

---

## A critical study of toxins effect and histopathological investigation on fishes in industrial area

Reetu K. Pandey and Ramdas R. Kamdi

Shri Jagdish Prasad Jhabarmal Tibrewala University,

Vidyanagari Jhunjhunu, Rajasthan-333001

**Abstract :** India is the third largest producer of fish and second largest producer of fresh water fish in the world. Fisheries play a vital role in employment creation, livelihood security and food security. The increase in the water pollution is due to city sewage and industrial waste discharged into the river and lakes. This industrial waste increases the amount of the toxins chemical in fresh water. Due to this industrial hazardous waste including toxic chemicals into the environment the water pollution imposes this adverse effect on all kinds of aquatic flora and fauna. Fishes are mainly affected from this human nuisance and from this industrial pollution the heavy metals affect in histopathological changes in the fishes resulting them to die and also due to pollution of water from pesticides adjoining the cultivation fields. Oil spills from industrial sources runoff into the water sources which coat the skin of fish and kill them. Oil provides a source of toxins for fish that can cause disease, genetic defects/alterations and death. The average fish catch was between 1.7 and 2.2 tons per day in Butibori region and predominant fish species are *Labeo rohita* (Rohu) and *Catla catla* (Catla). The adverse effect of the toxins on the different organs of the fish specifically the liver and gills of fish are adverse affected by the presence of these toxins.

**Keywords :** Industrial pollution, Heavy metals, *Labeo rohita*(Rohu), *Catla catla* (Catla)

**INTRODUCTION :** Reservoirs are used for various purposes, specifically water supply, flood protection, recreation, power generation, fish industry, water transportation etc. Today there are about 50000 dams in the world whose height exceeds 15 meters. These dams can retain more than 6.5 trillion m<sup>3</sup> of water that constitutes approx 15% of annual global river flow. Lakes are dynamic ecosystems that change over time in response to hydrological and biological processes, and human interventions. Lakes are complex ecological systems which interact with their drainage basins collecting from water, nutrients and organic matter and support large biological diversities besides supporting the human and their activities.

Water pollution has many sources. The most polluting of them are the city sewage and industrial waste discharged into the rivers and lakes. The types of industrial waste generated include cafeteria garbage, dirt and gravel, masonry and concrete, scrap metals, trash, oil, solvents, chemicals, weed grass and trees, wood and scrap lumber and similar wastes. The effects of water pollution are not only devastating to people but also to animals, fishes and birds. Water pollution imposes this adverse effect on all kinds of aquatic flora and fauna. Fishes are mainly affected from the human nuisance. This water pollution includes immune suppression, reduced metabolism, and damage to gills and epithelia. Pollution related diseases include epidermal papilloma, fin/tail rot, gill disease, liver damage, hyperplasia and ulceration. Many surveys have indicated a greater proportion of diseased fish and also Histopathological changes in polluted water fish compared to non polluted water fish.

**Material and Methods :** This paper presents the information pertaining to methodology applied in the present study.

1. The water samples were collected aseptically and were processed by following standard methods

of water and waste water analysis (APHA-AWWA).

2. The sample of Infected fishes is *Labeo rohita* and *Catla catla* were collected in a bag and it was tied carefully while transportation.
3. After carrying the bag, proper precaution to wash the fish with mercury chloride to avoid the contamination of the fish. The diseased part was carefully removed which was affected by the toxins.
4. After this the researcher took the fish into the laboratory for further observation and the histopathology investigation.
5. Histopathology studies were carried out as per standard method

Study area- Site Description For this research work, survey of water bodies in Butibori region was done. Butibori region has largest number of industries. During survey many sample of fish mortality and diseases both were recorded which were affected by the toxins. Histopathological Investigation. On the basis of the study result it is concluded that there is significant adverse effect of the toxins on the different organs of the fish. Specifically, the liver and the gills of the fish are adversely affected by the presence of these toxins.

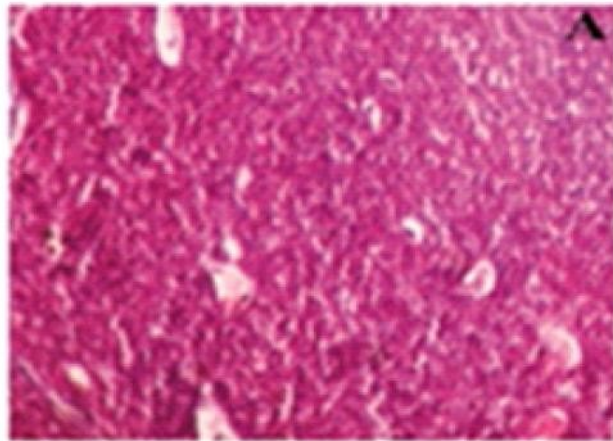


Fig. 4.39A: Normal Liver of the fish *Labeo rohita*

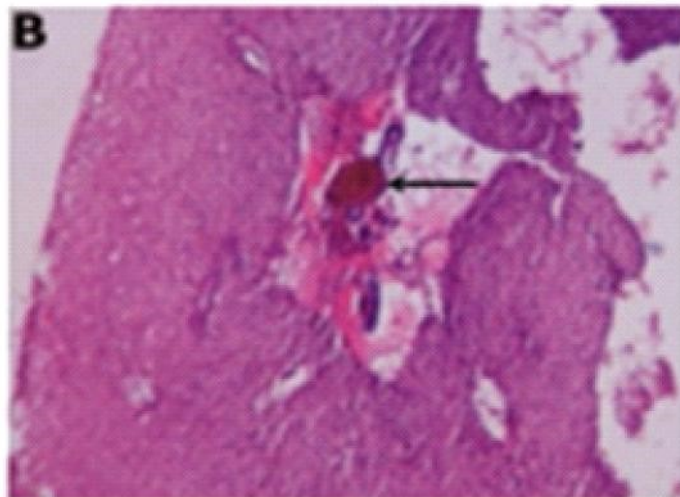


Fig. 4.39B: Liver of fish *Labeo rohita* showing area of hemorrhage

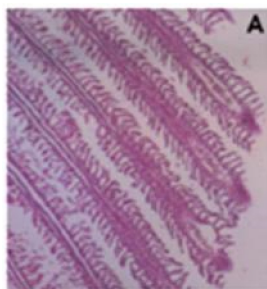


Fig. 4.40A: Gills of the fish *Labeo rohita* showing normal gill filaments

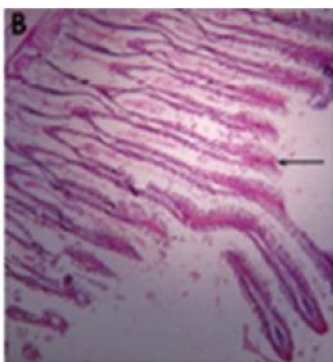


Fig. 4.40B: Gills of the fish *Labeo rohita* showing widening of gill filaments

**Conclusion and Suggestions :-** Water is a vital to man's existence. Early human civilizations centered on springs and streams. Many civilizations that flourished after developing reliable water supply collapsed when the supply was exhausted or its quality deteriorated hence the water quality and the robustness of the aquatic ecosystems play an important role in the sustainable development of the region. In this study, the physio chemical and fish related data was collected from the study area and subsequent to its statistical analysis.

**References :**

- 1) Collier T.K, Anulacion B.F, Arkoosh M.R, Dietrich J.P., Incardona J.P, Johnson L.L, Ylitalo G.M.& Myers M.S.(2013).Organic Chemical Toxicology of Fishes.4-Effects on Fish of Polycyclic Aromatic Hydrocarbons (PAHS) AND NAPHTHENIC Acid Exposures, Fish Physiology, 33;195-255.
- 2) Dams under Debate, 2006 Stockholm, Formas, Sweden 114PP.
- 3) Dick De Zwart, Leo Posthuma .Organic Chemical Toxicology of Fishes .10-Handling Fish Mixture Exposures in Risk Assessment. Fish Physiology 2013, 33, pp481-524.
- 4) Gilman D. Veith, David L. Defoe, Barbara V. Bergstedt Measuring and Estimating the Bio concentration of chemicals in Fish 2011.
- 5) Grandjean P. & Landrigan P. J. (2006) developmental neurotoxicity of industrial chemicals. The Lancet 368(9553): 2167-2178.
- 6) Segner H. (2011) Chapter 86-Reproductive and Developmental toxicity in fishes. Reproductive and Developmental toxicology, 1145-1166
- 7) Ron Van der Oost, Jonny Beyer, Nico P., E Vermeulen Fish bioaccumulation and biomarkers in environmental risk assessment, a review Environmental Toxicology and Pharmacology 2003, 13(2), pp 57-149.
- 8) Yasamanov N. A. Basics of environmental science 2003 Moscow, Academia, Russia 351 pp.

- 9) Whitfield, A. K. & Harrison, T. D. (2014) Fishers and indicators of Estuarine Health Reference Module in Earth System and Environmental Sciences.
- 10) Viana A. P; Fredou F. L. & Fredou T. (2012) Measuring the ecological integrity of an industrial district in the Amazon estuary, Brazil marine pollution Bulletin 64(3); 489-499.
- 11) T.W Schultz, J. R. Seward. Health –effects related structure toxicity relationships: a paradigm for the first decade of the new millennium science of the total environment 2000, 249(1-3), pp 73-84.
- 12) Julio A., Camargo, Flouride toxicity to aquatic organisms: a review Chemosphere 2003, 50(3) pp 251-264.



## FISH BIODIVERSITY OF SAIKHEDA DAM WETLAND AREA OF LINGTI VILLAGE IN KELAPUR TALUKA, DIST.-YAVATMAL (M.S.), INDIA.

Sumedh K. Waware and R. R. Kamdi

Centre For Higher Learning And Research, Department Of Zoology,  
Sardar Patel Mahavidyalaya, Chandrapur (Maharashtra) India.

Corresponding Author : [kamdi.ramdas@gmail.com](mailto:kamdi.ramdas@gmail.com)

Communicated : 11.12.18

Accepted : 24.01.19

Published: 30.01.19

### ABSTRACT:

The Saikheda dam Wetland area is situated in lingti village Taluka Kelapur of Yavatmal district in Maharashtra. Which is 20 km off Pandharkawada towards south east of Pandharkawada on Pandharkawada Yavatmal road this dam was constructed in 1972 on the river Khuni. This river Khuni originated near Mohada in Ghatanji taluka of Yavatmal district towards West north of the dam with located know. The Study area harbour's varying in shape. & Size, in a rainy season a good habitat to various fish species. To assess the status and distribution of fishes, trips were conducted in the intensive study area. The fishes were classified based on their habitat and their presence was visually observed. A total of 19 fish species in upstream habitat. The status of fish fauna and management of Saikheda dam Wetland ecosystem has been discuss in this paper. Biodiversity is essential for balancing ecosystem and facing varied problems to environment. Globally nature as well as animal diversity are affected due to increase in unwise anthropogenic activities. Aquatic ecosystem is also adversely affected due to release of wastes in it. In the field of Ichthyology there is valuable contribution by many workers. As far as economic importance is concerned, the scope of fish and fisheries in Maharashtra is of prime interest. The current review deals with the freshwater fish recorded and confirmed by various species belonging to 07 orders, 09 families and 15 genera in Maharashtra during 2017 to 2018 and will be useful for fishermen, consumers, fish industry producers and researchers. Saikheda Project and Dam's Official Designation is "Saikheda , D -0 1247" . Saikheda Dam was constructed as part of irrigation projects by Government of Maharashtra in the year 1972. Nearest city to dam is Pandharkawada and the Dam is situated in Kelapur Taluka of Yavatmal District of Maharashtra. It is built on and impounds Khuni River. The dam is an Earth-fill Dam .Purpose of the dam is for irrigation .The length of dam is 1740 m ( 5708.66 Feet ) , while the height of the dam above lowest foundation is 23.77 ( 77.98 Feet ) . Detailed information about project spillway is not available. Project has a Spillway of Other type. Length of the spillway is not known . However measured length of the spillway is approximately 253 m (765 Feet). The Spillway is Ungated..Dam's catchment area is not known. Maximum / Gross storage capacity is 38.511 MCM. Live storage capacity is 27.184 MCM. Now days almost all the water bodies make for good picnic spots. Saikheda lake is also a popular Tourist attraction for its scenic beauty.

**Keywords:** Fish fauna, biodiversity, wetland and ecosystem.

### INTRODUCTION:

Maharashtra is rich in freshwater (rivers, irrigation canals, dams, and lakes) reservoirs and its fish diversity. Therefore, Maharashtra is one of the important states for fish production and natural water resources and there is great scope for developing fisheries in this state. Fish diversity is declining rapidly each day due to unending anthropogenic stress. This diversity is not only the wealth of our world but it also has some serious implications on fishery. Thus there is an urgent need for proper investigation and documentation of this fish diversity in order to develop a fresh water fish diversity information system having both bioinformatics and georeferenced databases of fish and fish habitat. In the present review documentation of the fish fauna of fresh water

reservoirs in the Maharashtra state for 2017 to 2018 is done.

Wetland ecosystem play a vital role in distribution of flora for aquatic, semi-aquatic and submerged floral association. The study of changed ecosystem is important for future planning which will help in conservation of natural flora, fauna and ecosystem for its future use and management when a natural ecosystem is destroyed obviously stability of system is also reduced. In Saikhada Wetland area large extent of tree were felled in catchment of this area is customarg to dress up the bare area contor trenched and afforested to pervert the reserivior from silting up the flora on dam stream bank and afforestation on command areas of Wetland help in conservation of natural habitats.

ASSOCIATION STUDIES AMONG THE YIELD AND YIELD CONTRIBUTING TRAITS IN  
GROUNDNUT (*ARACHIS HYPOGAEAL.*)

K. N. Uikey, S. R. Kamdi, J. M. Parbat, V. M. Chandrikapure, N. A. Mohurle, R. R. Kamdi and V.  
S. Jayade

College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M. S.)

ABSTRACT

Thirty-eight local collections of groundnut collected from Gadchiroli district along with two checks namely TAG-24 and Kopergaon - 3 were evaluated in RBD with three replications. The results on correlation studies showed that dry pod yield plant<sup>-1</sup> was significant and positively correlated with number of mature pods plant<sup>-1</sup> at both genotypic and phenotypic levels. Whereas, genotypic positive significant correlation of dry pod yield plant<sup>-1</sup> was observed with number of primary branches plant<sup>-1</sup> and mature kernels per cent. The partitioning of positive genotypic correlation of dry pod yield plant<sup>-1</sup> with different traits into direct and indirect effects revealed that days to 50 per cent flowering (1.014) contributed highest positive direct effect to dry pod yield plant<sup>-1</sup> followed by hundred kernel weight (0.664), number mature pods plant<sup>-1</sup> (0.606), mature kernel per cent (0.395), plant height (0.254), oil content (0.108) and number of immature pods plant<sup>-1</sup> (0.001). The major contributors to the indirect effect were number of mature pod plant<sup>-1</sup> and mature kernel per cent. These two characters have also contributed maximum direct effect towards dry pod yield plant<sup>-1</sup>. The correlation and path coefficient analysis revealed importance of number of mature pods plant<sup>-1</sup> and mature kernels per cent as the promising characters to increase dry pod yield plant<sup>-1</sup> both directly and indirectly.

**Key word:** Groundnut, Valencia, correlation and path analysis

Introduction

Present investigation was undertaken to estimate correlation coefficients among selected character of ground nut (*Arachis hypogaea* L.) and their direct and indirect effects on yield of groundnut.

Material and Methods

Thirty eight *Valencia* botanical types of groundnut were collected from farmers of Gadchiroli District of Maharashtra state and two checks (TAG-24 and Kopergaon-3) were evaluated in Randomized Block Design with three replications at experimental field of Agricultural Botany, College of Agriculture, Nagpur during 2015. The unit size of plot was one row of 5 m length, while, row to row and

plant to plant spacings were maintained at 30 cm and 10 cm respectively. Observations were recorded on the 14 characters (Table 1) on five randomly selected plants. The data were subjected to correlation and path coefficient analysis suggested by Sharma (1998) while path co-efficient analysis by Wright (1921) and Dewey and Lu (1959). Standard path co-efficient was determined as described by Goulden (1959).

Results and Discussion

During present investigation genotypic correlation coefficients were higher than phenotypic correlation coefficients for most of the characters. The difference between genotypic and phenotypic correlation, for each pair of trait studied,

## A critical study of toxins effect and histopathological investigation on fishes in industrial area

Reetu K. Pandey and Ramdas R. Kamdi

Shri Jagdish Prasad Jhabarmal Tibrewala University,

Vidyanagari Jhunjhunu, Rajasthan-333001

**Abstract :** India is the third largest producer of fish and second largest producer of fresh water fish in the world. Fisheries play a vital role in employment creation, livelihood security and food security. The increase in the water pollution is due to city sewage and industrial waste discharged into the river and lakes. This industrial waste increases the amount of the toxins chemical in fresh water. Due to this industrial hazardous waste including toxic chemicals into the environment the water pollution imposes this adverse effect on all kinds of aquatic flora and fauna. Fishes are mainly affected from this human nuisance and from this industrial pollution the heavy metals affect in histopathological changes in the fishes resulting them to die and also due to pollution of water from pesticides adjoining the cultivation fields. Oil spills from industrial sources runoff into the water sources which coat the skin of fish and kill them. Oil provides a source of toxins for fish that can cause disease, genetic defects/alterations and death. The average fish catch was between 1.7 and 2.2 tons per day in Butibori region and predominant fish species are *Labeo rohita* (Rohu) and *Catla catla* (Catla). The adverse effect of the toxins on the different organs of the fish specifically the liver and gills of fish are adverse affected by the presence of these toxins.

**Keywords :** Industrial pollution, Heavy metals, *Labeo rohita*(Rohu), *Catla catla* (Catla)

**INTRODUCTION :** Reservoirs are used for various purposes, specifically water supply, flood protection, recreation, power generation, fish industry, water transportation etc. Today there are about 50000 dams in the world whose height exceeds 15 meters. These dams can retain more than 6.5 trillion m<sup>3</sup> of water that constitutes approx 15% of annual global river flow. Lakes are dynamic ecosystems that change over time in response to hydrological and biological processes, and human interventions. Lakes are complex ecological systems which interact with their drainage basins collecting from water, nutrients and organic matter and support large biological diversities besides supporting the human and their activities.

Water pollution has many sources. The most polluting of them are the city sewage and industrial waste discharged into the rivers and lakes. The types of industrial waste generated include cafeteria garbage, dirt and gravel, masonry and concrete, scrap metals, trash, oil, solvents, chemicals, weed grass and trees, wood and scrap lumber and similar wastes. The effects of water pollution are not only devastating to people but also to animals, fishes and birds. Water pollution imposes this adverse effect on all kinds of aquatic flora and fauna. Fishes are mainly affected from the human nuisance. This water pollution includes immune suppression, reduced metabolism, and damage to gills and epithelia. Pollution related diseases include epidermal papilloma, fin/tail rot, gill disease, liver damage, hyperplasia and ulceration. Many surveys have indicated a greater proportion of diseased fish and also Histopathological changes in polluted water fish compared to non polluted water fish.

**Material and Methods :** This paper presents the information pertaining to methodology applied in the present study.

1. The water samples were collected aseptically and were processed by following standard methods



## SEA FOOD PROCESSING BY USING A BIOTECHNOLOGICAL METHOD

**Reetu K. Pandey and Ramdas R. Kamdi**

Anand Niketan College Anandawan Warora

### Abstract

Amongst all the environmental fresh water, biological communities have been essential for supporting life on the earth. People depend on fresh water for commercial and domestic usage. Which incorporate drinking water, agribusiness, transportation, and vitality generation, mechanical, procedures, waste transfer and fisheries. Fisheries business development promises good future. Increase the growth of the fisheries or sea food development with the help of biotechnological tread. The bio-technological process for commercial exploitation of living organisms use this fish food processing by using bio-technology techniques we give to support the economic development of the people.

**Keywords:** Fish silage, Fish protein, Bio-technology method, biological communities etc.

### Introduction:

Application of biotechnology to fish processing and product development holds a good promise future. Application of biotechnology in fish processing and product development amounts to judicious use of hydrolytic enzymes – “fish proteases” either endogenous or derived from micro organism to get the desired selective degradation of peptide bonds in protein molecules. Biotechnology is the commercial exploitation of living organisms or their components E.g. Enzymes.

Application of fish proteases in sea food industry:

#### Fish protein hydrolysate:

Fish protein hydrolysate is produced by transformation of inexpensive pelagic fish and fish processing wastes to a protein concentrate which can be use in food and other application rather than a lower value animal feed. Fish hydrolysate can be produced from fish protein by process employing proteolytic enzymes of vegetable of microbial origin. Proteinase treatment of fish protein to break down the protein into smaller sized peptides. By controlling the condition of the process, end products of desired properties can be obtained.

The commercial interest in hydrolysate is centered on its use in milk replacer. By using fish protein to replace the milk protein in animal feeds, it is possible to produce a cheaper feed for young calves, lambs and baby pigs. The bitter taste of fish hydrolysate limited its use for human consumption.

#### Fish silage:

Fish silage may be described as a liquid product made from fish or parts of fish and acid. Liquefaction is caused by the action of enzymes naturally present in the fish and is accelerated by the acid, which creates the right condition for the enzymes to break down the tissues and limit the growth of spoilage bacteria. Organic acids are mostly used for silage production from fish.

In the beginning, silage production only made use of inorganic acid such hydrochloric acid and sulfuric acid. Although these acid. Ware relatively in expensive, they were not convenient because their preservative action first come into effect when the pH value is down to about 2. The feed stuff, to be had de-acidified before it was fed to the animals. The preservation effect of many organic acids such as formic acid becomes active at higher pH level (pH 4). In recent years formic acid has therefore increasingly being used in silage production.

The rate of liquefaction is temperature dependant. Digestive proteases from fish have maximal activity at 45 to 50°C. It has being demonstrated that silage can be stored at least 1.5-2 years but it is necessary to add antioxidants to prevent oxidation off the fat.

Use of acid can be avoided by producing lactic acid biotechnologically by adding sugar or molasses along with lactobacilli to fish or fish waste. Lactobacilli convert sugar into lactic acid which preserves the fish and creates favorable conditions for the silage. In addition to acid, some type of lactobacilli produces other substances (antibiotic) which increase their preservation effect. The bacilli are also considered to prevent oxidation of fats. Silage produced by lactobacilli has not yet reached production. Bio-fermented silage show better growth in chicken and prawns than the feed made from acidic silage produce in the conventional manner.

#### Biotechnological method:

The desire to produce Chitin with more consistent physico-chemical properties necessary the use of milder treatments for removing some of components associated with shell, such as proteins. Various proteolytic examples-(Chymotrypsin, papine and bacterial protease) of the three proteases tested, chymotrypsin was found to most effective, achieving a degree of deproteinization comparable with the chemical approach using





## Studies On Fish Biodiversity Of Nawargaon Lake In Maregaon Taluka, District Yavatmal, (M.S.) India

Sumedh K. Waware and R. R. Kamdi

Sardar Patel Mahavidyalaya, Chandrapur Center for Higher Learning and Research

### Abstract

The fishes are one of the most important vertebrate, provided rich protein sources for human and several animals and important elements in the economy of many countries. Fish diversity of Nawargaon Lake essentially represents the fish faunal diversity. Nawargaon Lake conserve a rich variety of fish species which supports the commercial fisheries in Maregaon Taluka, District Yavatmal. Keeping in the view, the diversity of fish fauna of the Nawargaon Lake in Maregaon Taluka in Yavatmal District, Maharashtra, Central India has been studied from the period Feb.2016 to March.2017. The aim of the study was to explore the fish fauna of Nawargaon Lake. In the course of investigation, four sampling spots were selected viz., SPOT-A, SPOT-B, SPOT-C and SPOT-D of Nawargaon Lake. The fish diversity is a good indicator of health of aquatic ecosystem. A good piscine diversity represents the balanced ecosystem. Taking this into consideration the fish diversity of Nawargaon Lake is studied during present investigation. The Nawargaon Lake is huge and spread over area about 2740m and catchment area is 9.663 thousand hectares.

### Introduction:

India is one of the mega biodiversity countries in the world and occupies the ninth position in terms of freshwater mega biodiversity (Mittermeier et al., 1997). In India there are 2,500 species of fishes of which 930 live in freshwater and 1,570 are marine (Kar et al., 2003). Day (1994) described 1418 species of fish under 342 genera from British India. Jayaram (1981) listed 742 freshwater species of fishes coming under 233 genera, 64 families and 16 orders from the Indian region. Talwar (1991) estimated 2546 species of fish belonging to 969 genera, 254 families and 40 orders from India. Recently, Jayaram (1999) grouped and estimates 852 species of fishes belonging to 71 families and 16 orders from the Indian region.

The state of Maharashtra is one of the important aquatic biodiversity hotspots of the country, having bestowed with a large number of water bodies both lotic and lentic, the state boasts of a rich fish biodiversity. The richness of fish species has attracted the attention of eminent researchers and state has a good contribution in enriching the data bank on the aquatic biodiversity of the nation. Some of the earliest studies on the aquatic biodiversity of the state were carried out by Hora and Nair (1941). Hora (1949) reported 42 species of fishes in Rihand River of state. Motwani and David (1957) reported 95 species of fishes belonging to 20 families from the some drainage. Dubey and Mehra (1962) recorded 70 fish species in River Chambal. Vyas et al., (2010) recently studied the aquatic biodiversity of ponds and Rivers of Madhya Pradesh and reported the presence of 86 fish species in different River basin of Madhya Pradesh.

Nawargaon Lake is by far the most significant water resources of the state of Maharashtra. The Nawargaon Lake is the most important ecological hub for aquatic biodiversity in Yavatmal District and has therefore been the epicenter of the biodiversity studies.

There is practically not much information available in the literature regarding the recent fish fauna of the Nawargaon Lake in Maregaon Taluka, District Yavatmal in Maharashtra State, India. Further no attempt seems to have been made so far to study the fish diversity of this Nawargaon Lake. Fish sampling was conducted at four selected locations in the Nawargaon Lake namely SPOT-A, SPOT-B, SPOT-C and SPOT-D respectively. The Nawargaon Lake is the lifeline of the people resides in nearby villages mostly for various domestic activities. Fishing for livelihood and food is a common practice of the local community. The fish diversity of the Nawargaon Lake is still unexplored and not documented.

### Material and Methods:

**Sampling and Analysis:** - 1. Physico-chemical Analysis: During the study, water samples were collected at seasonal interval during Feb.2016 to March 2017, using clean 1L-polyethylene bottle for analysis of water variables in the laboratory from pre-selected spots of the Nawargaon Lake. The water quality parameters such as air and water temperature, Ph, Secchi Disc transparency, alkalinity (carbonate and bicarbonate) and dissolved oxygen were measured on in the field itself. The air and water temperature was recorded through digital equipment and dissolved oxygen was analyzed used Modified Winkles Method. The methodology adopted for the analysis of physico-chemical



## Identification of Phenotypically Stable Lathyrus Genotypes over Years

S. R. Kamdi<sup>1</sup>, Shanti Patil<sup>2</sup>, R. D. Deotale<sup>3</sup>, V. B. Kalamkar<sup>4</sup>, R. R. Kamdi<sup>5</sup>, A. V. Thul<sup>6</sup> and V. S. Madke<sup>7</sup>

College of Agriculture, Nagpur, Dr. PDKV, Akola (MH)  
 sandeepkamdi@gmail.com,

### Abstract

For assessment of Genotypes x Environmental interaction, six grass pea local collections viz., CAGL- 19, CAGL- 93, CAGL- 86, CAGL- 43, CAGL- 94, CAGL- 62 along with three checks viz., Ratan, Prateek and Mahateora were evaluated in randomised block design with three replications over three years 2013-2014, 2014-2015 and 2015-16 in College of Agriculture, Gadchiroli, for number of pods plant<sup>-1</sup> and yield plot<sup>-1</sup> (g) using Eberhart and Russell Model (1966). Significant differences were observed among the genotypes under all the environments. Mean sum of squares due to environment (linear) and genotype - environment interaction were highly significant. Based on high mean, b=1 and minimum S<sup>2</sup>di value, genotype CAGL-94 was identified as stable genotype for both number of pods plant<sup>-1</sup> and yield plot<sup>-1</sup> (g) Therefore, this genotype could be suitable for cultivation in Vidarbha (Maharashtra) over the years

**Key words:** Grass pea, *Lathyrus sativus* L., stability analysis, G x E interaction

### INTRODUCTION

Grasspea is valued for its high protein content, high degree of adaptability under extreme conditions, disease resistance and low input requirement for its cultivation. In India the crop is largely grown in Madhya Pradesh, Maharashtra, West Bengal and Bihar and many instances of a 'crippling disorder' have been reported in these states. In the state of Himachal Pradesh, grasspea is a minor crop grown by marginal farmers as a rainfed crop in mid hill region conditions of the northwestern Himalayas. The climate of this region is sub humid and temperate wet, characterized by dry conditions at the time of sowing and terminal drought. Cultivation of grasspea has not been completely abandoned and the marginal farmers continue to grow it on a small scale for domestic consumption and as a forage crop. Grass pea (*Lathyrus sativus* L.) is mainly grown as *utera* crop after paddy in Rabi season on residual moisture in Eastern Vidarbha region on approximately 60,000 ha area. But, the yield potential of Vidarbha is nearly half as compared to India. Because most farmer use local varieties for cultivation which have low yield potential, poor plant type and high neurotoxin content this is unstable over environment. So, there is urgent need to develop varieties having high yield potential, tolerance to drought, low neurotoxin content and stable over environment. The genotype which can precisely maintain consistent yield performance over a wide range of climate and fluctuating environment is said to be stable genotype. The stability of genotype has always been a matter of great concern to plant breeders. Keeping these things in view, present study was conducted to

identify potential genotypes having stable performance over years in lathyrus.

### MATERIALS AND METHODS

Six grass pea local collections viz., CAGL- 19, CAGL- 93, CAGL- 86, CAGL- 43, CAGL- 94, CAGL- 62 and three checks viz., Ratan, Prateek and Mahateora were evaluated in randomised block design with three replications during three years i.e. 2013-14, 2014-15 and 2015-16 at College of Agriculture, Gadchiroli, for number of pods plant<sup>-1</sup> and yield plot<sup>-1</sup> (g). Every genotype was sown with 4 rows of 5 m length with a plot size of 5.00 x 1.20. The row to row and plant to plant spacing was maintained as 30 cm and 10 cm respectively. Recommended package of practices were followed to raise a healthy and disease free crop. Observation on five randomly selected plants for number of pods plant<sup>-1</sup> and yield plot<sup>-1</sup> (g) were recorded. The data were analysed for stability using Eberhart and Russell (1966) model.

### RESULTS AND DISCUSSION

Year-wise analysis of variance revealed significant differences among the genotypes under each environment for both the characters i.e. number of pods plant<sup>-1</sup> and yield plot<sup>-1</sup> (g) (Table 1). The pooled analysis of variance also revealed significant differences among genotypes for both the characters (Table 2) indicating that environments were differently exerted influence on different genotypes in their expression of characters. The Variety x Environments interaction was also significant indicating all the genotypes were effectively interacted against environments. The existence of G x E interaction for yield has also been reported by Kamaluddin and Ahmad (2012) in soybean and Kumari (2001) in lathyrus.



## Preliminary Study of Some Physico-Chemical Parameters In Labhansarad Dam In Warora Taluka of Chandrapur District, Maharashtra State, India

<sup>1</sup>Khiradkar Sandeep S., <sup>2</sup>Kamdi Ramdas R. and <sup>3</sup>Ingale Prashant P. <sup>4</sup>Gorghate N.D.

<sup>1</sup>S. P. College Chandrapur, <sup>2</sup>Anand Niketan College Anandawan Warora, <sup>3</sup>Shivaji Science College Congress Nagar Nagpur. <sup>4</sup>M.B. Patel College Sadak Arjuni Gondia.

### Abstract:

The habitats of freshwater such as reservoirs, dam, lakes, ponds and tanks hold almighty assurance as dominantly source of drinking water and irrigation. The today's need of mankind is the lively ecological status of freshwater bodies. Parameters like Temperature, pH, conductivity, dissolved oxygen were analyzed to find out the physico-chemical nature of the dam water in Labhansarad dam. The above parameters monthly noted and calculations showing monthly values in the table and graphs.

**Keywords:** Almighty, ecological, Labhasard dam.

### Introduction

The fresh water resources distributions is unequal throughout the global and the fresh water facilitation is becoming bogged day by day in consideration of population augmentation and sundry human activities. In the absence of fresh water resources, groundwater is exploited to meet the demand exerted by various sectors. The variation in the quality of wetland water in response to local geologic syntax and anthropogenic factors vindicate the evaluation of the quality of groundwater for any purposes including that for human consumption (Annapoorna H., and Janardhanab M.R., 2015). The advantage of economic and environmental that are achieved from the water (Picini and Harper, 2016). The physico-chemical and biological status in limnological point of view with respect to elevation of area, fisheries, agriculture and regular domestic uses of water (Ingale, 2016). The increasing anthropogenic activities in the contiguous catchment caused increased inflow of unprocessed sewage and solid wastes to the lake. It also indicates that the oligotrophic water bodies are slowly changing as mesotrophic and in future may be change as eutrophic (Shiddamallayya and Pratima 2008) hence we all have to word of honor for responsibility consequently.

### Materials and Methods:

Labhansarad dam located in Warora Taluka of Chandrapur District, Maharashtra State, India. It is situated in the remote area from the localities. Town Kotha at West direction 1 kilometer, at the north 1.5 Km Mahalgaon, town Sumthana 1.5km towards the East- South direction and town Lonar 1.5km towards South direction from the location of Labhansarad dam. The study carried out for the Six month during February 2016 to July 2016 for analysis the some

physico-chemical parameters such as, temperature, conductivity, total dissolved solid, turbidity, pH, dissolved oxygen will be performed at the site using portable water analysis kit using methods prescribed by APHA (1985) and NEERI (1986).

### Results and Discussion:

#### Temperature:

Water temperature is the most important physico-chemical factor for the hydrobiological studies point of view. In the months of May, maximum atmospheric temperature and moderate pollutants in dam water is due to low quantity of water may be responsible for increasing in the values of temperature at Station -B. In the month of February minimum atmospheric temperature and high level of dam water might be responsible for minimum value of the water temperature at stations D, C, A, and E respectively. The similar line investigations reported by Sharma and Walia (2014).

#### Conductivity:

It depend upon the ionic status of water. Ionic status of water determines the conductivity of water. The maximum value of conductivity recorded in the month of July might be due to inflow carries surface runoff from agricultural area of the dam at station- B, containing decaying organic matter, and may be due to the higher total dissolved solids. While minimum in the month of February may be due to expression of low ionic substance and decreased in total dissolved solid range responsible for decreasing the value conductivity at station - E. Same argument had also support to our findings recorded by Ajayan and Naik (2014) Ingale *et al.*, (2015).

#### Total dissolved solid:

Total dissolved solids are resolute as the residue remains left after evaporation of filtered sample. The maximum TDS observed in the month of July



## Current status of physico-chemical characteristics and biological factors of Nawargaon Lake in Maregaon Taluka, District-Yavatmal (M.S.) India

Sumedh K. Waware and R. R. Kamdi

<sup>1</sup>Center For Higher Learning & Research, Department of Zoology, Sardar Patel Mahavidyalay Ganjward Chandrapur, Maharashtra, India.

<sup>2</sup> Anand Niketan College, Anandwan, Warora, Dist. Chandrapur

### ABSTRACT

Nawargaon Lake was constructed as part of irrigation projects by Government of Maharashtra in the year 1997. Nearest city to Lake is Maregaon and the Lake is situated in Maregaon Taluka of Yavatmal District of Maharashtra in India. It is built on and impounds Nirguda River. In the present study an attempt has been made on physico-chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Nawargaon in Maregaon Taluka District Yavatmal Of Maharashtra. The study was conducted during Feb. 2016 to Jan. 2017. The samples were analyzed at monthly intervals for a period of one year. Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Nawargaon Lake has greatest importance for humankind. The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD, BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food.

### Introduction

Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran et al., 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. The physico-chemical as well as the biological factor of lake have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produce in it. The physical factors are water temperature, water current and turbidity of water, whereas the chemical parameter of lake comprise pH, dissolved oxygen, total alkalinity and total hardness of water. The biological factors considered were macro-zoo benthos and plankton of the lake. The seasonal changes in different physico-chemical parameters are responsible for annual variation and growth of biological factors viz., macro-zoo benthos and plankton etc.

Tepe et al., (2005) found that the water quality attributes such as water temperature, light penetration, dissolved oxygen, total alkalinity and total hardness are the representative of the seasonal fluctuation. Ali et al., (2006) showed that the water quality of fresh water ecosystem undergoes complex changes due to all physico-chemical factors and water quality as a sequence disrupting the aquatic life. Hayat et al., (1996) and Jena et al., (1998) revealed that temperature and ecological conditions are responsible for the

fluctuation of salt contents, which in turn influence the production, and growth of fish.

### Materials and Methods

The sampling was carried out in Nawargaon lake at five different sites (Latitude: 20.0763283N and Longitude: 78.7675095E), monthly between Feb. 2016 to Jan. 2017 for one year. About 12 water sample were collected in each months. The physico-chemical factors are water temperature, water current, turbidity of water pH, dissolved oxygen, total alkalinity and total hardness of water, whereas biological factors were macro-zoo benthos and plankton of the lake. Study of physico-chemical factors was carried out by using standard methods (APHA, 1998). For the qualitative estimation safe water quality standards were use (Boyd and Tucker, 1998; Ali et al., 2000). Macro-zoo benthos collected from 1 m<sup>2</sup> area of lake at the depth of 15cm. The plankton was sampled at each spot by filtering 100 liters of water. Preservation was made on the spot in 4% formalin. The quantitative analysis of plankton was made with the help of Sedgwick-Rafter counting slide as suggested by Welch (1952).

### Result and Discussion

#### Water temperature

The average water temperature of lake was found to be varying from 14.12°C to 21.58°C during Feb to August respectively. Thus, water of Nawargaon lake is coldest in winter and hottest in monsoon. (Table- 1)



## REDUCING ENVIRONMENTAL POLLUTION BY BIOCONVERSION OF HUGE QUANTITY OF ORGANIC WASTES INTO MUSHROOMS – AN ENVIRONMENTAL IMPACT

<sup>1</sup>Bhandari P.R., <sup>2</sup>Wadhai V.S. and Kamdi R.R.

<sup>1</sup>Sevadal Mahila Mahavidyalaya, Nagpur (M.S) India

<sup>2</sup>Sardar Patel Mahavidyalaya, Chandrapur (M.S) India

<sup>3</sup>Anand Niketan College, Warora (M.S) India

Email: prbhandari02@gmail.com

**Abstract:** Mushroom cultivation technology is friendly to the environment. The production of edible and medicinal mushrooms utilising, for example, paddy straw, cotton wastes, water hyacinth, tree saw dust, and various categories of refuse and lignocelluloses wastes, could readily be adopted in Indian communities in sophisticated, but low technology approaches. The spent substrate left after harvesting the mushrooms, which is entangled with innumerable mushroom threads (collectively referred to as mycelia) will have been biochemically modified by the mushroom enzymes into a simpler and more readily digestible form, which is thus more palatable to livestock, when used as a livestock feed supplement. It has been revealed recently that mushroom mycelia can play a significant role in the restoration of damaged environments. Saprotrophic, endophytic, mycorrhizal, and even parasitic fungi/mushrooms can be used in mycorestoration, which can be performed in four different ways: mycofiltration (using mycelia to filter water), mycoforestry (using mycelia to restore forests), mycoremediation (using mycelia to eliminate toxic waste), and mycopesticides (using mycelia to control insect pests). These methods represent the potential to create a clean ecosystem, where no damage will be left after fungal implementation.

**Keywords:** Mushroom, Solid Lignocellulose waste, Environmental pollution

### Introduction:

Reducing Environmental Pollution by bioconversion of huge quantities of organic Wastes into Mushrooms. Organic solid wastes are a kind of biomass, which are generated annually through the activities of the agricultural, forest and food processing industries. They consist mainly of three components cellulose, hemicelluloses and lignin (Beelman R. B. and D. J. Royse. 2006). The general term for these organic wastes is lignocelluloses. It is common knowledge that lignocelluloses wastes are available in abundance both in the rural and urban areas. They have insignificant or less commercial value and certainly no food value, at least in their original form. When carelessly disposed of in the surrounding environment by dumping or burning, these wastes are bound to lead to environmental pollution and consequently health hazards. It should be recognised that the wastes are resources out of place and their proper management and utilization would lead to

further economic growth as well (Beelman R. B. and D. J. Royse. 2006).

### Materials and Method:

Huge quantities of lignocellulosic and other organic waste residues are generated annually through the activities of agricultural, forest and food processing industries. In 1999, more than 3,000 million tons of paddy straws were available in the urban area, and about half of these residues remain unused. In addition, cottonseed straw, tons of paddy straw and soya bean straw. Million tons of sawdust, and wood chips are also available. All these lignocelluloses waste residues can be collected and used as substrate growing mushrooms. Otherwise, would cause health hazards due to burning. The fungal organism *Pleurotus sajor-caju* and *Pleurotus florida* are also known as Grey Oyster Mushroom or Indian Mushroom, are well acquainted with temperature and moisture of these atmosphere through year except



भारतीय शिक्षण संस्था, नवरगाव संचालित  
श्री ज्ञानेश महाविद्यालय, नवरगाव, जि. चंद्रपूर

विद्यापीठ अनुदान आयोग पुरस्कृत

दोन दिवसीय राष्ट्रीय चर्चासत्र

दिनांक २२ व २३ डिसेंबर २०१७

आयोजक : मराठी विभाग

“अभिरुची व बदलता वाचकवर्ग”



ज्ञान - विज्ञानं विमुक्तये

**प्रमाणपत्र**

श्री/श्रीमती प्रा. मोक्षदा मनोहर नाईक

आपण या चर्चासत्रामध्ये प्रमुख पाहुणे/अध्यक्ष/निबंधवाचक/सहभागी प्रतिनिधी/सुत्रसंचालक म्हणून सक्रिय

सहभाग घेतला. आपले योगदान महत्वपूर्ण होते. त्याबद्दल प्रमाणपत्र प्रदान करण्यात येत आहे.

चर्चासत्र समन्वयक

प्रा. गजानन कोर्तलवार

मराठी विभागप्रमुख

श्री ज्ञानेश महाविद्यालय, नवरगाव

श्री. जयंत बोरकर

अध्यक्ष

भारतीय शिक्षण संस्था

प्राचार्य

डॉ. सुरेश बाकरे

श्री ज्ञानेश महाविद्यालय, नवरगाव



## वाचन एक चिंतन

प्रा. मोक्षदा मनोहर (साईक)  
मराठी विभाग  
आनंद निकेतन महाविद्यालय,  
आनंदवन वरोरा

Ph & Email: 9423116421@gmail.com

वाचन आहे प्रवास सुंदर, नव्या नव्या ज्ञानाचा  
इतिहासाचा, साहित्याचा आणिक विज्ञानाचा  
नव्या जगाचे नव्या युगाचे प्रकाश गाणे गाती  
ग्रंथ उजळती अज्ञानाच्या, अंधाराच्या राती

आयुष्य सुंदर आणि समृद्ध करण्यासाठी ज्या काही गोष्टीची गरज असते त्यातील एक महत्वाची गोष्ट म्हणजे वाचन. साहित्याच्या वाचनामुळे आपल्या ज्ञानाच्या कक्षा तर विस्तारात जातातच पण या वाचनातून आपल्या जगण्याला एक आधार मिळत असतो. पुस्तके ही मित्राची भुमिका बजावत असतात. आपण एकटे असतांना निखळ आनंद देणारे, हसवणारे विनोदी साहित्य, ऐतिहासिक कादंबऱ्या वाचताना त्या भाव विश्वात घेऊन जाणारे साहित्य, मराठी वाचकांच्या आस्थेचा विषय असणारे संतसाहित्य, स्त्री स्वातंत्र्याची वाटचाल दाखवणारे स्त्रीवादी साहित्य, चालते-बोलते कथानक तुमच्यापुढे जिवंत करणारे नाटक, कथेच्या रूपाने तुमच्या हृदयाला स्पर्श करणारे कथा विश्व, बालसाहित्याच्या रूपाने बालकांचे विश्व उलगडणारे, त्यांना रमविणारे बालसाहित्य, विज्ञानयुगात फेरफटका मारणारे विज्ञानवादी साहित्य पण त्यासोबतच व्यक्तिस्वातंत्र्याचा जाहिरनामा प्रगट करतांना गावकुसाबाहेरचे जीवन चित्रण करणारे दलित साहित्य, आदिवासी-ग्रामीण व्यथा वेदनांना समजावून घेणारे साहित्य, चरित्र-आत्मचरित्राच्या माध्यमातून एखाद्या माणसाचे कर्तृत्व रेखाटतांना ' अनंत अमुची ध्येयासक्ती अन् अनंत आमुची आशा ' असे म्हणत दुसरीकडे प्रीतीचे हळुवार अंग कवितेच्या रूपाने उलगडणारे आमचे काव्यविश्व ह्या सान्यांचा आस्वाद आपल्याला वाचनामुळे घेता येतो.

पुस्तके म्हणजे अक्षरांची आनंदयात्रा. या आनंद यात्रेची वारकरी अर्थातच सर्व लेखक मंडळी पुस्तकांच्या रूपाने आपल्यावर आनंदाची अखंड पखरण करत राहतात. एरवी आपले आयुष्य किती लहान परिघात घोंटाळत असते पण पुस्तक वाचनातून आपल्याला विश्वरूपाचे दर्शन घडत असते. एक वैचारिक श्रीमंती आपणाला वाचनामुळे मिळत असते.

आपल्या देशात जी माणसं मोठी झाली ती केवळ वाचनामुळेच. स्वतःला घडविण्यासाठी वाचन ही काळाची गरज झाली आहे. कारण वाचनाच्या प्रवासात आकलनाचा परीघ विस्तारात जातो. पुस्तकांच्या वाचनाद्वारे ह्या मोठ्या माणसांची सुखदुःखे पाहूनच आपण आपल्या जगण्यात अधिक समतोल साधू शकतो. जिद्द, बळ, स्वाभिमान, चिकाटी, प्रामाणिकपणा अशा अनेक सद्गुणांची जोड आपल्या आयुष्याला मिळत असते. गुन्हेगारी पार्श्वभूमी असणारे श्री. लक्ष्मण गोळे जेल मधे असताना त्यांच्या हातात ' सत्याचे प्रयोग ' हे पुस्तक पडले. आजपर्यंत खोटे आणि खोटेच करणारे लक्ष्मण गोळे सत्याचे प्रयोग वाचून पुर्णतः बदलून जातात आणि पुढच्या आयुष्यात फक्त सत्याने, प्रामाणिकपणे जगण्याचा निर्धार करतात. आज श्री. लक्ष्मण गोळे सामाजिक कार्यकर्ते म्हणून परिचित आहेत. अशा प्रकारची अनेक उदा. वाचनाबाबतची आपणाला



## SYNTHESIS AND CHARACTERIZATION OF COBALT BIS - $\beta$ DIKETONATES

D. S. Panchabhai

Anand Niketan College, Warora, M.S., India

[ghanashripanchbhai@gmail.com](mailto:ghanashripanchbhai@gmail.com)

### ABSTRACT:

Bis  $\beta$  diketones have been synthesized by employing Baker Venkantraman Rearrangement on esters (o-aryloxy/heteroaryloxyacetophenones). The transition metal complexes have been synthesized by simple refluxing the ligand with the transition metal salts. The synthesized compounds were characterized by analytical techniques viz: IR, NMR, Mass and elemental analysis.

**Keywords:** Bis  $\beta$  diketones, Baker Venkantraman Rearrangement, metal complexes.

### INTRODUCTION:

$\beta$ -Diketones are among the most studied ligands in the chemistry of metal complexes<sup>1-3</sup> The nature of bonding and chelation was elucidated by Werner and Morgan<sup>4-5</sup>.  $\beta$ -diketonates have been exploited as building units in supramolecular<sup>6-15</sup>.  $\beta$ -Diketones have a wide range of uses ranging from metal extraction by chelation, to biomedical applications like as antibacterial antibiotics, to being used as a ligand in metal complexes for catalysis<sup>16-20</sup>. The  $\beta$ -diketonates form a versatile class of chelating ligands<sup>21</sup> whose uses in transition metal chemistry has been appreciated for almost 120 years<sup>22</sup>. Bis ( $\beta$  -diketonate) ligands that form complexes in which both diketones are bonded to the same metal center have not been previously known. Instead, linked bis ( $\beta$ -diketonates) have been used exclusively to construct dimetallic or polymetallic architectures.

$\beta$ -Diketone hydrazone derivatives are known to act as good chelating agents. The interest in studying these compounds and their metal complexes arises from their behaviour as efficient antituberculous agents<sup>23</sup> Furthermore, some hydrazones are used as quantitative analytical reagents, especially in colorimetric and fluorimetric determinations of metal ions. Some  $\beta$ -diketonato complexes of

titanium (IV) showed activities against tumors.  $\beta$ -diketonates have a wide range of uses in metal extraction by chelation. 1,3-Diketones are very important compounds in organic chemistry, because they exhibit some biological activities, such as antioxidants, antitumors, and antibacterial activities and are also key intermediates to various heterocyclic compounds<sup>24-25</sup>. Europium (III)  $\beta$  -diketonates have excellent luminescent property<sup>26</sup>.

### Present Work

The present work describes the preparation 3,3'-(4,6-Dihydroxy-1,3-phenyl)bis(1-aryl/heteroaryl propano-1,3-diones) and its transition metal complexes. The title compound was synthesized by employing Baker Venkantraman Rearrangement on esters (o-aryloxy/heteroaryloxyacetophenones). The synthesized compounds were characterized by analytical techniques viz: IR, NMR, Mass and elemental analysis.

### MATERIAL METHODS:

A using (KBr) disc on Perkin-Elmer spectrum Rx-I II the elemental analyses were done using the Perkin Elmer 2400 CHN analyzer. FT-IR spectra were recorded spectrometer. H NMR were recorded on Bruker AC-300 F (300 MHz) NMR spectrometer by using DMSO-*d* and CDCl<sub>3</sub> as solvent and tetramethylsilane as an internal standard. Mass



spectra were recorded on 70-S Mass spectrometer using m-nitro benzyl alcohol (NBA) matrix.

#### 4,6-Diacetylresorcinol (resdiacetophenones).

Resorcinol (20.0g, 0.181mole) was dissolved in (42.65g, 0.4178 mole) of acetic anhydride (63.16g, 0.4644 mole) of ZnCl<sub>2</sub> was added and the mixture was heated. After 3 hours of the mixture at 150° to 160°C, 4,6-diacetylresorcinol crystallized out. After cooling, 25g of water was added for hydrolyzing the remaining acetic anhydride, then 40g of methanol was added and, for growing crystals, the resulting mixture was heated under reflux for 30 minutes, then cooled and subjected to solid-liquid separation. The solid was washed with 168g of methanol and then dried where by 26.03g (0.1340 mole) of 4,6-diacetylresorcinol was obtained. The yield was 73.8 % on the resorcinol basis.

#### 1,3-Dibenzoyloxy-4,6-diacetophenone:4,6-

Diacetylresorcinol (resdiacetophenones) (0.1 mole) and dry pyridine (10ml), Benzoyl chloride (0.2 mole) was added slowly maintaining the temp. below 20°C. The reaction mixture was kept overnight and poured on a mixture of ice and HCl. Generally a solid compound separated which was washed with water and dilute NaOH solution and crystallized from ethanol. The yield is 70% m.p- 90°C.

#### 3,3'-(4,6-dihydroxy-1,3-phenyl) bis (1-phenyl propane-1,3dione).

1,3-Dibenzoyloxy-4,6-diacetophenones (0.005moles) was dissolved in 4ml of DMSO. To that solution powdered NaOH (2g) was added with vigorous stirring for about five minutes. The stirring was continued for about 5 min further. The reaction mixture was then cooled and poured on cold water. The pale yellow solid product obtained was washed with water dried and crystallized from alcohol. The yield 67% and m.p 121°C

**3, 3'-(4,6-Dihydroxy-1,3-phenyl)bis[(1-aryl/heteroaryl propane-1, 3-dionate)] Co(II) (2a).** A mixture of 2g ( $5 \times 10^{-3}$ ) 3,3'-(4,6-dihydroxy-1,3-phenyl) bis (1-phenyl propane-1,3dione) and 0.49g ( $2.5 \times 10^{-3}$ ) cobalt (II)acetate and 50ml of anhydrous ethanol was stirred at 50-60°C for 3h. The pink solid obtained was washed with ethanol and then with ethyl acetate. The yield was 62.63%. In the same way, all the other cobalt (II) metal complexes **3b-f** were prepared by adopting the same procedure.

#### RESULT & DISCUSSION :

1,3-Dibenzoyloxy-4,6-diacetophenone undergoes Baker-Venkataraman rearrangement to afford pale yellow needles of 3,3'-(4,6-dihydroxy-1,3-phenyl) bis (1-phenyl propane-1,3dione). The structure was further confirmed by the spectral analysis: Ketone group test : It gives positive test for ketone group IR (KBr): 3568 (-OH); higher than that of its metal complexes for most of the 3061 (=C-H); 1655 (-C=O); 1589 (C=C); 29261 (Ar-H); 1H bacteria. NMR (DMSO-d<sub>6</sub>) : 12.95(s, 1H), 12.72 (s, 1H), 3.19(s, 1H), 8.89(s, 1H), 8.84 (d, 2H), 7.10-8.17 (m, 12H), C<sub>24</sub>H<sub>18</sub>O<sub>6</sub> 7.26 (d, 1H), 6.92 (d, 1H), 7.02 (s, 1H); MS (EI, 70eV): m/z (%) 281 (M<sup>+</sup>, 100), Anal. Calcd. for C<sub>24</sub>H<sub>18</sub>O<sub>6</sub> : C, 71.60; H, 4.46. Found: C, 71.12; H, 4.81. In the 1H NMR Spectra it gives characteristic peak at 12.95 which is enolic proton and at 12.02 the formation of -diketones. The compound in enolic drugs form is more stable than that of ketonic one.

The complex of synthesized compound **2** gives pink coloured Co (II) -diketonate **4a** in high yield. The structure was then confirmed by the spectral analysis

IR (KBr): 3405cm<sup>-1</sup> (OH), ; higher than that of its metal complexes for most of the 1590 (C=C), 2936 (=C-H); (C-H), 1532(-C=O) NMR (DMSO-d<sub>6</sub>) : 11.95(s, 1H), 12.72 (s, 1H), 3.19(s, 1H), 7.10-8.17 (m, 12H), 7.26 (d, 1H), 6.3 (d, 1H), Anal.

Calcd.  $C_{48}H_{40}Co_2O_{14}$  for C H Co: C, 60.13; H, 4.17; Co, 15.2 ; Found : C, 60.07, H, 4.11, Co, 10.43 The lowering of C=O stretch, metal - oxygen stretch at  $484\text{cm}^{-1}$  and absence of enolic proton between  $\delta 14-16$  ppm confirms the formation of complex of the ligand **1a** with cobalt (II) having molecular formula  $C_{48}H_{40}Co_2O_{14}$ . Similarly, other transition metal complexes were prepared by the same method. The ligand and its metal complexes are quite stable. All the complexes are insoluble in water but soluble in acetone, Methanol and DMSO The complexes are non-electrolytic in nature

#### CONCLUSION :

Thus, on the basis of the study results, it is concluded that there is noticeable change in the number of fruits on Cotton, and Tur crops in the study area.

#### ACKNOWLEDGMENT:



My sincere thanks are due to the Head, Department of Chemistry, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for providing all the necessary laboratory facilities, the Director, SAIF, Punjab University, Chandigarh and VNIT college Nagpur for TGA analysis

#### REFERANCE :

- Fackler. J. P. (1966): Metal  $\beta$ -Ketoenolate Complexes, *Prog. Inorg. Chem.*, 7:361-425
- Lingafelter. E. (1966): Molecular Structure Details Of Metal Chelates Department of Chemistry, University of Washington, *Coord. Chem. Rev.* 1:151-155,
- Joshi. K. C, Pathak. V. N. (1977) :Variety in Coordination Modes of Ligands in Metal Complexes. *Coord. Chem. Rev.* 22, 37.
- Schroeder, T., V. Ugrinova, B. Noll and S. Brown, (2006): A chelating -diketone/phenoxide ligand and its coordination behavior toward titanium and scandium, *Dalton Transactions*, 1: 1030-1040
- Malhotra, R.C.(1988): Chemistry of metal - diketonates, *Pure and applied chem.*, 60: 1349.
- Steinbach. J. F, Burns. J. H.( 1958): Chloroform-bearing Chelates. *J. Am. Chem. Soc.*, 80, 1839-1841,
- Ueda. T, Eguchi. T, Nakamura. N, Wasylishen. R. E.(2003) : High-Pressure  $^{129}\text{Xe}$  NMR Study of Xenon Confined in the Nanochannels of Solid  $(\pm)\text{-[Co(en)}_3\text{]Cl}_3$  . *J. Phys. Chem*, 107, 180-185.
- Soldatov. D. V.Ripmeester,(2001): 4-vinylpyridine-extended metal-dibenzoylmethanate host frameworks Structure, polymorphism, and inclusion properties. *J. A. Chem. Eur. J.* 7, 2979-2994.
- Soldatov.D.V.Enright,G. D. Ratcliffe. C. I. Henegouwen. A. T, Ripmeester, (2001): Inclusion Potential, Polymorphism, and Molecular Isomerism of Metal Dibenzoylmethanates Coordinated with 2-Methylpyridine. *J. Chem. Mater*, 13, 4322-4334.
- Soldatov.D. V, Enright. G. D, Ripmeester, (2002) :Inclusion Ability of 4-Phenylpyridine-Extended Nickel(II) Dibenzoylmethanate, a New Metal-Complex Host†. *J. A. Chem. Mater.* 14, 348-356.
- Gromilov. S. A, Baydina. I. A, Zharkova. G. I. (1997): Crystal and molecular structure of trans-bis-(1,1,1-trifluoro-5-methoxy-5-methyl-2,4-hexanedionato) copper(II) . *J. Struct. Chem.* 38, 792-798.
- Soldatov. D. V, Ripmeester, (2000): Inclusion in Microporous  $\beta$ -Bis(1,1,1-trifluoro-5,5-dimethyl-5-methoxyacetylacetonato)copper(II), an Organic Zeolite Mimic *J. A. Chem. Mater.* 12, 1827-1839.
- Angelova. O, Macicek. J, Atanasov. M, Petrov. G, (1991): Chelating modes of 3-substituted 2,4-pentanediones. Crystal and electronic structure of bis(3-cyano-2,4-pentanedionato)cobalt(II)*Inorg. Chem.* 30, 1943-1949.
- Caneschi. A, Cornia.A, Fabretti. A. C, Gatteschi. D,(1999) : Structure and Magnetic Properties of a Dodecanuclear Twisted-Ring Iron(III) Cluster. *Angew. Chem., Int. Ed.* 38, 1295-1297.
- Griesar. K, Haase. W, Svoboda. I, Fuess. H, (1999): Synthesis, Crystal Structure and Magnetic Properties of a Copper(II)-Nitroxide Linear Chain Complex ,*Inorg. Chim. Acta*, 287, 181-185.
- Guthrie.J. W, Lintvedt. R. L,Glick. M. D, (1980): Synthesis, magnetic susceptibility, and structure of some binuclear copper(II), nickel(II), and cobalt(II) fluorinated 1,3,5-

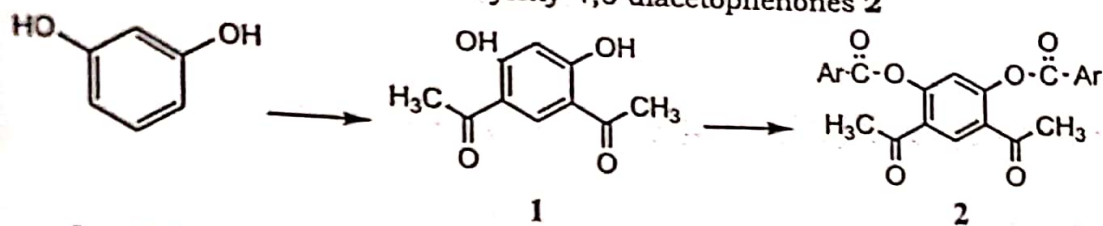
- triketones. Structural and electronic effects on magnetic exchange. *Inorg. Chem.* 19, 2949-2956.
- Casabo. J, Colomer. J, Escriche. L, Teixidor. F, Molins. E, Miravittles. C, (1990): An unusual  $\beta$ -diketone coordination mode. Crystal structure of bis(1,3-bis(2-hydroxyphenyl)-1,3-propanedione)tetrakispyridine dimanganese(III). *Inorg. Chim. Acta*, 178, 221-226.
- Maverick. A. W, Buckingham. S. C, Yao. Q, Bradbury. J. R, Stanley. Intramolecular coordination of bidentate Lewis bases to a cofacial binuclear copper(II) complex G. G, *J. Am. Chem. Soc.* 108, 7430- 7431, 1986.
- Saalfrank. R. W, Seitz. V. Caulder. D. L, Raymond. K. N, Teichert. M, Stalke. D, Self-Assembly of {2}-Metallacryptands and {2}-Metallacryptates *Eur. J. Inorg. Chem.* 1313- 1317, 1998.
- Y. Marcus and A.S. Keates, (1969) :Ion exchange and solvent extraction of metal complexes *Wiley-Interscience*, 499-521.
- Bennett, I, J. Broom, R. Cassels, J. Elder, N. Masson and J. Hanlon, 1999. *Bioorganic and Medicinal chemistry Lett.*, 9: 1847-1852
- Mehrotra. R. C, Bohra. R, Gaur. D. P, (1978): Metal  $\beta$ -diketonates and allied derivatives / R.C. Mehrotra, R. Bohra, and D.P. Gaur *Metal  $\alpha$ -Diketonates and Allied Derivatives*; Academic Press: New York, .45.
- Sacconi. L, (1952):Chemical Reactions of Complexes. I. Action of Hydrazides on Nickel Disalicylaldehyde *J. Am. Chem. Soc.* 74:4503
- Bennett, I, J. Broom, R. Cassels, J. Elder, N. Masson and J. Hanlon, (1999). Synthesis and antibacterial properties of  $\beta$ -diketone acrylate bioisosteres of pseudomonic acid, *Bioorganic and Medicinal chemistry Lett.*, 9: 1847-1852.
- Nishiyama, T., S. Shiotsu and H. Tsujita, (2002). Antioxidative activity and active site of 1,3-indandions with the  $\beta$ -diketone moiety, polymer degradation and Stability, 76: 435-439.
- Sato, K., S. Yamazoe, R. Yamamoto, S. Ohata and A. Ando, (2008). Direct Synthesis of 1,3-Diketones by Rh-Catalyzed Reductive  $\alpha$ -Acylation of Enones, *Organic Letters*, 10: 2405-2408.

**Elemental Analysis of 3,3'-(4,6-Dihydroxy-1,3-phenyl)bis  
[(1-aryl/heteroaryl propane-1,3-dione)] Co (II) 2a-f**

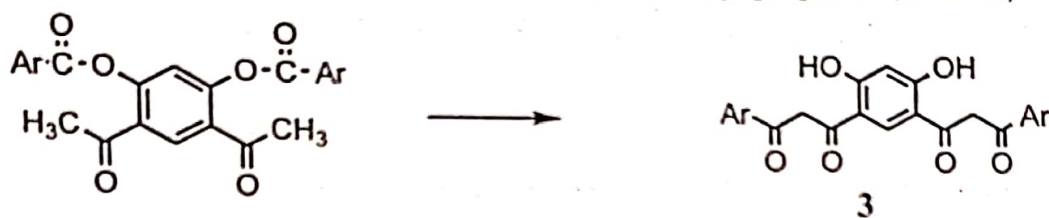
Compound	Colour with FeCl <sub>3</sub>	Ar-Aryl	Empirical formula	Yield	Calc.(found)			%M Calc. (found)	Decomposition Temp. °C
					C	H	N		
2a	Red	C <sub>6</sub> H <sub>5</sub>	C <sub>48</sub> H <sub>40</sub> Co <sub>2</sub> O <sub>14</sub>	62.63	60.13 (60.07)	4.17 (4.11)	–	15.2 (10.43)	580
2b	Brown	4-OCH <sub>3</sub> C <sub>6</sub> H <sub>5</sub>	C <sub>52</sub> H <sub>48</sub> Co <sub>2</sub> O <sub>18</sub>	64.94	57.89 (57.85)	4.45 (4.40)	–	10.75 (9.58)	420
2c	Red	4-ClC <sub>6</sub> H <sub>4</sub>	C <sub>48</sub> H <sub>36</sub> Co <sub>2</sub> O <sub>14</sub> Cl <sub>4</sub>	63.90	52.64 (52.60)	3.28 (3.25)	–	9.97 (7.21)	430
2d	Brown	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	C <sub>52</sub> H <sub>48</sub> Co <sub>2</sub> O <sub>14</sub>	69.10	61.56 (61.52)	4.73 (4.69)	–	10.95 (10.10)	450
2e	Red		C <sub>40</sub> H <sub>32</sub> Co <sub>2</sub> O <sub>14</sub> S <sub>2</sub>	65.43	52.34 (52.30)	3.48 (3.42)	–	10.39 (10.2)	430
2f	Red		C <sub>44</sub> H <sub>32</sub> Co <sub>2</sub> O <sub>14</sub> N <sub>2</sub>	63.22	55.63 (55.60)	3.37 (3.33)	5.05 (5.00)	12.02 (11.62)	480

**Scheme: Synthesis of ligand and its metal complexes.**

1. 1,3-Diaroyloxy/heteroaryloxy-4,6-diacetophenones 2



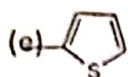
2. 3',3'-(4,6-dihydroxy-1,3-phenyl) bis (1-aryl/heteroaryl propane-1,3diones)



Ar = Ar<sub>1</sub>  
= Ar<sub>1</sub>

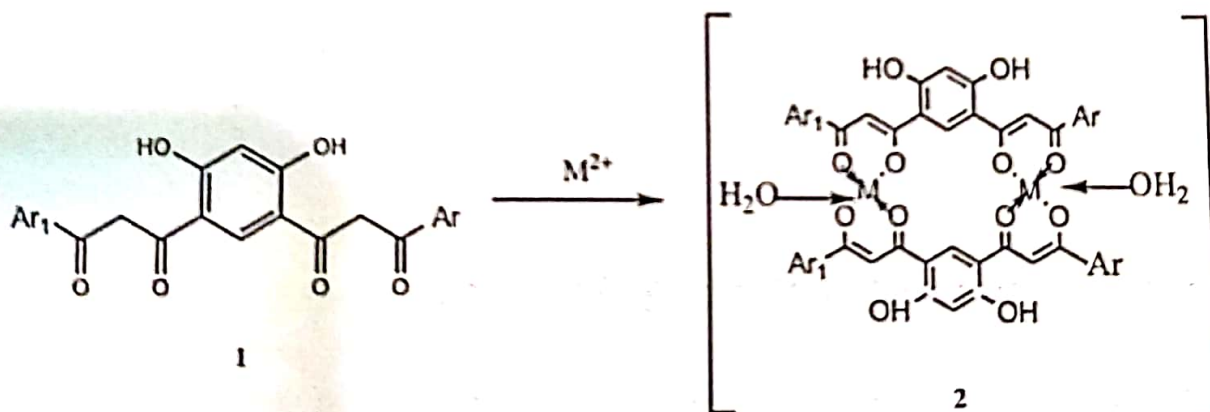
- (a) C<sub>6</sub>H<sub>5</sub> Ar
- (b) 4-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>
- (c) 4-
- (d) 4-ClC<sub>6</sub>H<sub>4</sub>

OCH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>



(f)

3.



M = Co(II)



INTERNATIONAL CONFERENCE

ON

**ROLE OF SOCIAL SCIENCE, SCIENCE,  
MANAGEMENT AND TECHNOLOGY IN ACHIEVING  
SUSTAINABLE DEVELOPMENT GOALS**

Hosted by

**MATRU SEWA SANGH  
INSTITUTE OF SOCIAL WORK  
NAGPUR (INDIA)**

**SHRI SHIVAJI SCIENCE COLLEGE  
CONGRESS NAGAR, NAGPUR (INDIA)**

**S.N. MOR ARTS, COMMERCE  
& GDS SCIENCE COLLEGE  
TUMSAR (INDIA)**

# Certificate

This is to certify that

**Dr.. Dhanashri Panchabhai**

Department of Chemistry, Anand Niketan College, Warora, M.S., India.

participated in the International Conference on Role of  
Social Science, Science, Management and Technology in Achieving  
Sustainable Development Goals held at Hotel Long Beach Garden,  
Pattaya, Thailand on 25<sup>th</sup> & 26<sup>th</sup> May 2018.

He/She presented paper titled -

**Synthesis and characterization of cobalt bis -  $\beta$  diketonates**

**Dr. Keshav Walke**  
Convener  
ICSD-2018

**Mr. Nitin Dutta**  
CEO, Regent International  
College, Thailand

**Dr. Venkat Pulla**  
Brisbane Institute of  
Strength Based Practice  
Australia

**Dr. A. D. Bobdey**  
Organizing Secretary  
SSES Amt's Science College  
Congress Nagar, Nagpur



## SUSTAINABLE COEXISTENCE OF HUMAN WITH ELECTROMAGNETIC RADIATION OF MOBILE AND MOBILE TOWERS.

Sanyogita Verma<sup>1</sup> and Pramod R. Chaudhari<sup>2</sup>

<sup>1</sup>Anand Niketan College, Anandwan, Warora, Maharashtra, India.

<sup>2</sup>ex-Deputy Director, National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur, Maharashtra, India.

<sup>1</sup>sanyogitaverma15@gmail.co; mob: +91 9579561692

<sup>2</sup>pr.chaudhari66@gmail.com; mob: +91 9766540848.

### Abstract:

The people everywhere are exposed to natural non-ionizing radiation levels due to the presence of radionuclides in the earth. Human body is acclimatized to these radiations up to certain level, above which it imparts health problems. The natural radiation level is increased by man-made radiations due to use of electronic gadgets and cell phone towers. The cell phones and gadgets are getting constantly upgraded, resulting in introduction of new ones in market, enhancing total radiation levels. The radiations emitted by diverse electronic equipments include radio waves, microwaves, and extremely low frequency waves. Thermal radiation from hot objects and electromagnetic field due to electric current flowing through power lines and electric appliances also has minor contribution to total radiation. The average natural radiation level to population is 2.299 mSv for India and 2.455 mSv for world population, which is now observed to be increased by around 100 times. There are public health problems over certain level of exposure, for which international norms and stricter Indian norms are available for mobiles and mobile towers, which are major contributor to radiation. The relevant information on health impact, preventive measures, and clarification of certain myths are available on the website of Department of Telecommunications (DoT), Govt. of India.

**Keywords:** Electronic Gadgets, Non-Ionizing Radiation, Impact, Public Health, Regulations, Prevention.

### Introduction

The troposphere air includes basic major elements like oxygen, carbon-di-oxide, nitrogen, and other gases in minor quantities and water vapour. These are essential for biogeochemical cycles of nutrients and energy for human life. Apart from these elements, another lesser known but of important natural component of human environment is non-ionizing radiation. These non-ionizing radiations come from naturally occurring radio isotopes present in the earth, and from non-ionizing radiation of solar spectrum. The human body is well acclimatized to these natural radiations up to certain threshold level.

The industrial development in the world adds air pollutants to pristine environment, at higher levels with the intensification of the developmental activity. Thus, the industrial air pollution plays major part in disturbing the environmental balance, human health, and sustainable development. The countries in the world are now trying to reduce the environmental pollution through technological intervention and by introducing various regulation and standards.

The radiation pollution is now added to the list of environmental pollutants. The incidence of radiation pollution, especially non-ionization radiation, is recent, with the introduction of electronic gadgets in public life in this electronic age, since around last three

decades. These man-made radiations have enhanced the natural level of radiation. Research has shown that this type of radiation is not benign or harmless to the human body, especially children, pregnant women and senior citizens and it is linked to fatigue, dizziness, mental fog, etc.

The people are well aware of the ionizing radiation from the incidents of atom bomb attack on Hiroshima and Nagasaki, nuclear tests, and accidents in nuclear power plants, having serious environmental and public health impacts for short exposure as well as long chronic exposure. The people are now interested in getting more information about non-ionizing radiations from various sources, which affect human health.

### Benefits and Popularity of Electronic Equipments

The electronic age has gifted many simple to highly sophisticated equipments and gadgets which are continuously upgraded especially mobiles, i-phones, laptops, computers etc. These equipments have made the life simple and interesting due to fast communication and availability of immense worldwide information on every subject handy at any time and at any place. Cell phones provide an instrument to interface with internet, vast worldwide information, communication with friends, family and co-workers, and useful in emergency especially for ladies in danger. Growth in internet will have multiple benefits

# आडीपट्टी रंगभूमी

आकलन आणि आस्वाद

(प्राचार्य डॉ. श्याम मोहश्कर गौरवग्रंथ)



संपादक

डॉ. राजकुमार मुसणे  
प्रा. जनबंधू मेश्राम  
प्रा. माधवी भट  
प्रा. प्रकाश वट्टी  
प्रा. वसंत चव्हाण

प्रा. राम वासेकर  
प्रा. सुधीर पोटवार  
प्रा. सविता गोविंदवार  
प्रा. योगीनाथ नगराळे  
प्रा. बबन अवघडे



महाराष्ट्रात एके काळी रंगमंच गाजविणाऱ्या रंगभूमी, सांप्रत केवळ इतिहासाचा विषय होऊन बसल्या असल्या तरी झाडीपट्टी रंगभूमी मात्र आपल्यावर झालेले अब्यायाचे आणि उपेक्षेचे सारे प्रहार झेलूनही उज्वळावस्थेत आहे. नाट्यशास्त्राची निर्मिती करणाऱ्या भरत मुर्लीनाही या रंगभूमीचे दर्शन घेण्याचा मोह व्हावा, असे तिचे देवदुर्लभ वैभव आहे. प्रत्यक्ष आकाशातील गंधर्वांनाही हेवा वाटावा असे या रंगभूमीचे कर्तृत्व आहे. म्हणूनच महानगरीय ताऱ्यांनाही तिचा संग हवाहवासा वाटायला लागला आहे.

या रंगभूमीचा हेतुपुरस्सर अनुल्लेख व्हावा असा प्रयत्न तत्कालीन स्वनामधन्य संशोधकांकडून व समीक्षकांकडून प्रारंभापासून प्रत्ययही होत आलेला आहे. पण हे उपेक्षेचे हलाहल पचवून तिचा नावलौकिक सर्वदूर पसरविण्याच्या कामी ज्यांनी आकाशपाताळ एक केले अशा शब्दसाधकांमध्ये डॉ. श्याम मोहरकर एक आहेत. झाडीपट्टीत अभिनयगुणासंपन्न कलाकारांची वानवा नाही. पण या रंगभूमीचा आरसा बनून लेखन करणाऱ्यांची संख्या मोजायला मात्र एका हाताची बोटेही पर्याप्त ठरतील. रंगभूमीवर आपले अभिनयकौशल्य प्रकट करून त्याच सामर्थ्याने तिच्यावर संशोधनपर साक्षेपी लेखनही करण्याची अनन्यसाधारण क्षमता ज्यांच्यात आहे, अशा दोनचार शब्दप्रभूपैकी डॉ. श्याम मोहरकर हे एक आहेत. त्यांनी यानंतरही झाडीपट्टी रंगभूमीसंदर्भात आणखी मनन-चिंतन करावे आणि पुढहा तिचे नवनवे उद्गेष लोकांसमक्ष आणावेत हीच अपेक्षा.

**डॉ. हरिशचंद्र बोरकर**

झाडीपट्टी रंगभूमीचे ज्येष्ठ रंगकर्मी व भाष्यकार

ISBN 978-93-83132-58-4



9 789383 132584



**राघव पब्लिशर्स अँड डिस्ट्रीब्युटर्स**

नागपूर-४४००३२



# आडीपट्टी रंगभूमी : आकलन आणि आस्वाक

(प्राचार्य डॉ. श्याम मोहरकर गौरवग्रंथ)



## संपादक मंडळ

प्रा. डॉ. राजकुमार मुसणे  
प्रा. जनबंधू मेश्राम  
प्रा. माधवी भट  
प्रा. प्रकाश वट्टी  
प्रा. वसंत चव्हाण

प्रा. राम वासेकर  
प्रा. सुधीर पोटवार  
प्रा. सविता गोविंदवार  
प्रा. योगीनाथ नगराळे  
प्रा. बबन अवघडे



राघव पब्लिशर्स अँड डिस्ट्रीब्युटर्स

नागपूर-३२

झाडीपट्टी रंगभूमी : आकलन आणि आस्वाद  
Zadipatti Rangabhumi : Aakalan ani Aswaad

ISBN : 978-93-83132-58-4

आवृत्ती प्रथम : १४ ऑगस्ट २०१७ (गोकुळाष्टमी)

© संपादक

मूल्य : ₹ ४२५

प्रकाशक :

राघव पब्लिशर्स अँड डिस्ट्रीब्युटर्स,  
राजविलास टॉकीज जवळ,  
महाल, नागपूर - ३२  
मो. : ९८२३२२७६७९

अक्षर जुळवणी व मुद्रक :

महालक्ष्मी ऑफसेट,  
महाल, नागपूर

---

या ग्रंथात समाविष्ट असलेल्या लेखकांच्या मतांशी संपादक मंडळ व प्रकाशक सहमत  
असतीलच असे नाही.

---

- प्रा. डॉ. विजय रैवतकर

१३. ताराचंद उराडे यांच्या नाट्यवाङ्मयाची चिकित्सा

१३१

- प्रा. बबन अवघडे

As per the New Semester-wise Syllabus of Gondwana University

# ZOOLOGY

with  
Practical  
Manual  
Inside

B.Sc. Semester I (CBCS)

Paper - I : Nonchordate - Protozoa to Annelida (Core Paper - I)

Paper - II : Cell Biology (Core Paper - II)

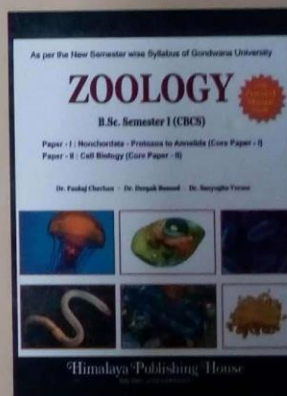
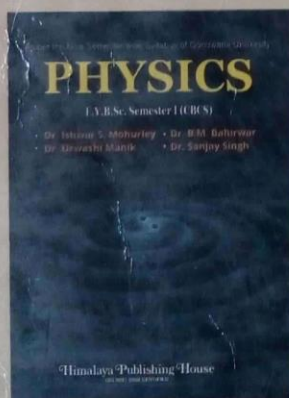
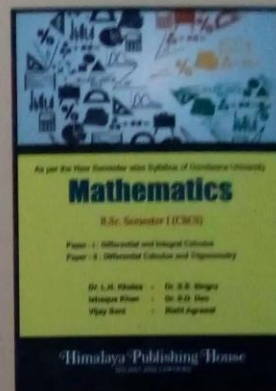
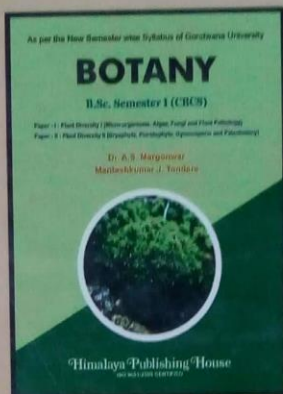
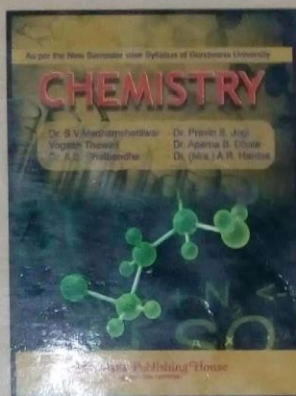
Dr. Pankaj Chavhan • Dr. Deepak Bansod • Dr. Sanyogita Verma



Himalaya Publishing House

ISO 9001:2008 CERTIFIED

# Our Outstanding Publications for B.Sc. Semester I (CBCS)



[www.himpub.com](http://www.himpub.com)

ISBN: 978-93-5273-462-7



9 789352 734627

ISBN: 978-93-5273-462-7

PSB 247

₹ 215/-

As per the New Semester-wise Syllabus of Gondwana University

# Zoology

**B.Sc. Semester II (CBCS)**

**With Practical  
Manual Inside**

**Paper - I : Animal Diversity of Non Chordate  
(Arthropoda to Hemichordata) (Core Paper III)**  
**Paper - II : Genetics and Evolution (Core Paper IV)**

**Dr. Deepak S. Bansod • Dr. Pankaj R. Chavhan  
Dr. Sanyogita R. Verma • Dr. Mrs. Nilima V. Umate**



**Himalaya Publishing House**  
ISO 9001:2008 CERTIFIED

## About the Authors



**Dr. Deepak S. Bansod**, working as Assistant Professor and Head in Department of Zoology at Shri J. Govindrao Munghate Arts and Science College, Kurkheda Dist.-Gadchiroli. He has seven years teaching experience at undergraduate level. Having good academic record, the author has done Ph.D. from RTM Nagpur University, Nagpur and recognized as supervisor for Ph.D. in subject Zoology under science faculty of Gondwana University, Gadchiroli. His area of specialization is Cell Biology and Genetics, He has published four research papers in recognized national and International journals and also presented six papers in various conferences.



**Dr. Pankaj R. Chavhan**, M.Sc., M.Phil., Ph.D. working as Assistant Professor and Head in the Department of Zoology in Shri Sadguru Saibaba Science and Commerce College, Ashti, Dist. Gadchiroli, Maharashtra, India. He is teaching to B.Sc. for more than eight years. He has good academic record and received Young Scientist Award at UGC sponsored national conference. He has also published more than 10 international research papers in the reputed journal and has also published two international books. He is recognized supervisor for Ph.D. in Zoology, Gondwana University, Gadchiroli.



**Dr. Sanyogita R. Verma**, Assistant Professor, Department of Zoology, Anand Niketan College, Anandwan Warora, Gondwana University, Gadchiroli. She is consistently engaged in the research field of Environmental Biology since the beginning of her career in 2004. Till the date, she has 24 published research papers in international and national journals with impact factors, one reviewed chapter and a book in international repute. She attended and presented papers in more than 15 international and national conferences and awarded as a "Eureka Forbes Young Scientist Award," and stands First in Gurukul International Research Paper Competition.



**Dr. Mrs. Nilima V. Umate**, Assistant Professor and Head in the Department of Zoology, Rashtrapita Mahatma Gandhi Arts and Commerce College, Saoli, Dist.- Chandrapur, Maharashtra, India. She has sixteen years of teaching experience at the undergraduate level and seven years at the Postgraduate level. She has been awarded Ph.D. from RTM Nagpur University, Nagpur. She has won best paper presentation award at a number of UGC sponsored national conferences. She presented her research work at the international and national conferences through paper presentations.

[www.himpub.com](http://www.himpub.com)

ISBN: 978-93-5273-714-7



9 789352 737147

ISBN: 978-93-5273-714-7

PSB 254

₹ 195/-



Scanned with CamScanner