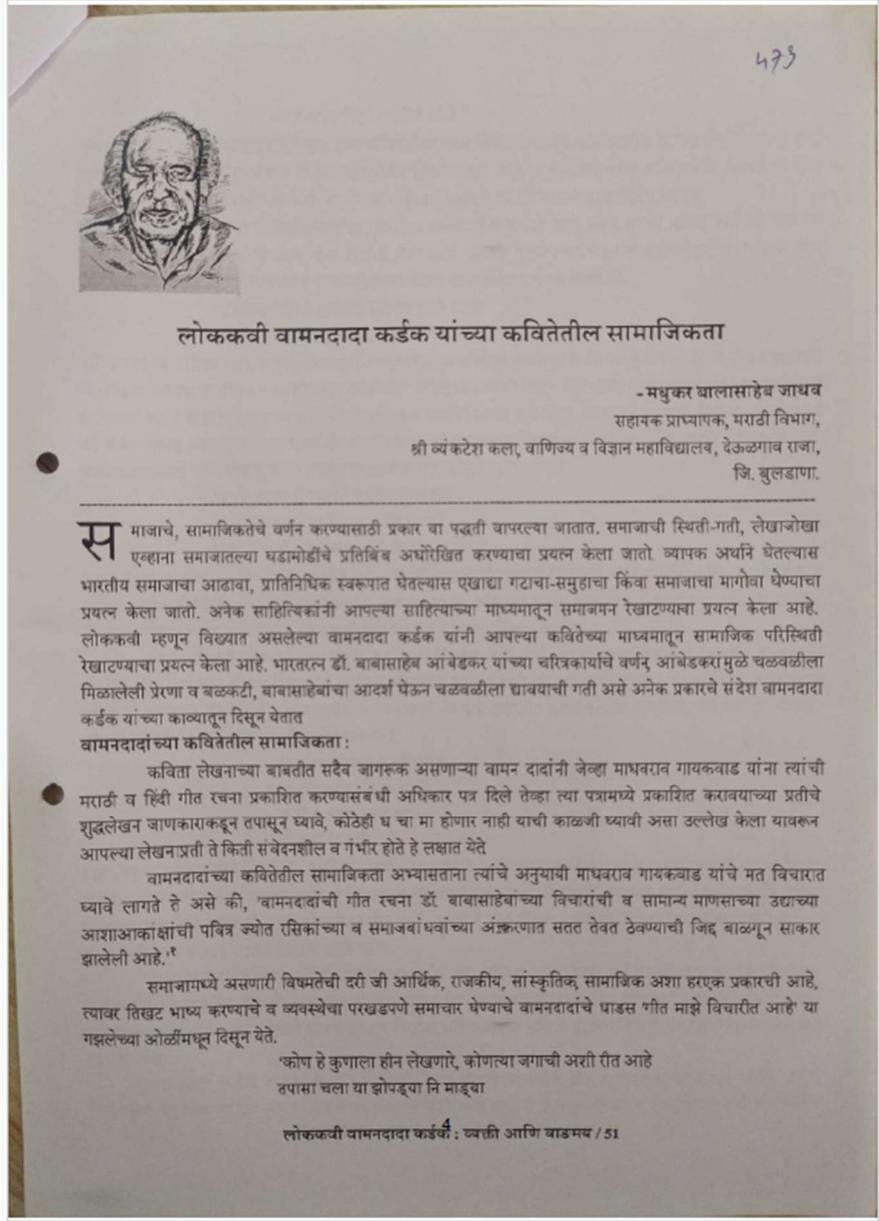


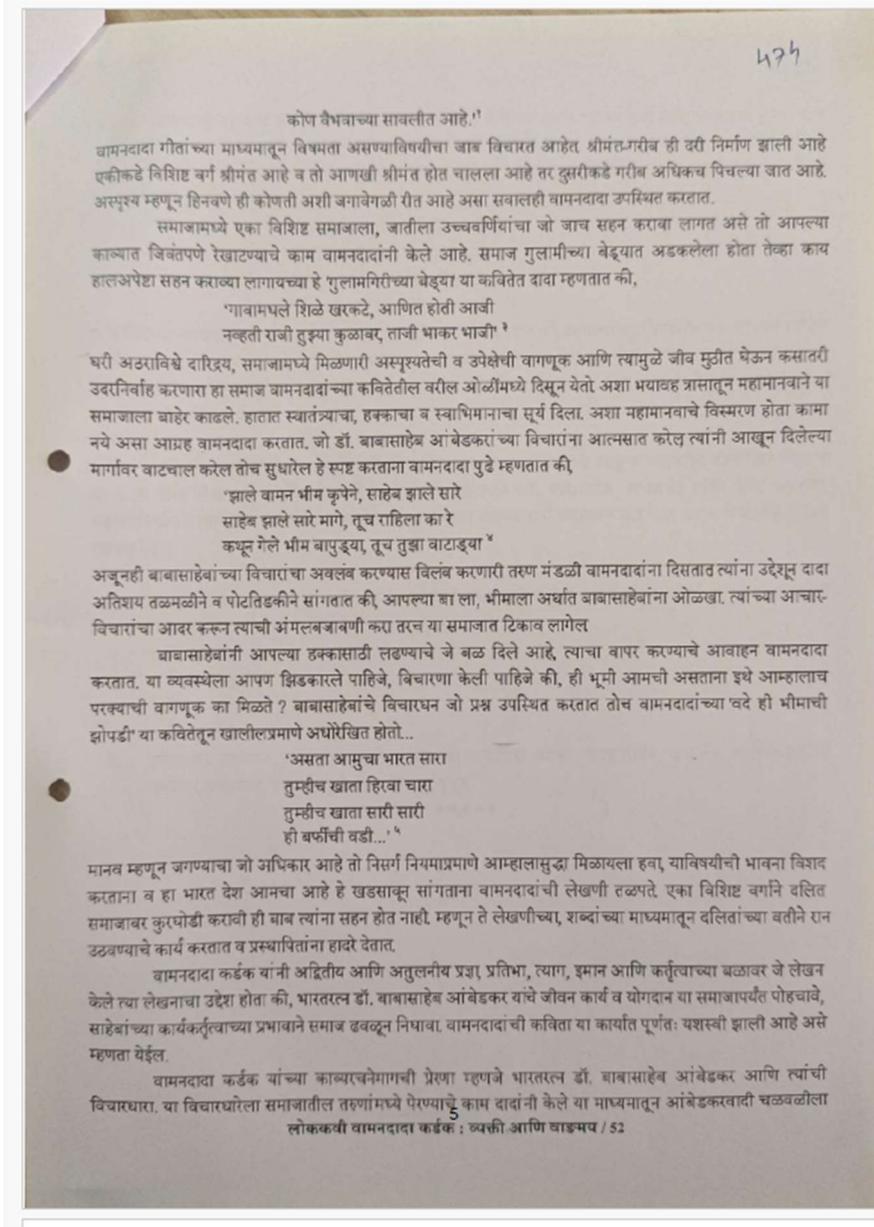


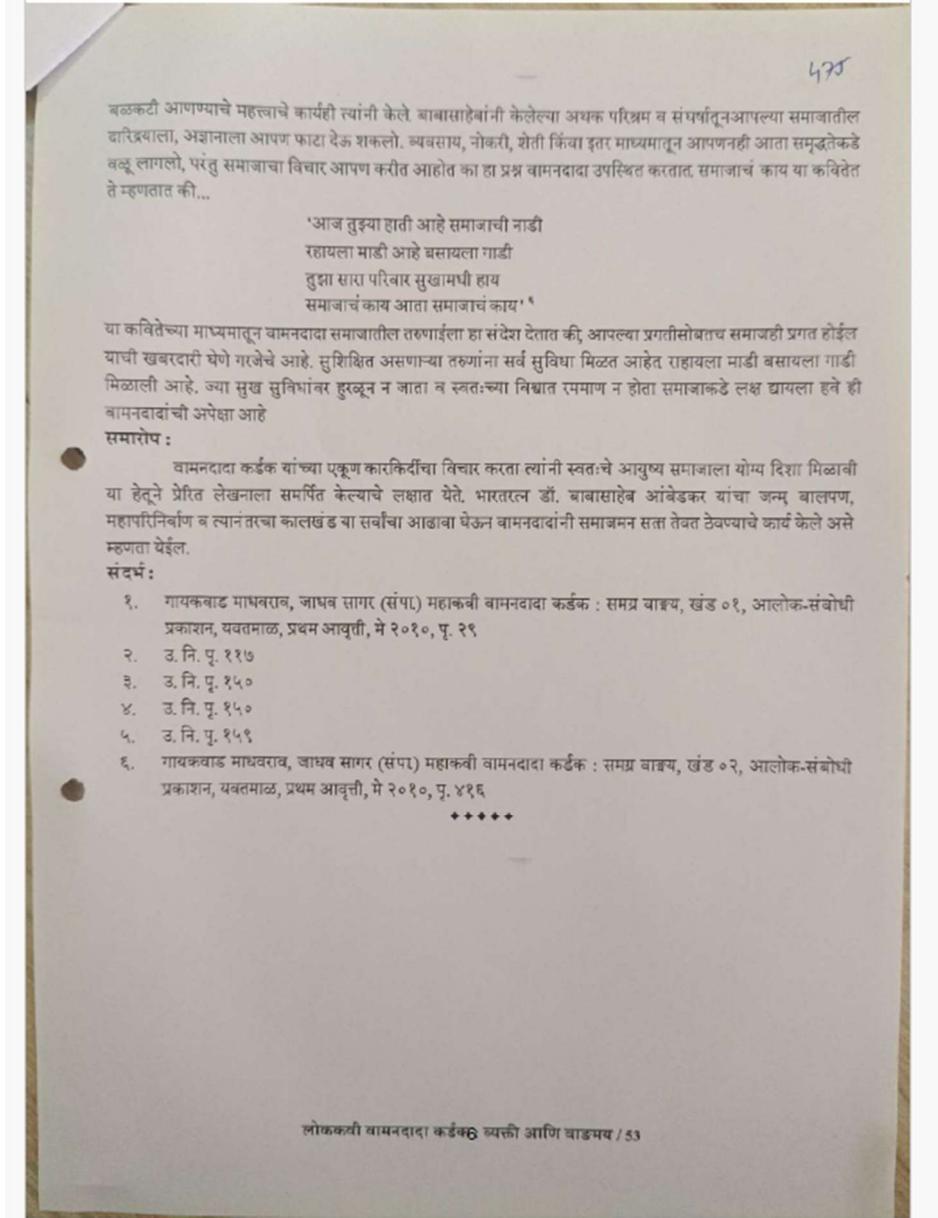


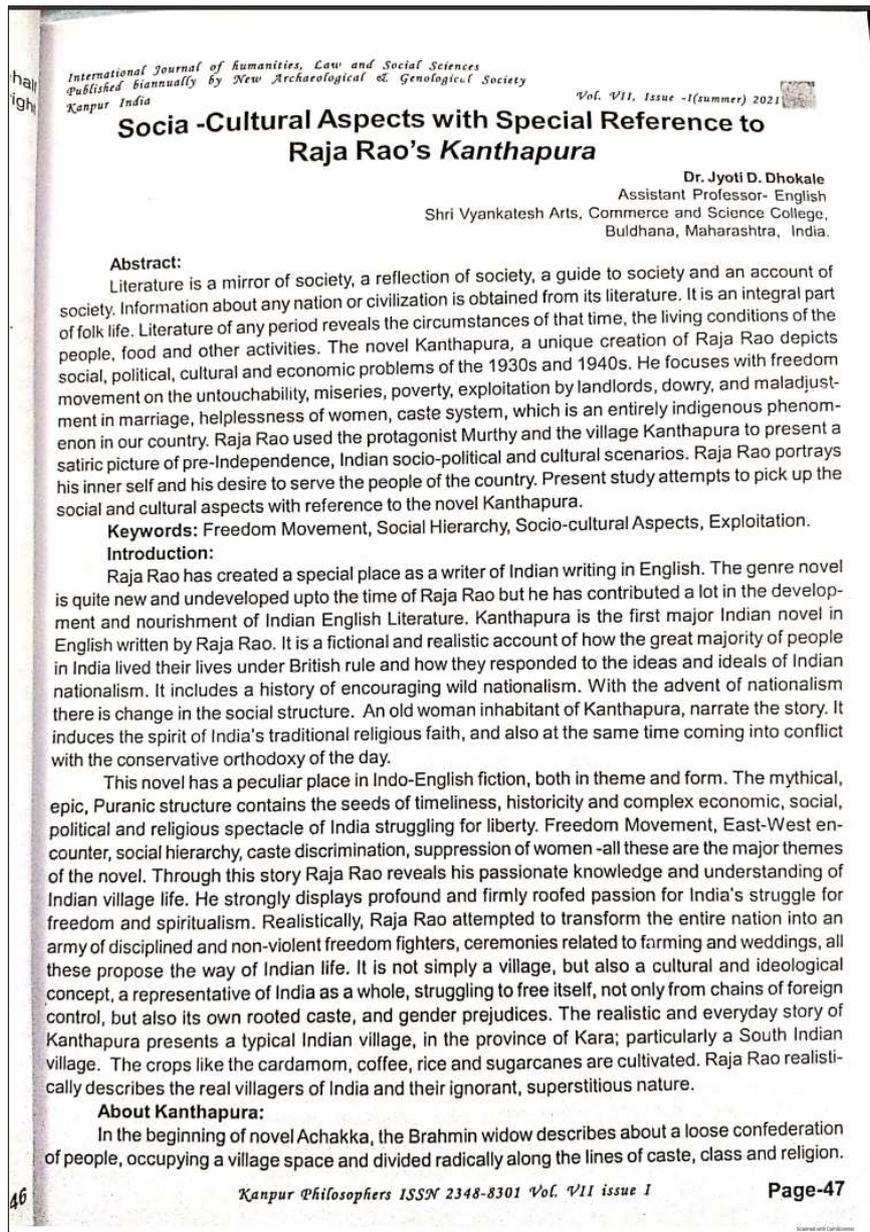












Within the same caste-group, the inhabitants of Kanthapura are further divided on lines of class, wealth and gender. Their houses show how rich or poor they are. Kanthapura is a very small village consisting of a hundred houses. People of the village worship Goddess Kenchamma. They are superstitious and religious. Agriculture is their chief occupation. The village is divided into a number of quarters like Brahmin quarter, potters' quarter, weavers' quarter and pariahs' quarter based on caste and communities. In this novel, Raja Rao reveals the effect of untouchability, exploitation, social governance, social set up of society, customs, religious belief, prejudices, sufferings of miserable coolies and the theme of the freedom movement is studied in a rural setting where hunger and starvation are caused by the operation of natural forces. This is nothing but a mirror image of the society. Being a traditional village in India, it becomes the microcosm of the universal, rural condition all over India. C.D. Narasimhaiah writes in Introduction:

"For, Kanthapura is India in microcosm: what happened there is what happened in many places during India's Fight for freedom." (Narasimhaiah 1974; Introduction X).

Kanthapura is a typical South Indian village on the slopes of the Western Ghats. Moorthy is the protagonist of the story. He is a young man educated in the city. He is a dedicated Gandhi man. The Gandhian Civil Disobedience movement comes to this remote isolated village when Moorthy comes from the city with the message of the Mahatma. He goes from door to door even in the Pariah quarter of the village and explains to villagers the significance of Mahatma Gandhi's struggle for independence. He motivates villagers to take charka - spinning and weaving their own cloth and then immediately the Congress Committee was formed in Kanthapura. Material of publicity is brought from the city and generously circulated in the whole village. A volunteer corps is formed, trained and educated so that they may remain non - violent in the face of government repression. In this task of organizing the freedom struggle in Kanthapura village, he is helped by Ratna, a young lady, of progressive and enlightened views and Patel Range Gowda, the Sardar Patel of the village.

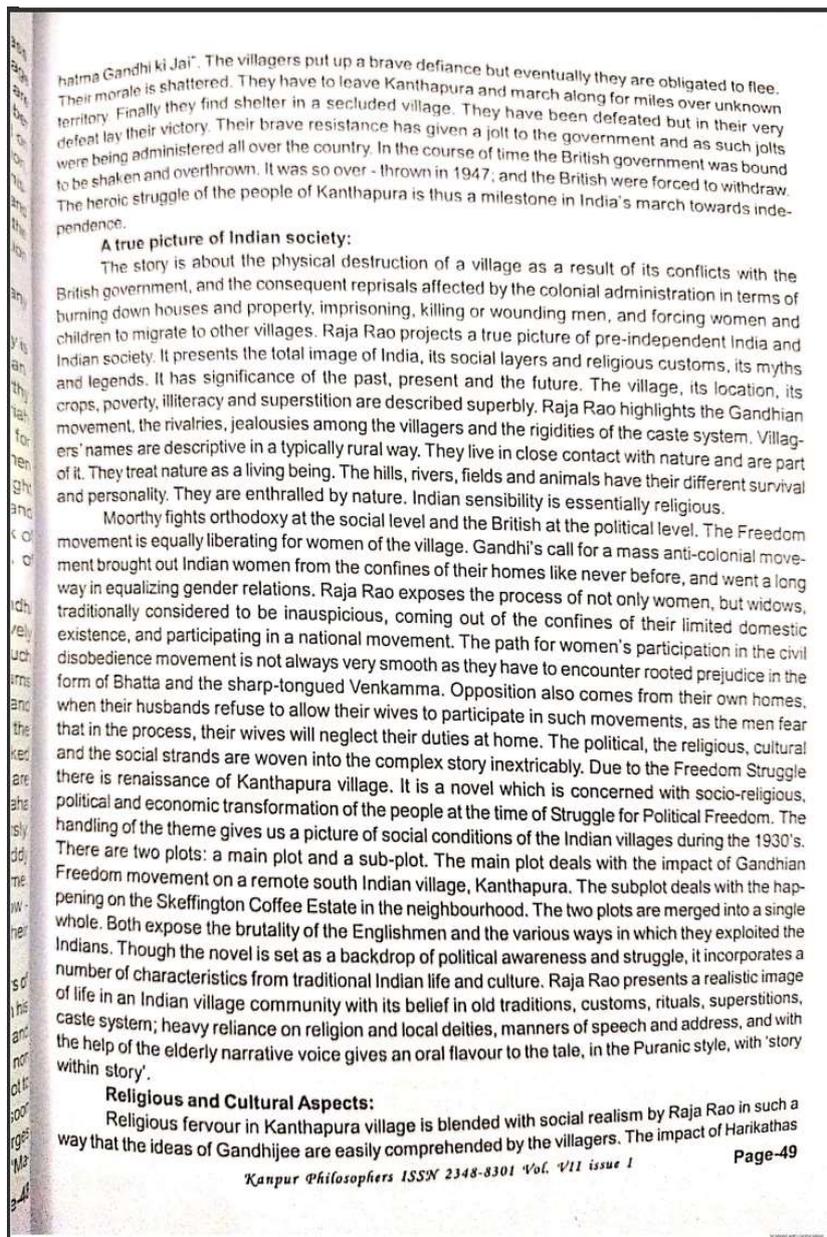
The British Government, on its part, takes prompt steps to counter the moves of the Gandhi - men and to contain the movement. Policeman Bade Khan, who is posted in the village, is actively helped and supported by Bhatta, the Brahmin. Bhatta, a powerful religious authority wields much influence on the ignorant people of the village. He enlists the support of a Swami in the city. He warns to excommunicate all those who mix with the Pariahs. Moorthy is actually ex - communicated and a few abandon him but on the whole, the people remain fearless and firm in their support to the Gandhi movement. Reports of the Dandi march of the Mahatma to break the Salt Law had evoked throughout the country. Not only it reached the village but also boost the public. Soon there are Satyagrahis and picketing. The villagers under the leadership of Moorthy participated in Satyagraha outside the toddy plantation. There is police lathi - charge and many are wounded and hurt seriously. A large number of people are arrested and sent to jail. This is followed by the picketing of the toddy booth outside the Skeffington Coffee Estate. Government repression is even more ruthless this time. None is spared then whether they are children or women or old men. The agonies of the fellow - villagers touch the heart of the workers of the Skeffington Coffee Estate and they too join their suffering.

The whole atmosphere resounds with shouts of "Mahatma Gandhi ki Jai". Large numbers of villagers are arrested. Moorthy is also arrested and sentenced to a long term of imprisonment. In his absence Ratna takes the charge of the Congress - work in the village. Women are organized and trained. Then approaches the no - tax campaign. The people are directed to remain peaceful and non - violent even if their fields, crops, cattle and houses are auctioned and occupied. They should not pay land revenue to the unjust British men. They remain non - violent in the beginning but soon violence breaks out. Government is merciless in its repression. There are ruthless lathi - charges and shootings. The atmosphere resounds with shrieking and crying as well as with shouts of "Ma-

Kanpur Philosophers ISSN 2348-8301 Vol. VII issue 1

Page-46





is ennobling and innovating and even the old women cannot remain detached. Sastri tells Harikathas. The old people of the place have repugnance for a Gandhiman like the narrator who dislike class and caste distinctions. They invite Jayaramachar, the Harikatha-man. He talks about the self purification, Hindu-Muslim unity and Khaddar. The old folks do not like the appreciation of Mahatma Gandhi. He advocates the spinning wheel. The villagers celebrate Shankara Jayanti, Rama, Krishna and Ganesh festivals and arrange Harikathas and give remuneration or dakshina to the man who tells the kathas. In, 19th century B. G. Tilak also started the Ganesh festival and Shivaji festival (in Maharashtra) instilling in the Marathas courage, patriotism, discipline and unity. Through this Raja Rao projects how these occasions help in social interaction besides developing organizational ability among the villagers. They hold melas and mass-melas in turns. With all their superstition and ignorance, illiteracy and impoverished conditions of life, they respond readily to the clarion call of Mahatma Gandhi to fight the forces of British Raj. The village and yokels of the village represent the mass mentality of the villagers everywhere. Range Gowda, Lingayya, Chandrayya, Ramayya and others are simple, illiterate, hard working and symbolic characters who have raw emotions.

The action of Kanthapura begins with religion as religion is the most potent force in Kanthapura. There is tremendous religious activity before the introduction of Gandhi of Swaraj. Religion sustains the spirit of the people of Kanthapura, starting from an invocation to the village Goddess Kenchamma, to the end of the novel. The action begins with the unearthing of a half sunken linga by Moorthy and its consecration. Even the characters are mostly the sons of the soil, the product of the illiterate society. The advantage of intellectualism is denied to them. However, the folk-colour in them comes off with fineness. Through this novel, Raja Rao has been able to capture a vital phase of the history of struggling India. The complexity of Indian village politics, caste-structure, social structure, religious structure, gluttony and greed of a Brahmin priest, politics of the class-structure, lives of the women-folk, practice of untouchability, tyranny of police, crooked diplomacy of rulers to divide and thus to rule the people, use of the iron hand in crushing the indigenous ethos for liberty, love of gods and goddesses, assembly in Kirtans and Kathas, basic unity and completeness of the village life, loveliness of Nature and the role played by rivers, mountains and plains in the farmers' lives and a thousand other things-are all immortalized in the novel with a liveliness, vivacity and freshness that are unparalleled.

Conclusion:

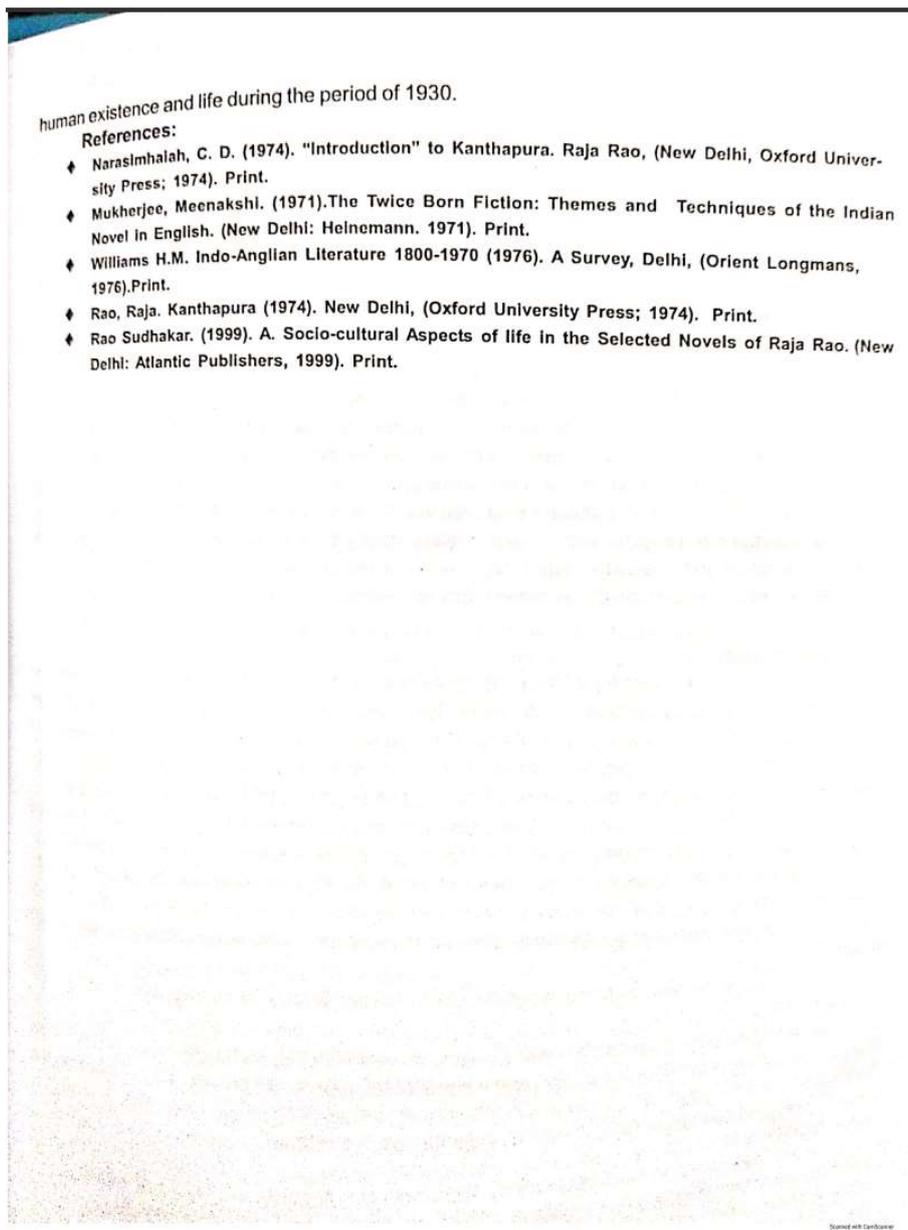
Present novel gives the reader an insight into the condition in rural India where the masses were oppressed both by caste hierarchy and the political power structures. It gives the true picture of a village that represents India's ancient culture which is still living. As per Gandhian views villages face much difficulty in accepting the changes in its social life, specifically, caste system as it has deep roots in the Indian society. The novel highlights the delicate issue of a secret agreement between Brahmanism and Colonialism. It reveals conflict between Brahmanism and Nationalism. The novel conveys that for most of the Brahmins Gandhi's anti-untouchable movement is more harmful than the British rule. The novel skilfully reflects the attitude of Brahmins, the high caste people, towards the lower caste people in the society. It also focuses on the cruelty and rigorous acts of the British rulers in suppressing the non-violent agitation of the freedom fighters. Raja Rao borrowed the style and structure from Indian vernacular tales and folk-epic.

Thus this novel includes keen and realistic observations on Indian myths, religion, social customs and the Independence movement. This fills out the background for all readers' more complete understanding and enjoyment. The narrator explains how the community obtains from daily life, with its millennia-old worship of the local deity, the strength to stand against the British Raj. Present paper focuses the struggle for freedom, social values and point of view of life and other social cultural aspects of life presented in the novel Kanthapura. Raja Rao has tried to portray the real picture of

Kanpur Philosophers ISSN 2348-8301 Vol. VII issue 1

Page-50







“Anti-Plagiarism Tools: A Review”

Nandkishor Gosavi ^{1*}, Dr. Umesh B. Deshmukh ²

^{1*}Department of Library, Research Scholar, Sant Gadge Baba Amravati University, Amravati, India

²Department of Library, Research Guide, Sant Gadge Baba Amravati University, Amravati, India
Nandkishor.gosavi@gmail.com¹, umeshdeshmukh.2010@rediffmail.com²

Abstract: Plagiarism plays an important role in any education area, it's basic to have care about copyright encroachment especially for the subject matter expert. In any case, relatively few people decisively consider forging, rules and how to come over it. Falsifying is an exceptional bad behavior and teaches in like manner there. So everyone should have absolute data about forging before they form. Nowadays the availability of articles is viably open through the web because of this analyst are getting untrustworthy approach to form paper which impact can on affirm making or test composing.

Keywords: Plagiarism, Copyright, Anti plagiarism Software

I. INTRODUCTION

Plagiarism has stained our education system for long. The reason behind highlighting this problem is that people, especially in our society are unaware of the consequences of this practice, and it is deemed normal without any sense of guilt or dishonesty. And further the expansion of the internet has made it easier for people to fetch and present someone else's work as their own. So this problem has to be identified so that this unethical practice can be eradicated. The first step in the eradication should be to bring reforms in the educational sector, because students carry on these habits into their practical lives causing social dilemma.

Scholastic untruthfulness is the primary developing worry for practically all higher instructive foundations and administrative bodies. Nature of exploration is extremely critical for any college or examination foundation to make sure about great positioning among worldwide companions. Examination quality straightforwardly impacts the standing of scholastic and exploration organizations. Scholarly examination yield and its quality turns into a thought and have pulled in the consideration of establishments, financing bodies, positioning offices and governments. Copyright infringement makes a danger unique examination work and has developed as a huge issue in the scholarly community. In colleges, research researchers are considered as the generator of original thoughts and gainful exploration conveyed by them is one of the significant important resources for a higher instructive establishment and at last contribute towards country's turn of events. Therefore, they should have mindfulness and comprehension of Plagiarism and related issues. There is no uncertainty that scholarly deceitfulness is a good and moral issue however absence of information and mindfulness likewise establishes counterfeiting. To this end this examination has been embraced to

investigate the mindfulness and demeanor on different parts of literary theft among research researcher in Maharashtra State.

Plagiarism plays an important role in any education area, it is imperative to have mindfulness about copyright infringement particularly for the analyst. Be that as it may, not many individuals precisely think about literary theft, rules and how to come over it. Counterfeiting is an intense wrongdoing and disciplines likewise there. So everybody ought to have total information about copyright infringement before they compose. These days the accessibility of articles is effectively open through the web due to this researcher are receiving exploitative way to compose paper which effect can on validate composing or exploratory writing.

II. DEFINITION OF PLAGIARISM

There are many definitions of what constitutes plagiarism and some of are described below: Plagiarism is an act of research misconduct as it involves stealing of intellectual property of someone else. The prevalence of plagiarism in academic and research domain is not recent but exists from centuries. The word plagiarism has been derived from Latin word 'plagiarus', which means kidnapping, seducing or plundering (Plagiarism, 2019).

Plagiarism is a kind of dishonest the place a individual steals any individual else's concept and makes use of it in his work. It is a gnawing difficulty in India's academia for years and even pinnacle academicians have fallen prey to it. The government's go is anticipated to make certain integrity in scholarly work.





III. TYPES OF PLAGIARISM

Since the seriousness of literary theft has been secured, it's critical to stipulate and detail the fluctuated sorts of copyright infringement there are, regardless research proposes that understudies generally steal out of indiscretion rather than real goal. Regardless of whether it's unintentional or purposeful, written falsification remains something that should be maintained a strategic distance from at all expenses by current understudies. Literary theft is moreover an immensely mind boggling issue with numerous variables included - to be sure there likewise are a few distinct kinds of copyright infringement that an understudy must remain completely aware of.

Different Types of Plagiarisms:

- i. Deliberate Plagiarism
- ii. Paraphrasing
- iii. Patchwork Paraphrasing
- iv. Bluffing
- v. Stitching Sources
- vi. Using a Copy of your work
- vii. Mosaic Plagiarism
- viii. Accidental Plagiarism
- ix. Buying Assignments
- x. Inaccurate Authorship

IV. WHAT IS THE ANTI PLAGIARISM?

Programming that scans the Web for imitation literary substance. It might furthermore be an independent program introduced on the client's PC or a component of a site, for example, www.turnitin.com. Colleges an expanding number of utilization against unoriginality programming system to decide whether understudies have replicated another person's composition, and journalists use it to check whether others are the utilization of their copyrighted work in full or to some degree.

V. LIST OF ANTI PLAGIARISM SOFTWARE

There are a wide variety of plagiarism detection software program systems, or detection tools, presently available. Use of plagiarism detection software program which is reachable on-line has sturdy function due to the fact human beings are extra open to the web. Numerous on line counterfeit checking softwares are on hand on line to observe the suitable content.

A) Free Plagiarism Detection Software.

1. Dupli Checker

This is one of the best free written falsification location devices on the Internet. While it doesn't have an extravagant interface, it absolutely takes care of business well. Dupli checker empowers you to either

reorder your content in the field and afterward check it for unoriginal lines, or transfer a Docx or Text document from your PC.

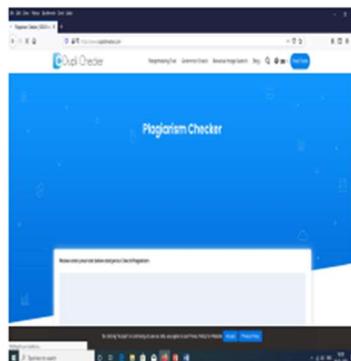


Figure 1. Home page of Dupli Checker

2. Copyleaks

This cloud-based validation stage empowers you to follow how eLearning content is being utilized all around the Internet. Various areas on the stage for instructive and business purposes. The business segment delivers to distributors and SEO offices, while the instruction area to schools, understudies and colleges.

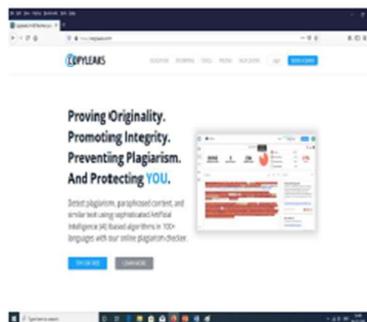


Figure 2. Home page of Copyleaks





3. PaperRater

A multi-reason free copyright infringement location device that is utilized in more than 140 nations.



Figure 3. Home page of Paper Rater

4. Plagiarisma

Fundamental and simple to-utilize, multi-reason written falsification discovery device that is utilized by understudies, instructors, scholars, just as different individuals from the abstract business.

5. Plagiarism Checker

Easy to understand, totally free copyright infringement recognition instrument to check whether substance is copied.

6. Plagium

Fundamental however completely utilitarian free written falsification location instrument with various degrees of search.



Figure 4. Home page of Plagium

7. PlagScan

Counterfeiting discovery device for the two people and organizations that checks writings against online substance, logical diaries and the client's records too.

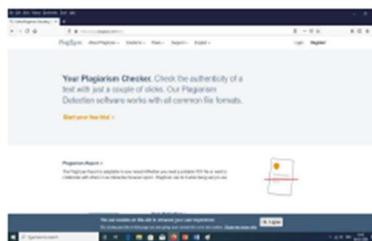


Figure 5. Home page of Plag San

8. PlagTracker

Quick free copyright infringement recognition device that searches the two sites and scholarly databases by reordering content, or document transferring.

B] Commercial Plagiarism Detection Software.

1. Academic plagiarism

Academic plagiarism is an online programming answer for people and instructive organizations to assist them with recognizing written falsification. It offers altering and editing administrations by scholarly specialists and teachers. It assists check with webbing pages, books and magazines, scholarly productions, and enormous databases of papers.



Figure 6. Home page of Academic plagiarism





World Journal of Humanities and Social Sciences
Vol 1, Issue 1, March 2021

2. Turnitin

The organization furnishes educators with instruments to connect with understudies in the composing procedure, give customized input, and survey understudy progress after some time. It is utilized by in excess of 26 million understudies at 15,000 foundations in 140 nations.



Figure 7. Home page of Turnitin

3. Blackboard

Writing board gives venture innovation and answers for the instructive business all around. The organization was established in 1997 and is headquartered in Washington, DC, US. Its workplaces are situated in Europe, North America, Asia, and Australia. The organization offers an assortment of arrangements through most recent innovations for government, further instruction, business, advanced education, and K-12 schools. It serves more than 19,000 customers in excess of 100 nations all around, which incorporate 1,900 universal establishments. It is available in the market by offering SafeAssign, an enemy of copyright infringement programming for organizations.

4. PlagTracker

PlagTracker is a seller that takes into account unoriginality location needs of understudies, educators, distributors, and site proprietors. Written falsification checks for the substance that follows American Psychological Association (APA), Modern Language Association (MLA), and Chicago style of references. Advantages offered to educators incorporate understudy the board, custom channel, reviewing framework, live archive see, report cross check, and following framework.

5. Urkund

Urkund is extremely straight forward to utilize by means of email, and huge numbers of our customers

pick this technique to check work for potential copyright infringement or to improve learning. Notwithstanding our framework can likewise be utilized to incredible preferred position as a coordinated piece of a school's picked computerized learning device. We guide an ever-increasing listing of extraordinary Learning Management Platforms (LMS) or Virtual Learning Environments (VLE). We additionally aid the Learning Tool Interoperability (LTI) trendy and Shibboleth for Single Sign-On (SSO). More that this you can construct bespoke integrations with our Web carrier or Application Programming Interface (API).



Figure 8. Home page of Urkund

VI. BENEFITS OF USING ANTI PLAGIARISM SOFTWARE

There are bunch advantages of utilizing calculation based custom composing literary theft checker on the web. Here beneath is a smart diagram of the advantages:

1. Unoriginality programming programs work truly quick. A product use of this sort can look through the whole web inside a couple of moments, coordinate the given content with writings from around the globe and feature the copied passages/areas inside a brief timeframe.
2. Copyright encroachment checkers in like manner give associations of the source content, which makes it more straightforward for the writers and academicians to know whether the results rely upon solid evidence. You can coordinate and break down the source content and your substance to find the duplicate substance.
3. Unoriginality programming applications are very helpful for web journalists who are relied upon to compose unique pieces inside a short turnaround. Because of the tight cut-off times, many web scholars don't get an opportunity to check the innovation of the writings they produce. These product applications offer





them the chance to check the creativity of web articles and web journals composed by them.

4. Composed misrepresentation checking programming applications help writers and academicians to stay inside the authoritative and good purposes of restriction, which is a precondition of surpassing desires in any field of preparing or work.

VII. FUNCTIONS OF ANTI-PLAGIARISM PROGRAMS

These days, because of the fast improvement of the web assets, the topic of innovation is particularly intense. While there are countless sites giving data about different subjects, there is an all-out absence of projects that could characterize the creation. In spite of such a basic issue, there is as yet an answer for it, for example various types of online instruments. By utilizing one of the offered online projects, clients can examine their bits of composing and decide if they incorporate any duplicated parts.

Be that as it may, one ought not settle on the spot judgment calls. Initially, it is important to discover how literary theft checker work. The individuals who are going to utilize specific written falsification identification programming should realize that it filters just a few passages, short pieces, or sections. It looks for the comparative arrangements of words by contrasting the very content and different reports.

Practically all enemy of copyright infringement programs utilize the web crawler when searching for duplicated material. The investigated content is broken into little parts, and afterward every one of them (parts) is being looked by means of a web crawler. On the off chance that there is identic data on some web

VII. HOW PLAGIARISM DETECTION SYSTEMS WORK HOW PLAGIARISM DETECTION SYSTEMS WORK

The nuts and bolts of the way toward identifying counterfeiting, string coordinating in particular, are portrayed beneath.

The strategy is very straightforward: take a short bit of content and attempt to distinguish a similar piece in different papers. A while later, you should rehash similar activities with different pieces of your work. In request to identify the written falsification level of the looked at content, you have to glue its part into the opened window and press the particular catch. This is the main thing you are required to do. The stuck content is contrasted with thousands if not a great many web assets. When the filtering procedure is more than, a client will get an unoriginality report. In the event that you don't know precisely how copyright infringement checker work, you may transfer the archive that must be

tried for genuineness into our framework. Regardless of the kind of paper, for example paper, exposition, and so on., we will completely check it for written falsification and convey a point by point unoriginality report to you. Note that unoriginality programming we are running doesn't spare the filtered content. Additionally, whatever your area is, you can check your work for credibility by means of our written falsification location programming for nothing.

One more advantage is that, clients are not assumed either to pay or go to an obscure site page to see the copyright infringement indexed lists. With our enemy of written falsification apparatuses, you won't have any issues with your undertakings. So why not attempt now?

VIII. HOW PLAGIARISM SEARCH WORKS?

Step I – distinguishes content components in the record
Step II – breaks the content into coherent semantically important sentences and expressions

Channels extraordinary letters, images and other simple to rework parts (Latin or Cyrillic letters in order substitutions)

Step III – checks for similitudes inside the neighborhood base of diaries and productions

Step IV - thinks about large bits of content as per Shingle calculation or some other

Step V - parses distinctive web crawlers for likenesses

Last advance - shows written falsification rate and nitty gritty report to the client

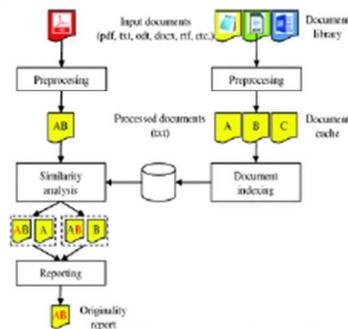


Figure 9. Example of a figure caption. (figure caption)





IX. WHAT PERCENTAGE OF PLAGIARISM IS ACCEPTABLE ?

The editors of diaries don't absolutely depend on the counter copyright infringement instruments, as they probably am aware their downsides. In most of cases, the got literary theft reports are not the last factor that impacts manager's choice on whether to acknowledge the articles or not. The pace of the level of counterfeiting is what is important.

Normally, the editors of various distributions counsel with proficient analysts about the satisfactory counterfeiting rate. The editors are permitted to make exemptions in the situations when it is amazingly difficult to rethink the content. It goes predominantly about the "Technique" area.

It tends to be inferred that a conclusive job is played not by the general level of counterfeiting yet the sort of a paper area where the closeness degree is the most noteworthy.

In any case, by and large acknowledged permitted written falsification rate is from 5 up to 7% considering citations and referenced books that may have been referred to elsewhere.

X. UGC GUIDELINES FOR PLAGIARISM

The University Grants Commission (UGC) despatched a round to all greater schooling establishments affiliated to it, announcing it has Plagiarism is obligatory for all Ph.D. college students for lookup work in the universities. The thinking is to enhance the excellent of lookup work by way of college students on how to go about it at the starting of their Ph.D. from them the methods to lookup a topic, the pleasant practices to undertake and how to keep away from plagiarism.

The UGC permitted the UGC guidelines 2018 (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Education Institutions) in its assembly held on March 20.

ACKNOWLEDGMENT

It is the proper time that the researchers as properly as college students must come ahead to give up plagiarism. The most necessary position in this regard need to be of instructors who must inform the college students and the researchers as to how to come out of this replica paste culture. They should inform them to cite the sources correct with due acknowledgement to the unique author, as a result warding off plagiarism.

REFERENCES

[1] Abirami, V. and Kavitha, E. S. (2019). A Study on the Awareness of Plagiarism Detection Tools among the Research Scholars of Periyar University, Tamil Nadu, Asian Journal of Information Science and Technology ISSN: 2231-6108 Vol. 9 No. 2, 2019, pp. 40-44.

[2] Balaam, P. (2005). 'Plagiarism: A Spreading Infection'. Current Science, 88, p1353-45 K.

[3] Basic, Z., Kruzic, I., Jerkovic, I., Buljan, I., & Marusic, A. (2018). Attitudes and Knowledge about Plagiarism among University Students: Cross-Sectional Survey at the University of Split, Croatia. Science and engineering ethics, 1-17.

[4] Ison, D.C. (2012). "Plagiarism among dissertations: prevalence at online institutions", Journal of Academic Ethics, Vol. 10 No. 3, pp. 227-236.

[5] Ison, D.C. (2015). "The influence of the internet on plagiarism among doctoral dissertations: an empirical study", Journal of Academic Ethics, Vol.13 No. 2, pp.151-166.

[6] Meuschke, N. and Gipp, B. (2013). State-of-the-art in detecting academic plagiarism. International Journal for Educational Integrity, 9(1).

[7] Michelle Cleary and Jan Sayers (2017). Academic Integrity and Plagiarism. Nurse Author & Editor, 27(2: 4) Retrieved from <http://naepub.com/ethical-issues/2017-27-2-4>.

[8] Onuoha, U. D. and Ikonne, C. N. (2013). Dealing with the plague of plagiarism in Nigeria. Journal of Education and Practice, Vol. 4 No. 11, pp.102-106.

[9] Pathak, N. and Malakar, K. (2017). Functioning of 'Research' Tools in the Enrichment of Research in K. K. Handiqui Library, Gauhati University 11th International CALIBER-2017 Anna University, Chennai, Tamil Nadu 02-04 August 2017.

[10] Prasantha and Lakshmi (2015). Awareness on Plagiarism among Research Scholars of Sri Venkateswara University: A Study, IOSR Journal Of Humanities And Social Science (IOSR-JHSS) Volume 20, Issue 3, Ver. II (Mar. 2015), PP 55-59.





World Journal of Humanities and Social Sciences

Vol 1, Issue 1, March 2021

AUTHORS PROFILE



1] **Mr. Nandkishor Gosavi** was pass with first class M.Lib from Madurai Kamaraj University in 2009. He is pursuing PhD at Sant Gadge baba University, Amravati. He is currently working as Assistant Librarian in SVKM' s NDMMS University Mumbai since 2019. He has published more than 02 research papers in reputed international Conferences and 05 research papers in reputed National Conferences. His main research work focuses on Cloud Computing, plagiarism, IoT. He has 14 years of experience.



2] **Dr. Umesh Deshmukh** has completed M.Lib with first class from Swami Ramanand Tearth Marathwada University in 2001. In addition, PhD from Sant Gadge baba University, Amravati in 2015. He is currently working as Librarian in Shri vyankatesh Arts, Commerce and Science College Deulgaon Raja Maharashtra, since 2009. He has published more than 09 research papers in reputed international Conferences and 05 research papers in reputed National Conferences. His main research work focuses on reading habits, plagiarism; He has 20 years of experience.

Copyright © 2021 Melange Publications

25





International Journal of Scientific Research in Science and Technology
 Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijrst.com)
 doi : <https://doi.org/10.32628/IJSRST218568>

Importance of Rural Public Library in Their Service to Rural Population: A Study of Maharashtra State

Dr. Umesh B. Deshmukh

Librarian Shri Vyankatesh Arts , Commerce and Science College, Deulgaon Raja, Dist Buldana.

ABSTRACT

Article Info

Volume 8, Issue 5

Page Number : 620-624

Publication Issue

September-October-2021

Article History

Accepted : 16 Oct 2021

Published : 30 Oct 2021

The paper focuses on the role of rural library as community information Centre in the development of rural masses in various areas such as educational, cultural, socio-economic and political, and to know the present status of the public libraries in Maharashtra state. Paper also highlights the services should be provided by the rural library as community information Centre.

Keywords : Rural library, Community Information Centre, Rural Development,

Public Library, Community Information Service

I. INTRODUCTION

In perception of Indian context, majority of Indian reside in rural areas and engaged in agriculture and small scale industry. Illiteracy is curse for a social, cultural, economic development of the country and it leads poverty. Therefore, development of the country total depends on the improvements of the rural masses; hence development of the rural masses can be achieved by resolving the problems of the rural masses. Information is considered as an inevitable tool for the development of the any society. It is a fundamental resource for all intellectual activities, cultural, socio, economic and political development of the society. In the development of rural areas rural libraries has a pivotal role by offering information dissemination services based upon knowledge for various public groups, on social, political, economic, cultural and other matters. Rural libraries play very dominant role in the welfare of the rural masses.

Rural library can act as community information Centre to improve living condition and quality of life by fulfilling each and every information need, those which are assist individual for their day to day problem solving. The UNESCO Public Library Manifesto (1994) declares that constructive participation and the development of democracy depends on satisfactory education as well as on free and unlimited access to knowledge, thought, culture and information. Ensuring access to citizens to all sorts of Community information services and facilitating the development of information and computer literacy skills have been included in the missions of the manifesto.

II. NEED FOR RURAL LIBRARIES

Like other basic need of the people, information is another basic requirement. But the people those who are living in rural areas they are far away from attain

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

620



Dr. Umesh B. Deshmukh Int J Sci Res Sci & Technol. September-October-2021, 8 (5) : 620-624

of basic information needs. To improve quality of life and potential of the rural people to participate in knowledge based society there is a need of rural library. Rural library plays a vital role for the spread of knowledge and information to the rural community. For the benefit of rural people and to support the rural activities, there is a need of rural libraries with all the required facilities. Rural libraries help to the rural community keeping fresh their knowledge by providing needed information of the rural community. Thus there is a need of rural library which are useful for uplift for rural community.

III. COMMUNITY INFORMATION CENTRE

Community Information is that which assist individual and groups with daily problem-solving and with participation in the democratic process. The services focus on the needs of people those who do not have ready access to other sources of assistance and on the most important problems that people have to look, problems to do with their day to day activity, home, job opportunities and their rights. Hence community information service may be referred as a optimistic decision to concentrate on enabling people in overall development of the community, particularly those in inferior socio-economic group to act either individually or collectively on their problems in several respects such as housing, employment, family and personnel matter, agricultural, consumer affairs, house hold, transportation, civil rights etc.

DEFINING COMMUNITY INFORMATION CENTREA

Community Information Centre is a place where members of a community can

- Locate Information about subjects of interest to them,
- Take Part in learning activities, Discussion and share knowledge, information and concerns with extension and other community workers,

- Planners and administrators. Find Materials to help them retain their literacy and numeracy skills,
- Meet to organize and work together on community projects,
- Use equipment to produce their own information materials, Enjoy culture and leisure activities.

Importance of Rural Public Library in their Service to Rural Population:

Provide information and activities which will help community members acquire the skill, knowledge and confidence to participate more fully in community affairs,

- Provide information and activities about health and agricultural techniques, business etc, to assist community to improve their economic situation,
- Provide a forum through which governments and other agency workers can be informed about concerns, problems and reactions of community members to their plans and programs,
- Provide support to extension programmers and help extension workers to co-ordinate their work in the community,
- Strengthen a community's involvement in and appreciation of local and national culture, Serve as a focal point for communities activities and enhance a sense of belonging among community members.

Present Scenario of Rural Libraries in Maharashtra:

With a view to universalize the right of reading Maharashtra Public Libraries Act has come into force in 1965 and enacted the same thereby laying a sound foundation for the growth of public libraries in this state. The then Maharashtra Library Association worked hard in the direction of bringing the Maharashtra Public Library Act into force with the accelerated motivation of the popular opinion. The efforts made by the then education minister Sri S.R.Kanthi and Dr. S.R. Ranganathan proved



Dr. Umesh B. Deshmukh Int J Sci Res Sci & Technol, September-October-2021, 8 (5) : 620-624

successful in implementing the Library Act in this state. Today, as far as the development of public libraries is concerned it has achieved remarkable progress in the state. The Maharashtra State is one of those few states in the forefront in view of the public library system in the country as a whole. The department of public library in Maharashtra has rendered 48 years of salutary service by installing a network of libraries throughout the state. The Department is, by way of offering library facilities striding fast from the capital towards the villages in the direction of evoking an intellectual revolution among the people by instilling in the common man an active interest for reading. As far as the acts of Public Libraries and establishment of Libraries is concerned, Maharashtra is the 3rd state in the country to establish libraries. The Act facilitates establishment and maintenance of libraries in rural areas. Important feature of act fact is provides provision for collection of libraris through property tax.

The present situation of the public libraries in Maharashtra are - 1 State Central Library, 1 Indira Priyadarshini Children's Library, 1 Public Technical Library, 27 District Central Library, 19 City Central Library, 14 Mobile Libraries, 490 Branch Libraries, 107 Service Stations, 31 Reading Rooms, 5766 Gram Panchayat Libraries, 21 Aided Libraries, 200 Slum Libraries and 600 Reading Rooms in Slum Areas.

There are 5766 numbers of gram panchayat libraries working in the state. As against 5766 number of gram panchayat, gram panchayat libraries have been established in 5766 gram panchayats. Besides the manpower to manage the gram panchayat library, it is the responsibility of the department to provide infrastructure facilities like buildings, furniture, water, light and such others.

Rural Library as a Community Information Centre:-

Rural library itself is a community information centre and it has the obligation to provide community information those which assist individual for their day to day problems. Public library has always been viewed as an important entity in a local community

development and empowerment process, particularly in a rural and disadvantaged community. It has been established as a crucial element in the life of community members, as it provides information that is essential for the community progress.

Services of rural libraries as community information Centre:

To provide basic needs, such as food, shelter, clothing, health, drinking water etc.

- To fulfill economic, educational, social and cultural information needs of the local people;
- To eradicate illiteracy by providing audiovisual and illustrated reading materials;
- To provide government information, such as government schemes, welfare schemes for below poverty lines, voter lists etc.
- To provide agricultural information such as crops, fertilizers, pesticides, seeds, weather forecasts, credit societies agricultural equipment's, soil testing, water supply and irrigation.
- To provide information about animal husbandry, dairying and fisheries.
- To provide information about funding agencies for housing, commerce, agriculture and industries,
- To provide information to the gram panchayat members about schemes available from each and every sectors,
- To provide information on career opportunities for the students

Guiding, counseling, directing on all matters relating to public such as hygiene, family planning, legal matters, etc;

- Local professionals, such as doctors, lawyers, engineers, educationists, artisans, ect.
- Census information, which includes population, literacy percentage, male, female ratio etc,



Dr. Umesh B. Deshmukh Int J Sci Res Sci & Technol, September-October-2021, 8 (5) : 620-624

- To provide needed information to the rural women. There should be a system in the rural areas where women can access, acquire needed information without any hesitation.
- To provide information to the labors, such as wage rates, welfare organizations, welfare funds, education for their children, housing schemes, social security, insurance, medical facilities, the prevention of diseases, labour laws etc.
- To analyze the village community and its basic component groups with their characteristic features and behavior;
- Addresses of important persons, institutions and organizations
- Local places of tourists attraction and facilities
- To provide information to the senior citizen, such as social security, legal actions for protection against harassments by adult children, national policies on older people, old age homes etc.
- General information on state and the country
- Addresses of important persons, institutions and organizations,
- To identify the discrepancy between the services provided and the real needs of the users, etc;
- Court case information.
- Immunization programmes Astrology
- Meetings fair and festivals
- Yellow pages
- Vocational education programmes
- Arranging exhibitions, book displays, etc
- Births, deaths and marriages
- Welfare rights
- Legal aids
- Adult literacy classes
- Children's immunization programmes
- Festival celebrations and other events
- Cooperate with NGOs
- Rights of disadvantaged
- Folk stories
- Reports from the panchayat leaders about their functioning policy decisions, etc

IV. CONCLUSION

The status of public library system as the community information centre in rural community is the new role and it is good chance for public librarians to work in such a challenge context. Public librarians should have more keen interest and cooperation with communities to find the discrepancy between services provided and real needs of the community people. In Maharashtra rural society the personal relationship is still important and people are still friendly and optimistic. Public librarians must get this good point to be a chance to encourage library services to grassroots level.

act as a torch bearer to the progress of the entire society. Hence is the need for public libraries to reconsider their objectives and role as community information centre and come forward to act as centres for the hub of community development activities. This calls public libraries to make maximum use of the advantages of information and communication technologies to develop digital resources, to facilitate access to world wide information to reach the unreached in addition to strengthening their existing resources and services. This further establishes greater need for inter library co-operation and resources sharing through networking.

Community information centre is one that is established, maintained and fostered for the overall development of the entire community. It is meant not only to facilitate information needs of the community, but act as a torch bearer to the progress of the entire society. Hence is the need for public libraries to reconsider their objectives and role as community information centre and come forward to act as centres for the hub of community development activities. This calls public libraries to make maximum use of the advantages of information and communication technologies to develop digital resources, to facilitate access to world wide information to reach the unreached in addition to strengthening their existing resources and services.



Dr. Umesh B. Deshmukh Int J Sci Res Sci & Technol. September-October-2021, 8 (5) : 620-624

This further establishes greater need for inter library co-operation and resources sharing through networking.

V. REFERENCES

[1]. Biradar, B. S., & Kumar, D. P. (2008). Community Information Needs: A case study of Holehonnur Hobli. SRELS journal of Information Management, 45 (2), 225-234.

[2]. Gadagin, B. R., & Kamble, V. T. (2008). Role of Community Information Centres in Rural Developments: A State of the Art in Maharashtra. SRELS journal of Information Management, 45 (4), 419-428.

[3]. IFLA/UNESCO. (1994). IFLA/UNESCO Public Library Manifesto 1994. Retrieved 09 08, 2014, from IFLA: <http://www.ifla.org/publications/iflaunesco-public-library-manifesto-1994>.

[4]. Kaula, P. N. (2006). Need and Development of Libraries in Rural India. Herald of Library Science, 45 (1-2), 52-59.

[5]. Krishnamurthy, C., Hadagali, G. S., & Jamdar, M. (2012). Rural Development and Community Information Centres: An Overview with Special Reference to Maharashtra. Pearl: A Journal of Library and Information Science , (2), 74-826. Kumar, P.Y. Rajendra. (2007). Network of Rural Libraries in Maharashtra. Proceedings of National Seminar on Legislation Based Rural Library service in India. Organized by Ranganathan Society for Book Culture, Library and Information Studies, North East Chapter on 8-10 Sept., 2007 at Imphal, pp.117.

[7]. Kumar, S. (2006). A journey of Rural Library Movements in India: Retrospect and Prospect. SRELS journal of Information Management, 43 (3), 295-306.

[8]. Sami, L. K., Iffat, R., & Shahida. (2008). Rural Development and ICT. SRELS journal of Information Management, 45 (1), 7-10.

[9]. Sharma, A. K. (2008). Information Environment in Rural India: Impediments to free flow of Information. Library Herald, 46 (1), 42-49.

[10]. Vashishth, C. P. (2007). Rural Information Initiatives in India. Library Herald, 45 (3), 191-204.

Cite this article as :

Dr. Umesh B. Deshmukh, 'Importance of Rural Public Library in Their Service to Rural Population: A Study of Maharashtra State ', International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 8 Issue 5, pp. 620-624, September-October 2021.
Journal URL : <https://ijsrst.com/IJSRST218569>





International Multidisciplinary E- Conference On Contribution of Various Aspects In Nation Building
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 5 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijrst.com)

Investigation of Phyllospheric Mycoflora of Tomato from Western Vidarbha, Maharashtra

Suryakant H. Kanherkar¹, Rameshwar Y. Mane²

¹Department of Botany, Yashwantarao Chavan Arts and Science Mahavidyalaya, Mangrulpir, Dist. Washim, Maharashtra, India

²Department of Botany, Shri Vyankatesh Arts, Com. and Science College Deulgaon Raja, Dist. Buldana, Maharashtra, India

ABSTRACT

In the present research work phyllosphere mycoflora of brinjal, was undertaken, to investigate different types of fungal mycoflora. The leaf, stem and fruit samples were collected from various field of Amravati and Akola region at the intervals of 15 days starting from seedling state up to its harvesting. The diseases samples were collected in all the stages of plant i.e. seedling, foliage, flowering and fruit-formation stage. The samples from plants were brought into laboratory in separate sterilized polythene bags for isolation of all possible phyllosphere mycoflora. The infected plant parts which were collected different stages of disease development and all the samples were carefully preserved in the form of herbarium to study the etiology of diseases. The symptoms of diseases were studied in the beginning as well as severity of infection. Phyllosphere isolation were carried out by different methods such as serial dilution, leaf impression, leaf washing methods, etc. The different types of fungal pathogens were also isolated by cutting small fragments of aerial diseased parts of plants from junction of infected and healthy parts. From the phyllosphere study it was concluded that mainly Deuteromycetean fungi were found to be associated with various parts viz. leaf, stem and fruit. The fungal isolated were identified with the help of available literature and stock cultures.

Key Words: - Tomato, Pathogen, Symptoms, Morphology, Phyllospher, Mycoflora

I. INTRODUCTION

Various surveys and regional surveys were made on mycoflora of Indian subcontinent including fungi of Bombay, Wangikar and Ballal (1984). The present data revealed that mostly Deuteromyces fungi were associated not only with the leaves of various wild plants but also ornamental and crops of economic value. It has been reported that genera belonging to the from order moniliales such as *Fusarium*,

Curvularia lunata, *Helminthosporium sp.*, *Bipolaris sp.*, *Alternaria*, *Botrytis*, *Cladosporium*, ; those belonging to the form order Melanconiales such as *Colletotrichum*, *Glomerella*, *Melanconium*, *Polnema* and of the order Sphaeropsidales like *Phoma*, *Phyllosticta*, *Coelophoma*, *Macrophoma*, *Macrophomina*, *Phomopsis*, *Sphaeropsis*, *Ascochyta*, *Botryodiplodia* have worldwide distribution. From the available literature it is revealed that the distribution of leaf spot fungi could not be restricted

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

199



by ecological conditions and geographical barriers. Among all plant pathogens, fungi are the major disease causing agents and can be responsible for about 90% of agricultural yield loss (Maninegalai *et al.*, 2011). It has been reported that various genera of fungal pathogen causing diseases on vegetables like brinjal are leaf spot and frost rot caused by *Phomopsis vexans*, colletotrichum fruit rot caused by *Colletotrichum melogena*, brinjal wilt caused by *Verticillium albo-atrum*, etc.

Macrophomina phaseolina is an anamorphic fungus in the ascomycete family Botryosphaeriaceae (Crous *et al.*, 2006). *Macrophomina* is primarily soil and seed-borne fungal pathogen that incites disease by producing microsclerotia or pycnidia (Pun *et al.*, 1998). With a wide host range of approximately 500 species in 75 plant families, the pathogen exhibits heterogeneous host specificity i.e., the ability to infect monocots as well as dicots and exhibits non-uniform distribution in the soil (Mayek-Perez *et al.*, 2001). *M. phaseolina* consists of only one species. In spite of being a mono-specific genus, *M. phaseolina* exhibits a high degree of morphological (Mayek-Perez *et al.*, 1997), pathogenic (Su *et al.*, 2001), it has worldwide distribution. From the available literature it is revealed that the distribution of the leaf, stem and fruit surface could not be restricted by ecological condition. In present investigation, the study of phyllosphere mycoflora was undertaken to screen the diseases causing fungi of the vegetable leaf, stem and fruit surface.

II. MATERIAL AND METHODS

Collection of materials and isolation of fungi:

A regular survey of phyllosphere fungi of vegetable from different region viz. Amravati and Akola region was made during the month of January 2013-January 2015. Various fungi causing diseases of vegetables were collected. Isolation of fungi was made by cutting the small pieces of leaves from the junction of healthy

and infected region. Infected pieces were surface sterilized by sodium hypochloride and transferred aseptically to sterilized slant in culture tubes. The slant was prepared from Ashtana and Hawker, s medium 'A'.

Study of phyllosphere mycoflora by serial dilution plate method

Serial dilution plate method is one of the common method adopted for study of phyllosphere microflora. Fresh healthy leaves of all ages were collected from Tomato, field in fresh sterile polythene bags and brought into the laboratory.

Study of phyllosphere mycoflora by leaf impression method

This method was useful for superficial fungal spores. At the time of isolation fresh leaf was taken and pressed from its dorsal surface momentarily against surface of petri plate at three places. Same leaves were placed from ventral surface against the agar surface in same way like the first. Same procedure was repeated for other leaf sample. Incubation of plates was carried out at 26°C in an inverted position for 7 days.

Leaf washing method

This method was established by and describe as standard washing method for isolation micro flora of leaf. The process involved the cutting of 3 mm diameters uniform discs at random from leaf surface sample and washing them in 2-3 changes of sterile water. Aliquots of the final washing were placed out with the tap water agar and incubated to determine the efficacy of washing process. The results were taken after 3 days of incubation.

Identification of isolate

The isolates were identified from available literature Illustrated genera of imperfect fungi by Barnett and Hunter (1972); Morphological and taxonomical studies of all the fungi isolated were carried out.



During the studies of phyllosphere fungi vegetative and reproductive characters were recorded to known the species identification.

Pathogenicity test

Pathogenicity of the organism was confirmed by Koch's postulate method. In order to pathogenicity, perfectly healthy, vegetable leaves of similar size were selected and thoroughly washed with sterile water. The fungus was claimed as pathogen only after satisfying Koch's postulates. Wherever more than one organism was isolate from a single lesion, pathogenicity of each organism was confirmed separately. During the studies the author made specific attention on variation in symptoms, month wise observation, nature of agriculture practices. All the data were recorded at the time of disease survey.

III. OBSERVATION AND RESULTS

Diseases Tomato

1) *Alternaria alternate* (Fr.) C. Keissler.

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Alternaria alternata*

Symptoms of Disease: - *Alternaria alternata*'s main decay causing organism of post harvest tomato fruits which responsible for black rot lesions on tomato fruits. Losses due to fungal rot of tomato. Symptoms first appear, white mycelium is developed. The fungus produces dark powdery chains of dark brown conidia of variable lengths and shapes. The spot color is usually extremely variable between olive green to dark brown.

Morphology of pathogen: -The mycelium may be variable in color. Hyphae are dark brown, light olive green to brown, septate, branched. Thick conidiophores are simple, erect, 30-40 µm long, 3-5 µm thick, and often clustered. Conidiophores dark, conidia simple, branched chains. These chains normally branch at the beak of a spore, sometimes

from the short lateral projection of the beak. Conidia have transverse and oblique septa, measure 10-18 X 20-65 µm, and are ovoid to obovoid, obclavate, obpyriform, ellipsoidal, uniform. Conidia often have a short conical or cylindrical beak which is about one third the length of the conidia, and measure 3-6 x 8-22 µm.

2) *Alternaria solani*

Disease sample: - Fruit

Name of disease: - Early blight (Alternaria rot)

Causal agent: - *Alternaria solani*

Symptoms of Disease: - This disease usually begins on lower leaves and gradually spreads upwards. Concentric rings (target-like) that develop in leaf, stem spots are characteristic. The fungus may live in soils for 1 or 2 years. In addition, it is spread on transplants and by windblown spores. It may appear on fruit, mainly as firm, dark-colored decay at stem end has been considered as the most common disease of tomato fruits and causes heavy losses in quality of the fruits, thus rendering large quantity of tomato fruits unfit for consumption. The causal organism was isolated from the tomato fruits. *A. solani* was mainly responsible for the tomato decay and typical symptoms occurred on stem were brown to black, depressed and usually with distinct rings that the spot range in size from minute pin-heads to areas extending completely across the surface of the fruit giving it a flattened appearance. The fungal rot *Alternaria* is main decay causing organism of post harvest tomato fruits while responsible for black rot lesions on tomato fruits.

Morphology of pathogen: - Colonies usually brown to black, hyphae dark brown, branched. Hyphae are aseptate, 1.1-1.5 µm in diameter. Conidiophores dark, gray, mostly simple, rather longer, needle shaped, typically bearing simple conidia; conidia 20-30 µm thick, 45-80 mm long.



3) *Alternaria bataticola* Nees ex Fr.

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Alternaria bataticola*

Symptoms of Disease: - *Alternaria bataticola* is main decay causing organism of post harvest tomato fruits while responsible for black rot lesions on tomato fruits. The genus causes economically important diseases in various crops, mostly as necrotic lesions on leaves, stems and fruits.

Morphology of pathogen: - Colonies effuse usually grey, dark blackish brown or black mycelium, immersed or particularly superficial, hyphae colourless, olivaceous brown or brown. Conidiophores macronematous have simple or irregularly and loosely branched, pale brown or brown, solitary or in fascicles. Conidiogenous cells integrated, terminal becoming intercalary, polytretic, sympodial or sometimes monotretic, cicatrised. Conidia catenate, solitary, dry, typically ovoid or obclavate, often rostrate, pale or mid-olivaceous brown to brown, smooth or verrucose, with transverse and frequently also oblique or longitudinal septa; Plate - 20 (90).

4) *Alternaria macrospora* Zimm.

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Alternaria macrospora*

Symptoms of Disease: - On the fruit 2-5 cm rot borer is formed in young fruit. The circular patches growing on fruit. The patches are circular ring-like structure is develop. The ring is blackish colour, due to caused damage of fruit. *Alternaria macrospora* fruit decay causal agents while responsible for black rot of tomato fruits.

Morphology of pathogen: - Colony initially white, turning brown with age, spreading. Hyphae brown, branched, septate 2.1 to 4.3 µm wide. Conidiophores simple, long, branched, septate 5-8 µm. Conidia in chain of 8-10, septate to dark brown 8.0-15 µm.

5) *Cercospora* sp.

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Cercospora* sp.

Symptoms of Disease: - Symptoms on hole part of fruit number of black spot on growing, Irregular black dot formed. The dot is pustule like structure and in black sooty powdered form. The mature as well as non-mature fruit is cracking. Green colour fruit can convert to yellow colour and fruit is fall down.

Morphology of pathogen: - The colony is whitish to black. Conidia hyaline, acicular, obclavate-cylindrical, filiform, usually pluriseptate. Conidiophores dark, simple, arising in clusters, bearing conidia successively on new growing tips; conidia hyaline, dark, filiform, several celled; parasitic on higher plants, commonly causing leaf spot. Conidia hyaline to lightly pigmented, multi-celled with 4 or more septations, one end may be narrower than other. The fungus produces stromata which are globular. Conidiophores in mass are medium dark and slightly olivaceous brown in colour and paler towards the tip. Conidiophores 20-30 µm in diameter and conidia are long, septate 25-55 µm in diameter;

6) *Fulvia fulva*

Disease of sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Fulvia fulva*

Symptoms of Disease: - On surface of fruit 4-5 black colour doted spot due to disease development. But fruit is not cracking, it is directly rotting. These symptoms look in ripened fruit only. After 24 hrs the fruit produced dirty smell caused by this pathogen.

Morphology of pathogen: - Colony is greenish black colour, thread-like velvate. Conidiophores dark, erect, slender, usually simple, septate, long; conidia hyaline, borne singly at apex or produced in chain. The 1-celled, bunched of conidia mostly globos or ovoid, fusoid, in dry basipetal chain. The conidiophores



have 100-150 µm in length and 2-4 µm in width and 2-4 µm in diameter area.

7) *Bipolaris sp.*

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Bipolaris sp.*

Symptoms of Disease: - On the fruit, eye-like spots are developed. The middle part of spots is shiny velvety, mycelium is formed, the symptoms also observed in green young fruit. The green fruit converted into yellow fruit, and fruit is damaged and falls down.

Morphology of pathogen: - Conidiophores brown, mostly simple, producing conidia through apical pores, resuming growth sympodially and forming conidia on successive new tips; conidia brown, several celled, fusoid, straight or curved, germinating by one germ tube at each end, sporangiospore is long septate. The conidia are long septate 20-50 µm in breadth 60-90 µm in length. Conidiophores are long septate 100-200 µm long.

8) *Helminthosporium sp.*

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Helminthosporium sp.*

Symptoms of Disease: - Whitish to black mycelium dots are produced on young fruit. Green fruit convert to yellow colour. The rashes or cracking appear on fruit and fruit falls down.

Morphology of pathogen: - Colonies consist of irregularly velvety, spreading margin brown to black, with strict, brown, green brown to black mycelium. Mycelium dark, often in substrate; stromata often present; conidiophores single or clustered, tall, erect, brown, simple; conidia develop laterally through pores beneath septa while apex of conidiophores is still growing, often appearing in whorls, single, subhyaline to brown, obclavate, phragmoporous, pseudoseptate, with prominent basal scar; parasitic or saprophytic mycelium dark, often in

substrate; stromata often present. Conidiophores usually arise in groups, erect and straight, sometimes reclining, usually unbranched, septate, geniculate at points below the conidia. Conidia darkly to lightly pigmented, multi-celled, ovoid to cylindrical, simple conidia develop, 25 - 50 µm in diameter laterally through pores beneath septa, while apex of conidiophores is still growing, 80 - 90 µm in diameter, often appearing in whorls, single, subhyaline to brown, obclavate, phragmoporous, pseudoseptate, with prominent basal scar; parasitic or saprophytic.

9) *Cercospora carotae*

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Cercospora carotae*

Symptoms of Disease: - In first symptoms white to black colour are developed on fruit; the fruit is cracking many rashes are formed. The host may exhibit dry lesions on the fruit with a well-defined border between healthy and diseased tissues. Fruit infected directly from the soil surface or through the peduncle rot. Fruit rot develops, fruit tissue is damaged.

Morphology of pathogen: - Conidiophores 3-15 in a fascicle borne singly, pale olivaceous brown, paler tips, upper portion slightly geniculate, straight, scars conspicuous thickened, 20-40 x 2.5-4 µm conidia hyaline, filiform to cylindrical, solitary, straight to slightly curved, 1-5 septa, rounded base, obtuse apex, helium thickened and darkened, 25-95 x 3.5-5.5 µm.

10) *Fusarium moniliformae*

Disease sample: - Fruit

Name of disease: - Fruit rot

Causal agent: - *Fusarium moniliformae*

Symptoms of Disease: - The young as well as old fruit attacked by this pathogen. On the fruit white, thread-like mycelium growing on hole part of fruit. It is fast growing universal disease due to caused by *Fusarium*. On fruit mycelium is developed, which is green, yellow, red color, convert to black or brown colour. After



sometime fruit is damage. Fruit infected directly from the soil surface or through the peduncle rot quickly and turn into a watery mass.

Morphology of pathogen: -Colonies appear white in culture, spreading mycelium septate, branched, and cottony in culture with ting of pink colour, 2.5-2.8 µm thick. The mycelium is circular fluffy and white to slight bluish with purple reverse, mycelium. Conidiophores formed in cultures, spherical to oval thick walled, single or in chains of two or three, terminal or intercalary. Conidiophores short, hyaline, variable in shape. Conidia are of two types. Macroconidia linear curved at both ends and notched at base, thin walled 3-5 septate, measuring 3 - 3.4 µm. Microconidia are small, elliptical or curved, thin walled, unicellular 4.2 -7.5 X 3.3 -3.6 µm in size. Intermediate conidia oblong, 3-6 celled with rounded end. Conidia 3 or more-celled elongated to slightly curved, canoe-shaped.

11) *Fusarium oxysporum*

Disease sample: - Fruit

Name of disease: - Fusarium rot

Causal agent: - *Fusarium oxysporum*

Symptoms of Disease: -The main symptoms are brown discolorations of the vascular tissue on the fruit, yellowing and wilting of the fruit. This fungus survives in the soil for many years. At last, two races of fungus are present. On the fruit, eyespot is developing. In this spot white creamy colored, velvety mycelium is developed. Area of mycelium is increase after sometime and fruit is spoiled.

Morphology of pathogen: -Colonies white to pinkish, mycelium abundant, branched, spreading mycelium septate, branched, cottony in culture with ting of pink colour, septate 3.1- 3.9 µm wide, conidiophores simple, short. Conidiophores formed in cultures, spherical to oval thick wall, single or in chains of two or three, terminal or intercalary. Conidiophores short, hyaline, variable in shape and terminating in 1-3 or more phialaden; conidia, hyaline, variable in size,

conidia of two types held in moist head. Conidia 3 or more-celled elongated to slightly curved, canoe-shaped. Macro conidia 4-6 celled fusiform to falcate, 15.4 -30 X 2.6 µm tapering towards both the ends. Microconidia one celled, ovoid to oblong, singly develops on the conidiophores terminally.

12) *Phytophthora sp.*

Disease sample: - Leaf

Name of disease: - Late Blight

Causal agent: - *Phytophthora sp.*

Symptoms of Disease: -*Phytophthora sp.* is one of the most important plant pathogenic genera. Members of this genus frequently cause root rot and pre and post seedling diseases and are more often specialized and destructive plant pathogens causes late blight and important tomato diseases. Symptoms appear on the upper surface of leaves as greasy, gray spots that expand rapidly. White mold usually develops at the margin of affected areas stem and petioles are infected, are above these infections wilt and die. Fruit infection begin as brown, greasy spots that rapidly expand to rot the entire fruit. *Phytophthora* rot of tomato caused by *Phytophthora infestans*. The symptoms of *Phytophthora* rot of tomato occurred on affected fruits as hard, humpy, reddish brown lesions with indefinite margin but under humid conditions developed soft consistency and designated this rot as dry *Phytophthora* rot. That the typical lesions of tomato were brown to black, flattened or slightly sunken with indefinite margin.

Morphology of pathogen: -Mycelium white mass, in host often with haustoria. Hyphae 3-8µm, irregularly swollen undulate, sometimes with characteristic swellings, initial branching at right angles to parent hyphae and often swollen, for a short distance. Chlamydospores thick walled, secondary spores, usually spherical, intercalary, sometimes terminal, wall smooth, upto 2µm thick, hyaline. Sporangiospores usually undifferentiated, branching sympodial or irregular and from below the



sporangium or from within an empty one. Sporangia usually terminal, single on long, hyphae in sympodia or within an evacuated sporangium; ellipsoid, ovoid, obpyriform, apex differentiated by an internal hyaline, thickening of the inner wall and sometimes protruding to form a papilla. wall smooth up to 2 μm μ thick, non caduceus or shed with a pedicel.

13) *Pythium sp.*

Disease sample: - Leaf

Name of disease: - Pythium rot

Causal agent: - *Pythium sp.*

Symptoms of Disease: -Pithier rot begins as a small water-soaked spot where the leaf contacts the soil. Within 72 hours the entire leaf becomes rotted, the skin ruptures, and the watery contents of the fruit spill out. A white cottony growth may be observed within lesions under humid conditions.

Morphology of pathogen: -Non-septate, no cross walls hyphae observed in root, stem or leaf tissue; hyphae may appear wide. With grainy texture; irregular hyphal swellings finger-like projections, thick-walled oospores may be observed; round or lemon-shaped sporangia may be present. Conidia are circular-like 25-75 μm in diameter in area. Hyphae are long and septate 40- 80 μm -in length.

14) *Cercospora sp.*

Disease sample: - Leaf

Name of disease: - Chlorotic lesion

Causal agent: - *Cercospora sp.*

Symptoms of Disease: -The disease symptoms are characterized by chlorotic lesion, angular to irregular in shape, later turning grayish-brown. Severely infected leaves drop-off prematurely, resulting in reduced fruit yield.

Morphology of pathogen: -Conidiophores dark, simple, arising in clusters and bursting out of leaf tissue, bearing conidia successively on new growing tips; conidia hyaline or dark, filiform, several celled; parasitic on higher plants, commonly causing leaf spot.

Conidia hyaline, colorless to lightly pigmented, multi-celled with 5 or more septations one end may be narrower than other; conidiophores produced in clusters. The fungus produces stromata which are globular. Conidiophores in mass are medium dark and slightly olivaceous brown in colour and paler towards the tip. Conidia are sub hyaline to pale olivaceous and 20-30 μm in diameter and conidia long, septate 25-55 μm in diameter.

15) *Sclerotium sclerotiorum*

Disease sample: - Stem

Name of disease: - Southern blight

Causal agent: - *Sclerotium sclerotiorum*

Symptom of Disease: -Distinguishing sign is white mold, often with seed-like sclerotia present on infected stem near soil line. This fungus caused rot of tomato and other plant part in contact with soil. The fungus lives in the soil for many years. It caused wilting and dying in many different kinds of plants.

Morphology of pathogen: -Colonies usually white with many mycelial strands in the aerial mycelium. Sclerotia develop on colony surface, nearly spherical, mostly 1-5 mm across, shiny surface. Hyphal cell is usually 5.5-8 μm wide and up to 350 μm long with one or more clamp connections at septa, mycelium usually light; parasitic, principally on underground part of plants. Profuse, white mycelium radiates across infected tissue or soil in a fan-like manner; hyphae may have clamp connections above hyphae septa; hard, small round, yellow to brown sclerotia form on infected tissue. Sclerotia brown to ovoid compact, variable in size, measuring 8-12 mm in diameter.

16) *Geotrichum sp.* Link.

Disease sample: Fruit

Name of disease: - White rot

Causal agents: - *Geotrichum sp.*

Symptoms of Disease: -Fungal rots of tomato are due to buckeye rot the incidence of fungal rot in tomato



fruits. Most common pathogen and caused loss of tomato fruit crop due to *Geotrichum* sp. Symptoms first appear as white mycelium is developed.

Morphology of pathogen: -Mycelium white septate, conidiophores long, conidia hyaline, 1-celled, short cylindrical with truncate ends, formed by segmentation of hyphae; mostly saprophytic, common in soil. The conidia length is 10-15 µm in diameter and breadth is 5-8 µm in diameter. The sporangiospore is long 50-120 µm in diameter.

- [6]. Su G, Suh SO, Schneider RW and JS Russin (2001), Host specialization in the charcoal rot fungus *Macrophomina phaseolina*. *Phytopathology*, 91:120-126.
- [7]. Wangikar, B. P. and Ballal V. N. (1984). A new species of *Hypodermella* from Maharashtra. *Curr. Sci.*, 53: 1162-1163.

IV. REFERENCES

- [1]. Crous P.W., Slippers B, Wingfield M.J., Rheeder J., Marasas FOW, Philips J.L.A, Alves A, Burgess T., Barber P. and Groenewald JZ (2006). Phylogenetic lineages in the Botryosphaeriaceae. *Studies in Mycology*, 55:235-53.
- [2]. Maninegalai, V., Ambikapathy V. and Panneerselvam A. (2011). Antifungal potentiality of some medicinal plants extracts against *Bipolaris oryzae* (Breda de Haan). *Asia. J. Plant. Sci. Res.*, 1: 77-80.
- [3]. Mayek- Perez N, Lopez-Castaneda C, Gonzalez-Chavira M, Garch-Espinosa R, Acosta-Gallegos J, De la Vega OM and Simpson J (2001). Variability of Mexican isolates of *Macrophomina phaseolina* based on pathogenesis and AFLP genotype. *Physiological and Molecular Plant Pathology*, 59:257-264.
- [4]. Mayek-Perez N., Lopez-Castaneda C. and Acosta-Gallegos J.A. (1997). Variacion en caracteristicas culturales in vitro de aislamientos de *Macrophomina phaseolina* su virulencia en frijol. *Agrociencia*, 31:187-195.
- [5]. Pun K.B., Sabitha D. and V. Valluvaparidasan (1998). Studies on seed-borne nature of *Macrophomina phaseolina* in okra. *Plant Disease Research*, 13:249-290.





International e-Conference on New Horizons And Multidisciplinary Applications In Science And Technology
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 6 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijrst.com)

Investigation of Phyllospheric Mycoflora of Chili from western Vidarbha, Maharashtra

Dr. Suryakant H. Kanherkar¹, Dr. Rameshwar Y. Mane²

¹Department of Botany, Yashwantarao Chavan Arts and Science Mahavidyalaya, Mangrulpir, Dist. Washim, Maharashtra, India

²Department of Botany, Shri Vyankatesh Arts, Com. and Science College, Deulgaon Raja, District Buldana, Maharashtra, India

ABSTRACT

In the present research work phyllosphere mycoflora of Chili, was undertaken, to investigate different types of fungal mycoflora. The leaf, stem and fruit samples were collected from various field of Amravati and Akola region at the intervals of 15 days starting from seedling state up to its harvesting. The diseases samples were collected in all the stages of plant i.e. seedling, foliage, flowering and fruit-formation stage. The samples from plants were brought into laboratory in separate sterilized polythene bags for isolation of all possible phyllosphere mycoflora. The infected plant parts which were collected different stages of disease development and all the samples were carefully preserved in the form of herbarium to study the etiology of diseases. The symptoms of diseases were studied in the beginning as well as severity of infection. Phyllosphere isolation were carried out by different methods such as serial dilution, leaf impression, leaf washing methods, etc. The different types of fungal pathogens were also isolated by cutting small fragments of aerial diseased parts of plants from junction of infected and healthy parts. From the phyllosphere study it was concluded that mainly Deuteromycetean fungi were found to be associated with various parts viz. leaf, stem and fruit. The fungal isolated were identified with the help of available literature and stock cultures.

Keywords: - Chili, Pathogen, Symptoms, Morphology, Phyllospher, Mycoflora

I. INTRODUCTION

Various surveys and regional surveys were made on mycoflora of Indian subcontinent including fungi of Bombay, Wangikar and Ballal (1984). The present data revealed that mostly Deuteromyces fungi were associated not only with the leaves of various wild plants but also ornamental and crops of economic value. It has been reported that genera belonging to the from order moniliales such as Fusarium, Curvularia lunata, Helminthosporium sp., Bipolaris sp., Alternaria, Botrytis, Cladosporium, ; those belonging to the form order Melanconiales such as Colletotrichum, Glommerella, Melanconium, Polnema and of the order Sphaeropsidales like Phoma, Phyllosticta, Coelophoma, Macrophoma, Macrophomina, Phomopsis, Sphaeropsis, Ascochyta, Botryodiplodia have worldwide distribution. From the available literature it is revealed that the distribution of

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

414



leaf spot fungi could not be restricted by ecological conditions and geographical barriers. Among all plant pathogens, fungi are the major disease causing agents and can be responsible for about 90% of agricultural yield loss (Maninegalai et al., 2011). It has been reported that various genera of fungal pathogen causing diseases on vegetables like brinjal are leaf spot and frost rot caused by *Phomopsis vexans*, colletotrichum fruit rot caused by *Colletotrichum melogena*, brinjal wilt caused by *Verticillium albo-atrum*, etc.

Macrophomina phaseolina is an anamorphic fungus in the ascomycete family *Botryosphaeriaceae* (Crous et al., 2006). *Macrophomina* is primarily soil and seed-borne fungal pathogen that incites disease by producing microsclerotia or pycnidia (Pun et al., 1998). With a wide host range of approximately 500 species in 75 plant families, the pathogen exhibits heterogeneous host specificity i.e., the ability to infect monocots as well as dicots and exhibits non-uniform distribution in the soil (Mayek-Perez et al., 2001). *M. phaseolina* consists of only one species. In spite of being a mono-specific genus, *M. phaseolina* exhibits a high degree of morphological (Mayek-Perez et al., 1997), pathogenic (Su et al., 2001), it has worldwide distribution. From the available literature it is revealed that the distribution of the leaf, stem and fruit surface could not be restricted by ecological condition. In present investigation, the study of phyllosphere mycoflora was undertaken to screen the diseases causing fungi of the vegetable leaf, stem and fruit surface.

II. MATERIAL AND METHODS

Collection of materials and isolation of fungi:

A regular survey of phyllosphere fungi of vegetable from different region viz. Amravati and Akola region was made during the month of January 2013-January 2015. Various fungi causing diseases of vegetables were collected. Isolation of fungi was made by cutting the small pieces of leaves from the junction of healthy and infected region. Infected pieces were surface sterilized by sodium hypochloride and transferred aseptically to sterilized slant in culture tubes. The slant was prepared from Ashtana and Hawker, s medium 'A'.

Study of phyllosphere mycoflora by serial dilution plate method

Serial dilution plate method is one of the common method adopted for study of phyllosphere microflora. Fresh healthy leaves of all ages were collected from Tomato, field in fresh sterile polythene bags and brought into the laboratory.

Study of phyllosphere mycoflora by leaf impression method

This method was useful for superficial fungal spores. At the time of isolation fresh leaf was taken and pressed from its dorsal surface momentarily against surface of petri plate at three places. Same leaves were placed from ventral surface against the agar surface in same way like the first. Same procedure was repeated for other leaf sample. Incubation of plates was carried out at 26°C in an inverted position for 7 days.

Leaf washing method

This method was established by and describe as standard washing method for isolation micro flora of leaf. The process involved the cutting of 3 mm diameters uniform discs at random from leaf surface sample and washing them in 2-3 changes of sterile water. Aliquots of the final washing were placed out with the tap water agar and incubated to determine the efficacy of washing process. The results were taken after 3 days of incubation.



Identification of isolate

The isolates were identified from available literature Illustrated genera of imperfect fungi by Barnett and Hunter (1972); Morphological and taxonomical studies of all the fungi isolated were carried out. During the studies of phyllosphere fungi vegetative and reproductive characters were recorded to known the species identification.

Pathogenicity test

Pathogenicity of the organism was confirmed by Koch's postulate method. In order to pathogenicity, perfectly healthy, vegetable leaves of similar size were selected and thoroughly washed with sterile water. The fungus was claimed as pathogen only after satisfying Koch's postulates. Wherever more than one organism was isolate from a single lesion, pathogenicity of each organism was confirmed separately. During the studies the author made specific attention on variation in symptoms, month wise observation, nature of agriculture practices. All the data were recorded at the time of disease survey.

III. OBSERVATION AND RESULTS**Diseases of Chili: -****1) Fulvia fulva**

Disease sample: - Fruit

Name of disease: - Fulvia fruit spot

Causal agent: - Fulvia fulva

Symptoms of Disease: - Pale green, yellowish spots appear on the upper surface of fruit, an olive-green to tan, velvety fungal growth appears on the lower surface of the spots. Under favourable conditions (long periods of humidity greater than 85 percent), complete defoliation can occur.

Morphology of pathogen: - Colony is greenish-black colour, thread-like, velvate, conidiophores dark, erect, slender, usually simple, septate, long; conidia hyaline, borne singly at apex or produced in chain 1- Celled, bunched of conidia mostly globus or ovoid, fusoid, in dry basipetal chain. Conidiophores are 100-150 µm in length and 2-4 µm in width, the conidia has 2-4 µm in diameter area.

2) Alternaria solani

Diseases sample: - Fruit

Name of disease: - Fungal Fruit Rot

Causal agent: - Alternaria solani

Symptoms of Disease: - Symptoms first appear as water-soaked, gray lesions that collapse and darken. Lesions turn velvety as spores are produced. Infection generally occurs at growth cracks, injuries or at the blossom-end of fruit. Internal colonization of pepper fruit without external signs of infection can occur when flowers are infected, the cracks appearing on leaf spot. The Alternaria solani occurs commonly, causing the characteristic leaf spots with concentric rings. The spots are mostly irregular, 6-9 mm in diameter and may coalesce to cover large areas of the leaf blade. Severely affected leaves may drop also infects the fruits causing large deep-seated spots. The infected fruits turn yellow and drop off prematurely.



Morphology of pathogen: - Mycelium is septate, branched, light brown and dark brown. Conidiophores emerge through stomata and dark colored. Conidia are single celled, muriform, beaked and produced in chains. The conidia are with 6-8 transverse septa and a few longitudinal or oblique septa.

3) *Alternaria alternata*(Fr) C. Keissler,

Disease- sample: - Fruit

Name of disease: - Alternaria Rot

Causal agent: - *Alternaria alternata*

Symptoms of Disease: -Symptoms first appear as water-soaked, gray lesions that collapse and darken. Lesions turn velvety as spores are produced. Infection generally occurs at growth cracks, injuries or at the blossom-end of fruit. Internal colonization of pepper fruit without external signs of infection can occur when flowers are infected.

Morphology of pathogen: - The pure culture was isolated on 27±2° C produced colonies, olivaceous, black-grey, creamish yellow to black. Conidiophores arising singly or in small groups, branched, straight or curved; Colonies 5.5-6.0 cm diameter after 3-5 days at 27°C, reverse smooth, up to 40 µm long, 2 – 4 µm thick, with 1-2 or several apical conidia. Conidiopores often in branched chains, obclavate, ovoid, with a short conica or cylindrical beak, golden brown, up to eight transverse and several longitudinal, oblique septa, 25-65 µm long, 10 – 20 µm thick, beak pale, 2 – 5 µm thick.

4) *Alternaria porri* (Ellis)Cif.

Diseases sample: - Leaf

Name of disease: - Alternaria leaf spot

Causal agent: - *Alternaria porri*

Symptoms of Disease: - The disease causes characteristic leaf spots with concentric rings. The spots are mostly irregular and coalesce to cover large areas of the leaf blade. Severely affected leaves drop off.

Morphology of pathogen: - *Alternaria porri* colonies are rapid growing, cottony, and gray to black. The conidia develop in branching chains at the apex of the conidiophore, with the youngest conidium at the apex of each chain. The conidia are dematiaceous and muriform. The conidia are large breadth is 4-6 µm in diameter and their breadth is 40-70 µm in diameter.

5) *Colletotrichum capsici* (Syd.) Butl. Bisby

Disease sample: - Fruit

Name of disease: - Anthracnose fruit rot

Causal agent: - *Colletotrichum capsicii*

Symptoms of Disease: - Fruit lesions are the most important character of this disease. Fruit symptoms begin as water-soaked areas that turn tan or brown. Lesions may be small and circular, coalesce to cover large areas of the fruit. Under moist conditions, pink, salmon or orange masses of spores are formed, usually in concentric rings. Depending on the species present, black or brown filamentous structures may be visible in the lesion. Anthracnose can affect both green and ripe fruit, but symptoms are usually not visible until fruit ripen and turn red. Warm, wet weather generally favours infection and development of symptoms. Depending on the species of *Colletotrichum* present, optimal temperatures for infection range from 20° C to 27° C, free moisture is



necessary for infection. Fog and dew are conducive to disease development. Rain disseminates the pathogen's spores and often leads to severe losses, especially if fruit are wounded

Morphology of pathogen: -The isolates of *C. capsici* were obtained from the chili fruits infected with fruit rot. Each showed colony colour, pattern of growth on PDA. The isolate is white to light mouse grey, circular, mycelium with black coloured all over the colony growth. Whereas, isolate produced dark black to brown coloured circular flat mycelium with scattered and black coloured acervulus. The colony diameter after 5 days of incubation at 27±2°C was found. Conidia were hyaline, unicellular, fusiform curved with narrow ends. The average dimensions of conidia which possessed large oil globule in the centre, varied between the isolates in dark brown setae with several septations and pointed brown tips.

6) *Colletotrichum acunatum*

Disease sample: - Leaf

Name of disease: - Anthracnose leaf spot

Causal agent: - *Colletotrichum acunatum*

Symptoms of Disease: - Anthracnose affects all above-ground parts during any stage of growth. Seedling infection may be confined to cotyledons. Necrotic gray to brown spots may develop on leaves and stems. Fog and dew are conducive to disease development. Rain disseminates the pathogen's spores and often leads to severe losses, especially if fruit are wounded. These fungi can survive in infected seed and persist in leaf or stem lesions, in plant debris for long periods of time.

Morphology of pathogen: - Colonies are rapid growing, cottony, and gray to black with dark brown to black acervuli. The mycelium is branched, septate cottony thread. The acervuli are irregular in shape and consist of dark setae. Sometimes acervuli are also formed on the leaf. Acervuli are rounded, elongate, separate, superficial, erumpent, with conspicuous multicellular, dark seta, and 80-90 µm in diameter. Conidiophores are hyaline, single-celled, falcate, fusiform, spindle shaped, with acute apices, and measure 17-24 x 2.3-3.8 µm. Setae are brown with a dark swollen base and a pale rounded tip, Conidia single celled.

7) *Cladosporium fulvum* Link.

Disease sample: - Leaf

Name of disease: - Cladosporium leaf spot

Causal agent: - *Cladosporium fulvum*

Symptoms of Disease: - The disease causes characteristic leaf spots. The spots are mostly irregular areas on the leaf. Severely affected leaves drop-off.

Morphology of pathogen: - The colony brown to black. Colonies are pale gray or grayish brown, thinly hairy on natural substrata cottony or loosely felted in culture. Hyphae creeping, conidiophores almost erect branched, and floccose, septate on the surface, often forming a turf, olive coloured conidia globose and ovate usually greenish terminal and then passed to the side. *Cladosporium* is characterized by erect, conidiophores with chains of conidia in tree-like heads. Conidiophores long, upright and branching at apex; conidia variable in shape oval, cylindrical or irregular and produced in chains, saprophytic or pathogenic. The lemon-shaped conidia which has well marked dark attachment scars and show considerable variation in size. The conidiophores are macronematous, straight or slightly flexuous, distinctly nodes, pale or mid-pale brown, smooth, up to 50 µm long or sometimes even longer in culture, 2-6 µm thick, with terminal and intercalary



swellings of 4-6 μm diameter. Conidia arise in terminal, in simple or branched chains. Conidia are cylindrical, rounded at the ends, ellipsoidal, subhyaline or pale olivaceous brown, smooth, 4-20 x 2-4 μm .

8) *Alternaria* sp.

Disease sample: - Leaf

Name of disease: -*Alternaria* leaf spot

Causal agent: - *Alternaria* sp.

Symptoms of Disease: - The disease causes characteristic leaf spots with concentric rings. The spots are mostly irregular and coalesce to cover large areas of the leaf blade. Severely affected leaves drop-off.

Morphology of pathogen: - Colonies usually brown to black; hyphae dark brown, branched. Hyphae are aseptate, 1.1-1.5 μm in diameter. Conidiophores dark, gray, mostly simple, rather longer, needle shaped, typically bearing simple conidia; 20-30 μm thick, 45 – 80 μm long.

9) *Botrytis cinerea* Pers. ex Pers.

Disease sample: - Fruit

Name of disease: - *Botrytis* Fruit Rot (Grey Mold Rot)

Causal agent: - *Botrytis cinerea*

Symptoms of Disease: - Initial infection occurs when fruit are in direct contact with the soil. The fungus also colonizes in dying flowers and fruit through the stem end, growth cracks and wounds. *Botrytis* also infects cold-injured fruit. Soft rot may develop and consume the fruit entirely. Affected areas are gray to olive green, slightly sunken and have distinct margins. The epidermis peels away easily from lesions to reveal softened, watery underlying tissue. Under humid conditions, gray-brown mycelial develop on the surface, and grape-like clusters of spores can be seen with a hand lens.

Morphology of pathogen: - Colony is white to gray or grayish to brown, and spreading for a short distance in agar. The fungus is characterized by stout, brown, branched conidiophores supporting glistening gray heads of pale conidia. Conidiophores slender, long often darkly colored when viewed through, branching irregularly at end; terminal cells enlarged or rounded and bear clusters of conidia, which can be observed under low magnification of compound microscope. Conidiophores are brown, tall, upright, and septate and branched, up to 25 μm wide and 3 μm long. Conidia occur in clusters at the swollen rounded apices and at intervals along with conidiophores on short blunt teeth. Conidia are oval or egg-shaped, often with a slightly projecting point of attachment, colorless to pale brown, and measure 5-15 x 3 – 4 μm . Large, black, irregular sclerotia produced. They are rather flat in appearance and measure 4x3x3 μm . Conidiophores long, slender, hyaline or pigmented, branched, sometimes dichotomous; conidia hyaline or ash-coloured, gray in mass, 1-celled, ovoid; black irregular sclerotia frequently produced; parasitic, causing gray mold of many plants.

10) *Cercospora personata*

Disease sample: - Leaf

Name of disease: - *Cercospora* Leaf Spot (Frogeye)

Causal agent: - *Cercospora personata*

Symptoms of Disease: - This disease affects the leaves, petioles, stems and peduncles of chili. Symptoms first appear as small, circular to oblong chlorotic lesions. Lesions later turn necrotic with a sporulating light-gray center and a dark-brown margin. Concentric rings may be observed as individual lesions expand. These lesions



often resemble frog eyes, giving this disease its common name. As the lesions dry, the centers crack and drop out. When the disease is severe, defoliation and reduction in fruit size occur.

Morphology of pathogen: - Conidiophores dark, simple, arising in clusters and bursting out of leaf tissue, bearing conidia successively on new growing tips; conidia hyaline or dark, filiform, several celled; parasitic on higher plants, commonly causing leaf spot. Conidia hyaline to lightly pigmented, multi-celled with 5 or more septations, one end may be narrower than other; conidiophores produced in clusters. The fungus produces stromata which are globular. Conidiophores in mass are medium dark and slightly olivaceous brown in colour and paler towards the tip. Conidia are sub-hyaline to pale olivaceous. Conidiophores 20-30 µm in diameter and conidia are long septate 25-55 µm in diameter.

IV. REFERENCES

- [1]. Crous P.W., Slippers B, Wingfield M.J., Rheeder J., Marasas FOW, Philips JLA, Alves A, Burgess T., Barber P. and Groenewald JZ (2006). Phylogenetic lineages in the Botryosphaeriaceae. *Studies in Mycology*, 55:235-53.
- [2]. Maninegalai, V., Ambikapathy V. and Panneerselvam A. (2011). Antifungal potentiality of some medicinal plants extracts against *Bipolaris oryzae* (Breda de Haan). *Asia. J. Plant. Sci. Res.*, 1: 77-80.
- [3]. Mayek- Perez N, Lopez-Castaneda C, Gonzalez-Chavira M, Garch-Espinosa R, Acosta-Gallegos J, De la Vega OM and Simpson J (2001). Variability of Mexican isolates of *Macrophomina phaseolina* based on pathogenesis and AFLP genotype. *Physiological and Molecular Plant Pathology*, 59:257-264.
- [4]. Mayek-Perez N., Lopez-Castaneda C. and Acosta-Gallegos J.A. (1997). Variacion en caracteristicas culturales in vitro de aislamientos de *Macrophomina phaseolina* su virulencia en frijol. *Agrociencia*, 31:187-195.
- [5]. Pun K.B., Sabitha D. and V. Valluvaparidasan (1998). Studies on seed-borne nature of *Macrophomina phaseolina* in okra. *Plant Disease Research*, 13:249-290.
- [6]. Su G, Suh SO, Schneider RW and JS Russin (2001). Host specialization in the charcoal rot fungus *Macrophomina phaseolina*. *Phytopathology*.91:120-126.
- [7]. Wangikar, B. P. and Ballal V. N. (1984). A new species of *Hypodermelia* from Maharashtra. *Curr. Sci.*, 53: 1162-1163.

