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## Self Study Report

### SSR: CYCLE-II

(2017-2018 To 2021-2022)

## Research, Innovations and Extension

- 3.3.1 Number of Research Papers published per Teacher in the Journals notified on UGC CARE list during the last five years



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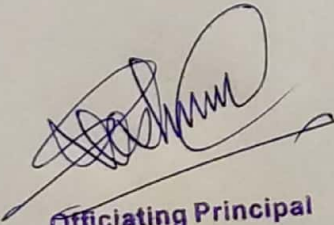
## Criterion No. – III

### Research, Innovations and Extension

3.3.1 Number of Research Papers published per Teacher in the Journals notified on UGC CARE list during the last five years

2021-2022	2020-2021	2019-2020	2018-2019	2017-2018
5	6	6	9	6



  
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## OCTAHEDRAL MOLECULAR SIEVE (K-OMS-2) SUPPORTED METAL NANOPARTICLES FOR CATALYSIS

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### ABSTRACT:

Catalysis plays an important role in synthesis of many fine chemicals and fuels via numerous chemical processes like hydrogenation, oxidation, dehydrogenation, etc. Herein, we have demonstrated first time the efficiency of cryptomelane type microporous manganese oxide Octahedral Molecular Sieve (K-OMS-2) material for the preparation of highly dispersed Cu nanoparticles. The catalysts were systematically studied by X-ray diffraction (XRD), N<sub>2</sub> sorption and Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) techniques. This K-OMS-2 supported Cu catalyst hold important potential as a good heterogeneous catalyst.

**Keywords:** Heterogeneous catalysts, Octahedral Molecular Sieve; Cu nano catalyst; catalysis.

### 1. INTRODUCTION

Catalysis is an essential part of daily life. Notably, supported metal catalysts were extensively utilized as superior catalysts in many chemical transformations. Manganese oxide octahedral molecular sieve (OMS) type materials possess highly porous structure, adsorption-desorption property, ion-exchange ability and moderate surface acidity-basicity.<sup>[1]</sup> Microporous manganese oxide OMS materials has pore dimensions close to zeolites.<sup>[1]</sup> Importantly, transition metal ion incorporated (especially divalent and trivalent ion) cryptomelane type manganese oxide (OMS-2 type material with 2 x 2 matrix) having one

dimensional tunnel structure, has been emerged as highly efficient catalyst for oxidation of alcohols and side chains in organic molecules.<sup>[2]</sup> Incorporation or doping of foreign metal mostly divalent or trivalent cations in OMS-2 changes its structural, electronic and catalytic properties as well.<sup>[3]</sup> The choice of metal cations (M<sup>+2</sup>/M<sup>+3</sup>) was mainly determined by their charge, polarizability and size. The metal doped OMS-2 catalyst has been verified as a potential catalyst for oxidation of 2-propanol,<sup>[3]</sup> oxidative dehydrogenation of ethanol,<sup>[3]</sup> supercritical water oxidation of pyridine,<sup>[4]</sup> phenol,<sup>[5]</sup> ammonia,<sup>[6]</sup> etc.

Recently, we have reported the effectiveness of Ru doped K-OMS-2 catalyst for hydrogenolysis and oxidation of biomass-derived 5-hydroxymethylfurfural.<sup>[7]</sup> In the present study we have demonstrated the utility of K-OMS-2 material for the preparation of highly dispersed Cu nanoparticles via ion-exchange method. This K-OMS-2 supported Cu nanoparticles catalysts hold considerable potential as an excellent heterogeneous catalyst in several chemical processes.

### 2. EXPERIMENTAL SECTION

#### 2.1. Chemicals

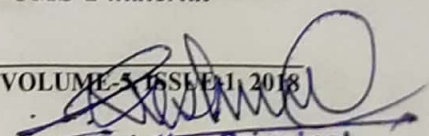
All chemicals used were reagent grade and employed without further purification. KMnO<sub>4</sub> (99%), MnSO<sub>4</sub>·H<sub>2</sub>O (99%), CuCl<sub>2</sub>·2H<sub>2</sub>O (99%), HNO<sub>3</sub> (70%) and NaBH<sub>4</sub> were procured from Loba chemicals, Mumbai, India.

#### 2.2. Synthesis of materials

##### 2.2.1. Preparation of K-OMS-2 material

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Original Research Article

**PHYSICO-CHEMICAL ANALYSIS OF WATER SAMPLES AND EFFECT OF ITS QUALITY ON HUMAN HEALTH**

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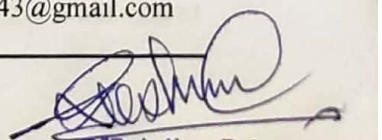
**ABSTRACT:** The present study is aimed at investigating the concentration of various elements present in water samples of "Navegaon Pandao Village of Nagbhid Taluka in Chandrapur District, Maharashtra state, INDIA". For this purpose, water samples were collected from various sources to study their quality. These samples consist of bore well and normal well water. The Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) instrument was employed for elemental analysis of these water samples. The obtained results were also compared with the standard recommendation values specified by World Health Organization (WHO) for the use of drinking by humans. The concentration of Al, B, Ba, Bi, Cu, Li, Ni, Mn and Zn were found to be lower than WHO limit in all samples. On the other hand Ca, K, Mg, Na and Si were on higher side of acceptable limit in some samples. The present study will be useful to identify the places where water-quality standards are met and will be indicative of the places where the water-quality is below standards. The adverse effect of the elements concentration on the health of the humans is also discussed. The data reported in this report will be extremely useful from the public health point of view.

**KEYWORDS:** Water; Public health; Elements; Adverse effect.

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Original Research Article

DOI- 10.26479/2018.0401.03

## EFFICIENT METHOD FOR PREPARATION OF HIGHLY DISPERSED METAL NANOPARTICLES SUPPORTED ON OCTAHEDRAL MOLECULAR SIEVES

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**ABSTRACT:** Cryptomelane type microporous manganese oxide Octahedral Molecular Sieve (K-OMS-2) material was synthesized through redox method. This novel K-OMS-2 material was employed as a catalyst support for the preparation of highly dispersed Cu nano catalysts via ion-exchange process. The chemical composition, structure, texture and morphology of all the materials were investigated by various physico-chemical characterization techniques such as X-ray diffraction (XRD), N<sub>2</sub> sorption, Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), etc. Highly dispersed Cu nanoparticles supported on K-OMS-2 catalysts hold significant potential as a good heterogeneous catalyst in numerous chemical processes like hydrogenation, oxidation, dehydrogenation, coupling reaction, etc.

**KEYWORDS:** Octahedral Molecular Sieve; Cu nano catalyst; high metal dispersion; catalysis.

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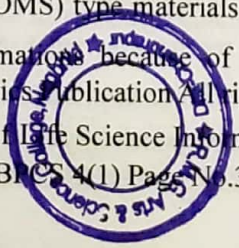
### 1. INTRODUCTION

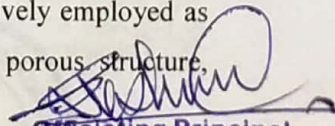
Manganese oxide octahedral molecular sieve (OMS) type materials were extensively employed as efficient catalysts in many chemical transformations because of their highly porous structure.

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Research paper

## Criticality in a dynamics ruled evolutionary model

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## ABSTRACT

We propose a model of dynamics-ruled evolution inspired by Bak-Sneppen model. We argue that the only way for the ecological system to find the least or most fit species is to infer it from dynamics. Thus, instead of punishing the species which is 'least fit', we punish one which 'appears to be least fit'. We find that the model still evolves to a critical state. The detailed dynamics does not seem to affect the presence of a critical state.

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## 1. Introduction

The fossil records often indicate very rapid evolutionary changes in a small period of time followed by 'stasis' in which there is a very little net evolutionary change. Paleontologists Eldredge and Gould termed this phenomenon of sharp, short bursts in evolution followed by gradual changes as 'punctuated equilibrium' [1,2]. The data was analyzed by Raup later and he modeled it using kill curve which provides an excellent fit [3,4]. Newman pointed out that this best fit implied that the size distribution of extinction events should be a power law with exponent  $-2$  [5]. We note that this data has also been alternatively fitted by a stretched exponential [6].

An interesting model for this extinctions within the paradigm of 'self-organized criticality' which attracted a lot of attention was suggested by Bak and Sneppen [7]. Their simplified model was a one-dimensional lattice representing species connected to their nearest neighbors. Each species was assigned a fitness value chosen randomly in the beginning. At each time step, the species with the least fitness and its neighbors were replaced by a new species with a fitness value chosen from the same random distribution. Surprisingly, this model shows correlations in space and time and shows extinction activity with a power law. The quantities such as the first return time, return time and jump size distribution show power law behavior. Despite its simplicity, this model has not been solvable analytically.

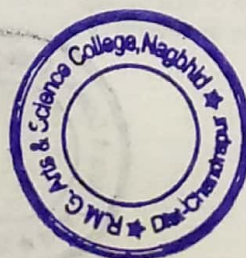
A critical value of fitness can be defined in this model. One can define avalanche size by the number of subsequent mutations below this value. The distribution of avalanche sizes is an inverse power law and the exponent is close to 0.9 which increases in higher dimensions.

There have been several other alternative models. Sole and Marubia presented model [8–10] in which the interactions between species were defined by matrix  $J$ . The  $i^{\text{th}}$  Species became extinct when  $\sum_j J_{ij} < 0$ . However, its asymptotic behavior is not known reliably [11]. Manrubia-Paczuski [12], Newman [5,13], Amaral-Meyer [14], Drossel [15] and Slanina-Kotrala [16,17] introduced some further models which showed power-law distributions of extinctions with different exponents. Underlying topology of connectivity between species is not necessarily Cartesian. In some of them, even the number of species

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## Physico-Chemical Characteristics of a Fresh Water Pond of Ghugus, District Chandrapur, Maharashtra (India)

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**Abstract**--Water is the most necessary component for the living beings. Life on the earth is never possible without water. Water is one of the most vital elements for the human environments. It is being used for many purposes e.g. Industrial water supply, drinking, irrigation, propagation of fish and other aquatic systems and generation of hydro-power plants. Water is the main source of energy and governs the evolution on the earth. 71.9 % of earth surface is covered with water (CIA, 2008), out of which, 96.5% of the world's water is sea water which is salty that is not to be directly useful for irrigation, drinking, domestic and industrial purposes. 1.7% is in groundwater and 1.7% in glaciers and the ice caps. Less than 1% water is present in ponds, lakes, rivers, dams, etc., which is used by human beings for drinking, industrial, domestic and agricultural purposes. According to an estimate about 70% of all the available water in our country is polluted due to the discharge of effluents from the industries, domestic waste, land and agricultural drainage (Shrivastava and Kanungo, 2013). In the present study an attempt has been made on physico-chemical characteristics of a pond, located in Ghugus Town in Chandrapur district of Maharashtra. The study was carried out for a period of twelve months i.e. November 2014 to October 2015. Monthly details have been collected and were represented seasonally along with standard deviation. Different parameters were taken in the study were Humidity, Atmospheric and water temperature, pH, Electrical Conductivity, Total Dissolved Solids, Dissolved oxygen, Biochemical Oxygen Demand, Total alkalinity, Bicarbonate Alkalinity, Total Hardness, Calcium Hardness, Chloride, Nitrate-Nitrogen and Phosphate. The results of the present study indicated that the water of the pond lies just below the level of eutrophication.

**Keywords**-- Physico-chemicals, Malgajari Talav, pollution, pH, TDS, DO, BOD

### I. INTRODUCTION

Ponds are important wetlands located in and around human localities as they are generally semi natural ecosystems constructed by man in landscape suitable for water stagnation. Ecosystem services rendered by these wetlands are innumerable including tangible and non-tangible ones. Besides acting as a source of fresh water, they lower the ambient temperature, raise the water table, increase the diversity of flora and fauna, and provide aesthetic atmosphere.

Due to uncontrolled increase in human population and development of township at large, these freshwater bodies are under enormous pressure owing to their overuse on one hand and enrichment due to nutrients and organic matter on the other, leading to the cultural eutrophication. Erosion of

catchment and direct pouring of domestic effluents along with sewage are threatening these wetlands all over the world. In view of the above, the present study deals with the assessment of physico-chemical characteristics of a freshwater pond located in the middle of township of Ghugus district Chandrapur of Maharashtra, India.

### II. RELATED WORK

Pandey and Verma (2004) studied the influence of catchment on chemical and biological characteristics of Baghdara Lake and Udai Sagar Lake in Southern Rajasthan. The two lakes were of contrasting features with Baghdara Lake receiving runoff from undisturbed woodlands and Udai Sagar lake receiving runoff from urbanized regions. The physicochemical and biological analysis of both the lakes reveals that Udai Sagar Lake was polluted and reaching eutrophic condition, whereas Baghdara Lake was







# Studies on physico-chemical parameters of Mul Lake, Maharashtra, India

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### ABSTRACT

India has 2.4 % of worlds land mass 4 % as water resources and 16 % of worlds population therefore no scope to underutilize water resources. Since the quality of the aquatic life depends on water quality, a thorough assessment of the water quality is an integral part of lakes evaluation. Study site located near Mul town in the Chandrapur district of eastern part of Maharashtra and is situated between 20<sup>o</sup>,07'N and 79<sup>o</sup> ,67' E. Water samples were collected in polythene bottles (two litters capacity) once in month from the selected sampling sites of two lakes to analyze the water quality parameters for the period of 12 months i.e. from January 2011 to December 2011. Annual variations in physico-chemical parameters, such as B.O.D., C.O.D., nitrate, phosphate, Chloride, alkalinity, D.O.,CO<sub>2</sub> etc. indicates that, the Mul lake is polluted and may be classified as mesotrophic or mesosaprobic.

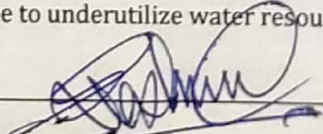
**Keywords** – Mesotrophic, Mul, water quality, physico-chemical

### INTRODUCTION

The inland water resource on the surface of earth such as Rivers, Lakes, Reservoirs and Ponds became the focus of special attention in the early stage of development of science of ecology. (Edmondson, 1959) Lakes maintain ecological balance of flora and fauna and their interrelationship regulate surrounding climate and recharge ground water, but unfortunately they are dying. (Hatchinson, et al., 1967) The lakes are getting polluted due to inflow of domestic effluents, apart from pollution, resulting from washing of clothes, Vehicles, Cattle, immersion of Idols during certain festivals etc. All these activities are deteriorating the quality of the water in the lake resulting in the accumulation of the toxic chemicals and other sludge leading to ecological imbalance.

India has 2.4 % of worlds land mass 4 % as water resources and 16 % of worlds population therefore no scope to underutilize water resources.



  
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## Catalysis

## Spinel-Type Mixed Oxides for Stable and Selective Partial Oxidation of Benzyl Alcohol

Lakshmi prasad Gurrula,<sup>[a]</sup> Atul S. Nagpure,<sup>[a, b]</sup> Hanmant R. Gurav,<sup>[a, c]</sup> and Satyanarayana Chilukuri<sup>\*[a]</sup>

Benzaldehyde is an important chemical intermediate, which need to be prepared through an eco-friendly process. Manganese oxides are active as catalysts for its preparation through partial oxidation of benzyl alcohol. In this study, Cu, Co and Mn containing spinel based mixed oxides ( $\text{Cu}_x\text{Mn}_{3-x}\text{O}_4$ ) were prepared and tested for partial oxidation of benzyl alcohol to get benzaldehyde with high selectivity. The catalytic activity strongly depended on chemical composition, acid-base properties and oxygen uptake. The influence of chemical composition, reaction temperature, oxygen partial pressure and the weight

hourly space velocity (WHSV) were investigated to optimize benzaldehyde yield and to stabilize the catalyst activity. A high benzaldehyde selectivity of 98%, accompanied with benzyl alcohol conversion of 84.5% was obtained over  $\text{Cu}_{0.25}\text{Mn}_{2.75}\text{O}_4$  catalyst at 300 °C. It was evident from temperature programmed desorption (TPD) of  $\text{CO}_2$  that this catalyst was found to have optimum basicity and high oxygen uptake, thus imparting high activity and stability. Activity and catalyst life could be attributed to appropriate acid-base properties.

## 1. Introduction

Selective oxidation of organic substrates is very important, as many industrial chemicals and chemical intermediates are obtained in this route. Among selective oxidations, conversion of alcohols to aldehydes is significant in the perfume industry.<sup>[1]</sup> Benzaldehyde is the second most important aromatic molecule with a range of commercial applications.<sup>[2]</sup> It is used as an intermediate in the production of fine chemicals, as flavor compound, as pharma intermediate, as food additive and in the manufacturing of cosmetics.<sup>[1]</sup> Hence, production of benzaldehyde (BzH) through partial oxidation of benzyl alcohol (BzOH) is very important. Currently, BzH is produced commercially through the liquid phase hydrolysis of benzal chloride and oxidation of toluene. The other methods being explored are the dehydrogenation of BzOH, carbonylation of benzene and the ruthenium-catalyzed oxidation of styrene with periodate or hypochlorite etc.<sup>[1]</sup>

Benzyl alcohol undergoes a variety of reactions depending on the nature of the catalyst and the reaction conditions used. Some of the transformations are (i) partial oxidation to yield BzH, benzoic acid and benzyl benzoate,<sup>[3]</sup> (ii) disproportionation

to form BzH, toluene and water,<sup>[4]</sup> (iii) dehydration to form dibenzyl ether<sup>[5]</sup> and (iv) self-condensation (benzylation) to form anthracene and stilbene.<sup>[5,6]</sup> There were extensive reports on partial oxidation of alcohols to aldehydes in batch reactors using different catalysts.<sup>[7–18]</sup> While liquid phase batch reactions require long hours to reach steady state, some of the work was focused on green approaches such as solvent-free processes,<sup>[7–9,11,15]</sup> utilization of green oxidants like air/ $\text{O}_2$ ,<sup>[7–13,15–18]</sup> and also through photocatalysis.<sup>[19]</sup> Hutchings et al. demonstrated solvent-free oxidation of BzOH using supported Au–Pd/ $\text{TiO}_2$  catalysts, in which toluene was obtained as a by-product as a result of disproportionation. Addition of Pd to Au increases the rate of disproportionation, while Au does not catalyze the formation of disproportionation products. Further studies through change of support from  $\text{TiO}_2$  to MgO and ZnO suppressed the disproportionation even for Au–Pd catalyst.<sup>[20]</sup>

Choudhary et al. achieved 100% conversion of BzOH at 94 °C with TBHP as the oxidant and Au/MgO as catalyst to get 72.5% BzH yield.<sup>[21]</sup> Palladium supported on different organosilane-functionalized carbon nanotubes were studied for solvent-free aerobic oxidation of BzOH by Yibo Yan et al.<sup>[15]</sup> Gold nanoparticles encapsulated in metal-organic frameworks used under solvent-free conditions with  $\text{O}_2$  as oxidant at atmospheric pressure converted 53.8% of BzOH to give 53.7% BzH yield.<sup>[14]</sup> Hydrotalcite  $\text{CoMgAl}$ , containing different  $\text{Mg}^{\text{II}}$  contents was investigated with TBHP as the oxidant.<sup>[22]</sup>  $\text{Mg}^{\text{II}}$  ions promoted the oxidation process of  $\text{Co}^{\text{II}}$  to  $\text{Co}^{\text{III}}$  leading to enhanced catalytic activity.<sup>[22]</sup> Effect of Ce and Fe addition to nanostructured  $\text{MnO}_x$  was explored, along with reaction mechanism, kinetics and deactivation pattern of this catalyst in BzOH oxidation.<sup>[16]</sup> DRIFT studies were employed to investigate fresh and used catalysts, the product benzoic acid formed was found to hinder the reaction due to its strong adsorption on active catalytic sites leading to the deactivation of catalyst.<sup>[17]</sup> Benzyl

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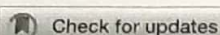
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2020, 4, 678

## Insights into the catalytic activity of Ru/NaY catalysts for efficient H<sub>2</sub> production through aqueous phase reforming†

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and Thirumalaiswamy Raja<sup>†ad</sup>

Ruthenium nanoparticles supported on NaY zeolite catalysts were synthesized by a simple ion exchange method. The structural and morphological features of the catalysts were systematically investigated using numerous techniques such as N<sub>2</sub>-sorption, XRD, CO<sub>2</sub>-TPD, H<sub>2</sub>-TPR, TEM, SEM, ICP-OES, TGA, CHN analysis, XPS, *in situ* CO-FTIR and NMR spectroscopy. These novel Ru–NaY catalysts were highly active and selective for H<sub>2</sub> production through aqueous phase reforming (APR) of glycerol and ethylene glycol. Among the various catalysts evaluated for H<sub>2</sub> production, the 3 wt% Ru–NaY catalyst demonstrated the highest catalytic performance with excellent H<sub>2</sub> selectivity and this catalyst exhibits better activity as compared to many state of the art catalysts reported so far. The superior catalytic activity of 3 wt% Ru–NaY was attributed to the appropriate Ru metal loading, good metal dispersion, small size of Ru nanoparticles, better metal-support interaction, and higher availability of catalytically active sites (Ru<sup>0</sup>) and facilitated water gas shift (WGS) reaction. This catalytic activity result clearly shows that NaY zeolite supported Ru nanoparticles catalysts have excellent potential for H<sub>2</sub> production from biomass-derived compounds.

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rsc.li/sustainable-energy

### 1. Introduction

At present, providing a carbon free future with secure renewable energy sources is one of the key technological challenges mankind is facing. Energy is an indispensable element in our daily lives and most of our current energy infrastructure is dominated by fossil fuels, which are non-renewable and associated with a high carbon footprint.<sup>1,2</sup> Therefore, it is very much essential to explore clean and sustainable energy sources and shift the dependency on a fossil fuel based economy to the renewable one. However, replacing such traditional sources of energy completely with renewable energy is equally a challenging task. Hence, clubbing current energy technology with renewable energy will give us the much-needed window to secure renewable energy sources and eventually eliminate CO<sub>2</sub> emission.

Sustainable hydrogen production offers a compelling vision for future energy owing to its cleanness and high combustion efficiency.<sup>1–4</sup> The current hydrogen production platforms are largely (~95%) dominated by fossil fuels, which are highly energy intensive process and release a considerable amount of greenhouse gases into the atmosphere.<sup>5,6</sup> Biomass is an ultimate solution in this regard due to its carbon neutral nature with environmental benefits. Although biomass holds great promise toward future economies, the conversion of biomass to hydrogen remains challenging, involving complex reactions processes along with a low hydrogen production rate.<sup>7–9</sup>

Low temperature catalytic conversion of biomass derived feedstock to different energy carriers received considerable attention in the past few decades.<sup>10</sup> In 2002, Dumesic (Cortright *et al.*, 2002) came up with a breakthrough in hydrogen generation; showed feasibility to produce H<sub>2</sub> with very good efficiency from biomass derived oxygenated hydrocarbons.<sup>10</sup> The reaction could be performed at relatively low temperature near 500 K, thus favoring WGS equilibrium leading to less CO as the byproduct thereby avoiding multistep processes for H<sub>2</sub> production.<sup>10–18</sup> Thus, APR provides a great platform for harnessing renewable sources for effective hydrogen production.

Although, a plethora of catalysts have been developed for APR of different bio-based oxygenated hydrocarbons, designing a stable, eco-benign and cost effective catalyst still remains a big challenge to the APR process.<sup>17–21</sup> The harsh hydrothermal reaction conditions during the APR process shorten the life

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† Electronic supplementary information (ESI) available. See DOI: 10.1039/c9se00797k







## Physico-Chemical Analysis of Waste Water from ACC<sup>7</sup> Cement Industry from an Industrial Town – Ghugus (Maharashtra), India

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**Abstract:** There are different sources of industrial water pollution, but one of them is the discharge of harmful chemicals and compounds into the water bodies through gutters, due to which the water from the water bodies becomes unsuitable for the drinking and other domestic purposes. Though 72% of the earth surface is covered by the water, only 2.5 to 2.75 percent is fresh water of which 1.75 to 2% is frozen in glaciers, ice and snow, 0.5-0.75% as groundwater and moisture. Thus less than 0.01% is available to us as a surface water to us from lakes, ponds, rivers, reservoirs and streams only. So it is our prime duty to keep them clean for the survival of not only humans but for all the living beings on this earth planet. Therefore the systematic management of industrial run off is necessary for keeping the balance of an ecosystem. Therefore a pond situated at Nakoda, the water of which is used by the natives for many purposes including drinking is taken for the study of physico-chemical analysis.

**Keywords:** Physico-chemical, cement industry, effluent water, waste water, Nakoda pond,

### I. INTRODUCTION

In previous days, wood was used as a main material in the building construction. But now a day's cement has taken its place. As cement industry is indispensable for the construction activity, it is playing a major role in improving the living standard of human society. Though cement industry is profitable, it is facing many challenging problems due to the environmental pollution and many other health issues as the effluents are entering in to the environment in its solid, liquid and gaseous state as by-products of the cement. The ACC cement plant is situated near a village Nakoda 31 km from a district place Chandrapur in Maharashtra with latitude 19° 55' 50.88" N and longitude 19° 55' 50.88" E.

Nakoda is a rural area and the inhabitants are engaged with cement industry, coal mining and other labour work. The raw materials used for the cement production are-limestone, gypsum iron and red alluvium and the major product of this industry is cement with different grades viz. CEM II/B-L, 72.5R and CEM II/A-L42.5N.

Water is an essential factor in the manufacturing processes in every industry. An industrial effluent released in to the water bodies contains different chemicals and other harmful materials which can destroy an aquatic life. Also they may enter into the human body through various sources and will cause number of disorders in various body parts, and even

may cause cancer. Manufacturing of cement is done in rotary kiln from the lime stone, gypsum, clay and other raw materials. The ratio of lime stone and clay is in the proportion of 3:1. This mixture is powdered and slurry is made by mixing water and poured in to the kiln. This slurry is burnt at about 1500°C with a flame from a coal or oil fire leaps up to the tower in a process known as calcination. Thus we get a mixture of silicates and aluminates of calcium which we call it cement.

Thus we get a useful product called cement but during the production of cement manufacturing, about 900 kg of CO<sub>2</sub> is emitted for every 1000 kg of cement, which is harmful for living animals. The heavy metals like thallium, cadmium and mercury are also emitted which are most toxic. That why, the ACC Cement was taken for the study of physico-chemical parameters.

### II. RELATED WORK

Such type of work is carried out by E. E. Ekeng, S. E. Bejor and I. E. Ibiang in south region of Nigeria to assess the qualities of soil, water and air. D. Freeda Gnana Rani, K. Arunkumar and S.R. Sivakumar also performed the same type of work in Ariyalur Tamil Nadu. Though Chandrapur district is having 7-8 cement industries in and around the Chandrapur city, such type of work is not carried out in this particular area, and hence this work is taken for the study.



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## Seasonal Variations in the Physico-Chemical Parameters of Malgujari Pond of Ghugus, District Chandrapur (Maharashtra)

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Received: 05/Oct/2018, Accepted: 20/Oct/2018, Online: 31/Oct/2018

**Abstract:** A Malgujari pond, situated at the heart of Ghugus, an industrial town from district Chandrapur of Maharashtra has been selected for the study of seasonal variations in physico-chemical parameters of water. The period of the study is from December 2015 to November 2017. The following parameters viz-temperature, pH, transparency, conductivity, DO, free CO<sub>2</sub>, BOD, COD, total hardness, chlorides, phosphate, sulphate and nitrates has been taken for the analysis. The present study showed that the atmospheric temperature is higher than that of water. It is maximum during summer while the minimum in the winter season. Conductivity, pH and BOD are also observed maximum in summer while minimum in winter. DO as well as transparency is found maximum in the winter and minimum in monsoon. Free CO<sub>2</sub>, BOD, COD, hardness, chlorides, phosphates, sulphates and nitrates are maximum in summer and minimum in winter. Alkalinity is more in monsoon and found less in winter. Comparatively higher values of conductivity, total alkalinity, chlorides, phosphates and nitrates in Malgujari pond of Ghugus is an indication of its contaminated status.

**Keyword:** Water pollution, physico-chemical parameters, Malgujari pond.

### I. INTRODUCTION

Life on the earth planet is never possible without water and is a most necessary component for living beings, and hence it is called Jivanam in Sanskrit. It is one of the most vital elements for the human environment. It is useful for many purposes like drinking, irrigation, aquaculture and in many industrial processes. 71.9 percent of the earth surface has been covered by water (CIA, 2008). Of this 96.5 percent is the sea water and is not directly used for any purpose. 1.7 percent is in the form of glaciers, and 1.7 percent is ground water. Only 0.1 percent of water is available for all of the processes of living beings. This particular topic has been chosen for the study to bring forward the pollution status of Malgujari pond, in terms of its physico-chemical parameters, as no such information about it is available. Shrivastava and Kanungo (2013), estimated that 70 percent of available water has been polluted due to the discharge of industrial effluents, domestic sewage, and agriculture drainages. Pesticides and fertilizers also add to water pollution. Though the water is the most important commodity of life, its quality is being degraded day by day. Several factors are responsible for the deterioration of water bodies. Some of them are the fast increasing human population, industrialization and excessive use of fertilizers. Some contagious diseases spread through water, so water quality must be good.

Malgujari pond is situated at the heart of the city is about 189 meters above mean sea level. Its geographical position is 19° 56' North and 79° 08' East. Water spread area of the pond is about in 20 acres. The depth of water in monsoon is about 15-18 feet and 4-5 feet during summer. The water from this pond is being used for agriculture and other domestic activities along with fishing. The present study deals with the seasonal variations of the physico-chemical parameters from December 2015 to November 2017.

### II. RELATED WORK

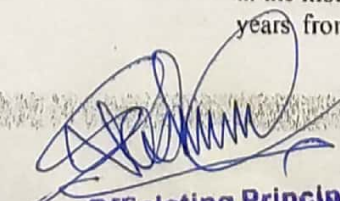
Such type of work is carried out by N. V. Harney, A. A. Dhamani and R. J. Andrew on "Seasonal variations in the physico-chemical parameters of Pindwani pond of Central India" to observe the changes in the physico-chemical parameters with the changing climates. Their objective was to observe the variations in different parameters in different seasons.

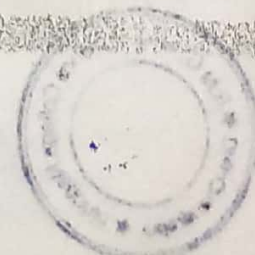
### III. MATERIALS AND METHODS

Collection of the water samples has been done at a depth of 1-1.5 meters from three marginal areas of the Malgujari pond. Sampling has been done in 2-liter capacity dried plastic cans with Refiner's sampler. Samples were collected in the morning hours between 8-10 am, every month for two years from December 2015 to November 2017. Recorded



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## FINE STRUCTURE OF SERTOLI CELL IN INDIAN FLYING FOX, *PTEROPUS GIGANTEUS GIGANTEUS* (BRUNNICH) DURING SEXUALLY ACTIVE AND INACTIVE STAGES

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Received: November 30, 2018; Accepted: March 3, 2019

**Abstract:** The present study was undertaken to reveal ultrastructure of Sertoli cell of non-hibernating bat, Indian flying fox, *Pteropus giganteus giganteus* collected from Bramhapuri forest range, 20°21'52.45"N and 79°53'37.33"E (Maharashtra, India). Ultrastructure of Sertoli cell during sexually inactive period shows hypotrophy of cell organelles with exception to presence of larger quantity of secondary lysosomes, lipid droplets and presence of rudimentary Sertoli cell barrier. Morphology of Sertoli cell during the sexually active stage of *Pteropus giganteus giganteus* reveals variations in cell organelle content of basal, stalk and apical region. Prominence of RER in basal region indicates vigorous protein synthesis while presence of anastomosing network of Golgi complex and vesicular mixed profile of endoplasmic reticulum in stalk region indicative of processing of proteins and its secretion which can be correlated with maximum nutritional need of spermatogenic cells provided by the cytoplasmic processes of Sertoli cell. Specialized junctional complexes between Sertoli and spermatogenic cell are ectoplasmic specializations. blood-testis barrier form as basal ectoplasmic specialization of Sertoli while tubulobulbar complex observed during present study have significant role in the progression and maturation of spermatogenic cell.

**Key words:** Sertoli cell, Indian flying fox

### INTRODUCTION

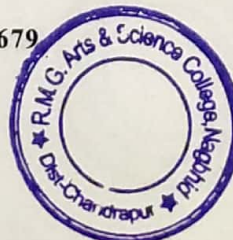
In adult mammalian testis, Sertoli cell performs diverse functions, which includes anchoring and nourishing germ cells, forming blood - testis barrier, removing residual bodies, releasing sperms at the time of spermiation and endocytosis of various substances [1-4]. To carry out all these functions which plays major role in spermatogenesis, Sertoli cell has to undergo structural changes which were in conformation with the changes in the organization of

the germinal epithelium during the annual reproductive cycle. As there is a continual production and upward migration of germ cells, each Sertoli cell at any given point, is in contact with many germ cells that are at different stages of differentiation [5]. Spermiation is complex process involves the removal of excess spermatid cytoplasm, progressive removal of ectoplasmic junctions, formation and degradation of tubulobulbar complex. [3,6-10].

The studies on seasonal variations in the ultrastructure

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*Research Paper*

**PRELIMINARY SURVEY OF AVIFAUNA FROM AGROFOREST ECOSYSTEM  
OF DEV TALAV, NAGBHID (MAHARASHTRA), INDIA**

**Deshmukh G.D. and Rudey, R. J.**

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India.

**Abstract**

The present study was undertaken to explore species diversity of birds, seasonal abundance of birds and their migratory pattern in and around the study area. The study area, Dev Talav (Pond) near Nagbhid (20°33'02.27"N and longitude 79 °39'02.27"E) is a water reservoir, located within the newly approved Ghodazari Sanctuary by Government of Maharashtra. It presents unique geographical site having mountaneous dry deciduous tropical forest, dominated by teak *Tectona grandis* and bamboo *Dendrocalamus strictus*, interspersed with meadows and paddy cultivations. It presents unique geographical site having mountaneous tropical forest range bounding Ghodazari Lake from three sides and Paddy fields on another side. A total of around 105 avian species belonging to 48 families 16 orders were recorded during Jan, 2015 to Dec. 2017. The species recorded included 6 Migrant (M), 32 Passage Migrant (PM) and 69 Residents (R). Among these Orders, Passeriformes is richest orders in terms of avian species diversity, represented by 52 species while families Ardeidae, Accipitridae, Sturnidae and Muscicapidae are found predominant. Present study will helps in designing conservation strategy as this agro-forest ecosystem posing threatened by forest grazing, forest fires during summer, poaching of birds and man-animal conflict and hence require immediate attention.

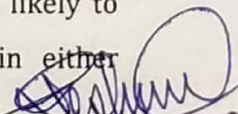
Key words: Avian, Bio-indicator, Diversity, Passeriformes, Muscicapidae.

**INTRODUCTION**

Birds are widespread in their occurrence, almost found everywhere in the world. Bird families and genera have broad geographical ranges, yet many individual species are specialized in their requirements and have narrow distributions. The variety of avian species in ecosystems reflects the well being of its habitat. Birds are likely to work better as biodiversity indicator taxa in terrestrial habitats than in either

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## 22. Histological Assay of the Seminiferous Epithelium Cycle of Indian Fruit Bat *Rousettus leschenaultia* (Desmarest)

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### Abstract

Chiropterans are worldwide in distribution. Their reproductive biology can be as variable as their habits. They have different reproductive strategies. They are important models to understand many interesting problems in reproduction, which have direct relevance to human beings both academically and for application, still limited attention has been given to reproduction in the chiropteran male.

The Indian fruit bat *Rousettus leschenaulti* is selected for present study because of its unique reproductive habits. Present investigation is based on histological study of Seminiferous tubule of Indian fruit bat, *Rousettus leschenaulti* which is one of its own kind. Spermatogenesis is remarkable process occurring in seminiferous tubule. It is a process of transforming round, immotile, diploid cell in to elongated, motile, haploid spermatozoa. In present light microscopic study, seminiferous epithelium of sexually matured male is studied where the spermatogenic cells are found arranged in well defined series of stages or cellular association. 10 stages of tubular morphology are revealed in seminiferous epithelium of *Rousettus leschenaulti* and these stages are repeated at fixed distance in seminiferous tubule.

**Key Words:** Seminiferous tubule, Spermatogenesis, *Rousettus leschenaulti*, Spermatozoa,

### Introduction

Nonhibernating bats display a variety of reproductive patterns even though environmental cues often seen subtle and seasonality is poorly marked (Krutzsch, 1979). Nonhibernating bats demonstrate reasonable synchrony between male and female reproductive



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## 21. Ethnomeicinal Plant *Moringa Oleifera* Lam. Used in the Treatment of Piles

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### Abstract

The present study was conducted in the region of Nagbhid tehsil of Chandrapur district, Maharashtra during two consecutive years (Oct.2014 to Sept.2016) for documentation of ethnomedicinal importance of plants in cure of piles. Twenty three villages were visited and information was documented by contacting and interviewing traditional healers and patients during field work in this region. The information was documented involving field study by contacting and interviewing traditional healers for plants used in cure of piles.

Commonly available medicinal plant *Moringa oleifera* Lam. was selected for the study. The patients who had used the medicines prepared by healers were also interviewed to document information of age group 18 to 78 years. To establish identity, the plants were collected for making herbarium record.

**Keywords:** Traditional Medicinal Plant, Nagbhid tehsil, Piles.

### Introduction

It has been estimated that about 80% of the raw materials for drugs used in the Indian systems of medicine are based on plant products. In order to authenticate such drugs it is important to look for the ancient writings, scientific interpretations of folklore and field work among the aboriginals who are living in close association with plant wealth of the nation.

In Maharashtra alone, there are more than 50 tribes showing great diversity in culture, traditions, customs, medicinal and food habits (Vartak and Gadgil, 1980). The major tribal communities in Maharashtra include Maria, Gond, Bhil, Korku etc. WHO has estimated that 80% of the world's populations rely primarily on traditional medicine (WHO, 1978; Okerele, 1992). The Indian subcontinent is inhabited by approximately 53 million tribals belonging to over 550 tribal communities that are spread over 227 linguistic groups. In India, it is reported



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## A REPORT ON ETHNOVETERINARY MEDICINAL PLANTS OF DEORI TEHSIL, DIST.-GONDIA (M.S.) INDIA

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<sup>2</sup>Department of Botany R. M. G. College, Nagbhid, Dist. Chandrapur (MS) India.

<sup>3</sup>M.P.A.S.C. College Panvel Navi Mumbai.

### ABSTRACT :

The study of medicinal plants used in ethnoveterinary practices was carried out from July 2015 to June 2016 in the nearby villages of Deori Tehsil. During the study, information about ethnoveterinary plants was obtained from local people and Vaidus by regular visit and questionnaire method. The information about the traditionally used ethnoveterinary plants were collected and documented. During the survey, it was noted that different plants were traditionally used by traditional healers to treat various veterinary diseases such as basic first aid for snake bite, indigestion, physio-therapeutic treatment, over cuts and wounds, deworming in cattle, diarrhea, and increases cattle lactation. A total of 37 ethnoveterinary medicinal plants species belonging to 25 families were recorded along with their botanical names, local names, family name, parts used and their ethnomedicinal usage.

**KEYWORDS :** Ethnoveterinary plants, Deori, Vaidus.

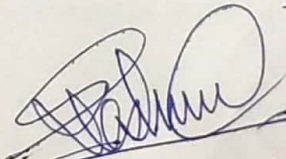
### INTRODUCTION

India is rich flora and fauna. Nature provides different medicinal plants which is important in the treatment of various diseases. Indigenous people have the traditional knowledge about the identification and use of different plants in various diseases and ailments. The knowledge of such plants is an important asset in preparing herbal medicine. Ethnoveterinary is less systematic, less formalized and usually transferred by word of mouth rather than writing (Phondani et al., 2010). The traditional use of medicinal plants in treating veterinary diseases is important in developing countries; where in, typical therapies for animal health care becomes financially difficult for resource poor farmers. Traditional methods of curing diseases serves better as alternative to synthetic and modern concept of treatments (Pandey et al., 2007). According to the World Health Organization, at least 80% of people in developing countries depend largely on indigenous practices for the control and treatment of various diseases affecting both human beings and their animals (WHO, 2002). Ethnoveterinary medicine is important for primary health care for poor communities. Research into ethnoveterinary medicine is often undertaken as part of a community-based approach that serves to improve animal health and provide basic veterinary services in rural areas (Shical et al., 2010). Traditional methods are important for treating veterinary diseases as they are cost effective, has no side effects, easy preparation method and easy availability of source plant. Hence, the current study forms the first report on the ethnoveterinary medicinal plants used by people and local Vaidus of Deori Tehsil.




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## PAPER

 Check for updatesCite this: *Sustainable Energy Fuels*,  
2020, 4, 3654Novel Ru nanoparticle catalysts for the catalytic  
transfer hydrogenation of biomass-derived furanic  
compounds†Atul S. Nagpure,<sup>1</sup> \*<sup>ab</sup> Pranjal Gogoi,<sup>ad</sup> Nishita Lucas<sup>a</sup>  
and Satyanarayana V. Chilukuri<sup>\*ac</sup>

The catalytic transfer hydrogenation (CTH) reaction was investigated for boosting the reduction of biomass-derived furanic compounds to obtain high-quality liquid biofuels. The CTH of 5-hydroxymethylfurfural (HMF) to 2,5-dimethylfuran (DMF) and furfural to 2-methylfuran (MF) was thoroughly studied over the Ru, Pd, Au, Pt, Ni, Rh and Cu metal catalysts supported on nitrogen-doped mesoporous carbons (NMCs) by utilizing 2-propanol as a source of hydrogen. The structural characteristics of the materials were examined by employing various physico-chemical methods, such as XRD, N<sub>2</sub> sorption, CHN analysis, XPS, FT-IR spectroscopy, H<sub>2</sub>-TPR, TEM, CO<sub>2</sub>-TPD, ICP-OES and Raman spectroscopy. The influence of the N content, basicity of the catalyst, reaction temperature, hydrogen donor, nature of the catalyst support and transition metal was systematically investigated with regard to the substrate conversions and product yields. The correlation between the N content (wt%) of the catalysts and the Ru nanoparticle size (nm) and turnover frequency (h<sup>-1</sup>) was also investigated. Highly dispersed Ru nanoparticles (1.9 nm) supported on NMC displayed admirable catalytic performance in CTH for the conversion of HMF to DMF and furfural to MF. The catalyst Ru–NMC with a good N content (11.4 wt%) gave 84 and 87 mol% yields of DMF and MF, respectively, with 2-propanol as the source of hydrogen under mild reaction conditions. In addition, this catalyst demonstrated excellent recyclability. The better catalytic activity of the Ru–NMC catalyst in the CTH of HMF and furfural was credited to the small size of the Ru metal nanoparticles (1.9 nm), high N content, superior metal–support interaction and mesoporous framework of the catalyst.

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rsc.li/sustainable-energy

## 1. Introduction

Taking into consideration the deteriorating oil reserves and the clear visible signs of climate change attributed to the release of greenhouse gases into the atmosphere, the efficient use of renewable biomass raw materials for preparing high-quality fuels and vital chemicals is critical.<sup>1</sup> Worldwide, intense research has been carried out in this area towards the development of processes and active catalysts to transform ample biomass feedstock into fuels for the transport sector as well as to prepare platform chemicals. For these efforts to be translated

into commercial reality, the catalytic processes developed have to be economically feasible in terms of the catalyst cost, its recyclability and ease of operation. The hydrogenolysis reaction holds great promise in the proposed biorefinery concept in order to bring down the high oxygen content of the biomass-derived substrates to obtain useful chemicals and fuels.<sup>2</sup> The selective hydrogenolysis of furfural and 5-hydroxymethylfurfural (HMF) to 2-methylfuran (MF) and 2,5-dimethylfuran (DMF), respectively, holds potential to produce liquid fuel alternatives/additives from sustainable compounds (Scheme 1). Furfural and HMF can be obtained from hemicellulose and cellulose-derived compounds, respectively, through acid catalysis reactions.<sup>3</sup> Both DMF and MF have desirable chemical and physical properties for use as transportation fuels such as greater energy density (33.7 MJ kg<sup>-1</sup> for DMF and 31.2 MJ kg<sup>-1</sup> for MF) than ethanol.<sup>4</sup> They also have a high research octane number (RON = 119 and RON = 103), very little water solubility (2.3 g L<sup>-1</sup> and 7.0 g L<sup>-1</sup>) and appropriate boiling point range (92–94 °C and 64.7 °C).<sup>4</sup> Moreover, DMF needs less energy for separation by distillation, compared to the separation of ethanol from fermented broth.<sup>5</sup> DMF and MF have been effectively investigated as biomass-derived biofuels in a research engine,<sup>6</sup> and their use was found to be quite

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## A NEW ANGIOSPERMIC PETRIFIED FOSSIL WOOD FROM THE DECCAN INTERTRAPEAN BEDS OF JAMSAVLI M.P. INDIA.

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### ABSTRACT:

A well preserved dicot wood was collected from Jamsavali M.P. The wood is dicotyledonous, diffuse porous, vessels mostly solitary and in radial multiples of two. Perforation plate simple. Intervascular pit pairs alternate, bordered, parenchyma paratracheal, vasicentric, wood rays mostly multiseriate and composed of heterogeneous cells, uniseriate rays mostly homogenous. Fibres short, thin walled, nonseptate. The wood though shows some characters of the present day families like Dipterocarpaceae, Lecythidaceae, Connaraceae, Flacaurtiaceae, Lythraceae and Bombacaceae. It has close affinities with the members of the family Bombacaceae. It could not conclusively be traced to any particular genus but it broadly placed under the family Bombacaceae.

**Key words:** - Dicot wood, diffuse porous, ray multiseriate, Bombacaceae.

### INTRODUCTION:

Recent developments have provided a better understanding of the history, evolution and relationships of the angiosperms. In addition, the fossil record, as representative of the history of life, holds the potential for clarifying relationships among extant taxa by revealing extinct mosaic taxa that link modern ones, in addition to providing the general pattern of evolution of taxa through time. Historically, and in the context of evolutionary biology, the fossil record has played both informative and corroborative roles and continues to be called upon to do both. However, the advent of modern methodologies for comparative studies of extant taxa invites a reassessment of the primacy and scope of the fossil record in addressing questions of evolution and systematic relationships (William L.2004). The wood being comparatively more resistant than the other plant parts is often

better preserved depending on the extent of degradation of cellulose layers of cell wall. Some notable fossil woods reported from Deccan Intertrapean beds of India. *Simarubaceoxylon mahurzari* and *Barringtonioxylon deccanese* (Shallom, 1959); *Polyalthioxylon parapaniense* (Bande, 1973); *Ebenoxylon mohgaonse* (Chitale and Patil, 1972); *Syzygioxylon mandlaense* (Ingle, 1973); *Rhamnoxylon intertrapea* (Chitale and Kate, 1971). *Lagerstoemioxylon vasentricum*, *Lagerstoemioxylon eoflosregium*, *Lagerstoemioxylon harsolavense*, *Lagerstoemioxylon obliqueporantum*, *Lagerstoemioxylon eohypolucu*, *Lagerstoemioxylon royi*, *Lagerstoemioxylon parenchymatosum*, *Lagerstoemioxylon floribunda*, *Lagerstoemioxylon eohypolucum* (Harsh and Sharma 1995), *Lythrecoxylon jabalpurii* ( Meshram 2014), *Meliaceoxylon jabalpurii* (Meshram 2016).



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## Diversity of Rhizospheric fungi associated with *Habenaria marginata* Colebr. - a rare terrestrial orchid

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### Abstract

The present study deals with the diversity of fungi present in the rhizosphere of *Habenaria marginata* which is a rare terrestrial orchid. The rhizospheric soil samples were collected from two different districts of Maharashtra i.e. Bhandara & Kolhapur. The fungi from the rhizospheric soil were isolated using serial dilution plate method (Waksman method) and Direct soil plate method (Warcup method). Seven different media were used for the isolation of fungi viz. PDA, CzA, RBA, MEA, SA, CMA and WkM. A total 34 species representing 19 genera were found to be associated with rhizosphere of *H. marginata*. *Aspergillus niger* was the most frequent species isolated from rhizosphere. The maximum diversity of fungi was obtained from the Bhandara district whereas it was least from the Kolhapur district. Diversity indices like Shannon\_H' and Simpson\_1-D were calculated. Shannon\_H' diversity index was found to be in range of 2 to 3 for the rhizospheric soil from both the districts and by both methods whereas Simpsons\_1-D index was found to be 0.9.

**Keywords:** Rhizosphere, Fungi, *Habenaria*, Bhandara, Kohlapur, *Aspergillus*.

### 1. Introduction

The pioneer work on the soil fungi was made by Adametz in 1886 in Germany by isolating several fungal species in the course of his biochemical studies on soils. Hiltner in 1904 for the first time introduce the term 'Rhizosphere'. The rhizosphere soil is the soil of micro-ecological zone present just near the plant root. It is mostly metabolically busier, faster moving and with more competitive environment than surrounding soil [1].

The Rhizosphere is a zone where immense microbial interaction taking place. The exudates released by the plants serves as the main food source for the microorganisms and are responsible for their population density and their activities [2, 3, 4].

Root exudates produced by the plants stimulate the growth of different fungi present in the soil and these lead to a race for inorganic nutrients between roots and microorganism [5, 6]. The mycobiota associated with root plays an important role in the soil ecosystem, influencing many soil biochemical processes which directly impact the growth and health of plants [7].

Orchidaceae is the second largest family of the flowering plants in the world with most morphologically and ecologically diversified plants. This family has near about 22500 species comprising 779 genera [8]. This diversity is represented by 1,331 species belonging to 186 genera of orchids in India [9].



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## Phylloplane of *Habenaria foliosa*- the threatened terrestrial orchid

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**Abstract:** The present investigation deals with the Phylloplane of *Habenaria foliosa* which is threatened terrestrial orchid. The leaf samples were collected from five different districts of Maharashtra viz. Gadchiroli, Chandrapur, Bhandara, Amravati & Sindhudurg. The phylloplane fungi were isolated using leaf dilution method. Seven different media were used for the isolation of fungi viz. PDA, CzA, RBA, MEA, SA, CMA and WkM. A total 33 species representing 20 genera were found to be associated with *H. foliosa*. *Aspergillus niger* was the most frequent species isolated from leaves. The maximum diversity of fungi was obtained from the Gadchiroli district whereas it was least from the Sindhudurg district. *Pestolotiopsis glandicola*, *Nigrospora oryzae*, *Torula herbarum*, *Phoma terricola* were only reported from Gadchiroli and Chandrapur district over the all 7 media.

**Key Words:** Phylloplane, *Habenaria*, PDA, Leaves, *Aspergillus*, RBA, orchid.

### 1. INTRODUCTION:

*Habenaria foliosa* is a threatened terrestrial orchid belonging to Orchidaceae, one of the largest family of Angiosperms. *Habenaria foliosa* is an annual herb growing in the tropical and subtropical regions with the tuberous root system and having flowering period of August-September. Generally this plant is found in the shades of the forest. Two varieties of these taxa are located in Maharashtra out of which the present study is on *Habenaria foliosa* var. *foetida*. Day by day the population of the orchids is decreasing because of poor seed germination, herbivores and anthropogenic activities and these taxa are facing the threats [1].

The external surface of the leaf, an environment for microorganisms has been termed the phyllosphere or phylloplane. Phylloplane is found to be a good platform for the growth of saprophytic fungi since there is a limited availability of nutrients, strong sun irradiation and variation in water availability [2].

The phylloplane fungi play a vital role in the life processes of plant. It plays a key role in cuticle degradation, more enzyme production, defense mechanism and also may lead to disease in the plant. So considering the importance of phylloplane fungi, the aim of this research is to determine the main constituents of the mycoflora on the leaves of *Habenaria foliosa*.

### 2. MATERIALS AND METHODS:

#### 2.1 Plant collection

For the analysis of Phylloplane of *Habenaria foliosa*, the leaves were collected from five different districts of Maharashtra state of India. Leaf samples were taken from Chandpur (N21°28.795' E079°08.865') of Bhandara district, Wadegaon (N20°13'3.2592' E80°8'41.442') of Gadchiroli district, Amboli (N15°55.853' E074°00.838') of Sindhudurg district, Melghat (N21°24.853' E77°08'56.990') of Amravati district and Ghodazari (N20°35.853' E079°38.208') of Chandrapur district.

#### 2.2 Leaf sampling and processing

The leaves of *Habenaria foliosa* were collected in the sterile ziplock bags from sites mentioned above. Care was taken to avoid contact of external environment during travelling. The leaf samples were brought to the laboratory as soon as possible so as to avoid the shrinkage of leaves after being detached from the mother plant.

#### 2.3 Isolation of Phylloplane fungi

For to access the Phylloplane diversity, seven different fungal growth media viz. Potato Dextrose Media (PDA), Czapek Dox Agar Media (CzA), Malt extract Peptone Dextrose Media (MEA), Rose Bengal Agar Media (RBA), Sabouraud's Agar (SA), Corn Meal Agar (CMA) and Waksman's Medium (WkM) were used. The leaf dilution method was employed for the isolation of fungal flora as suggested by the [3].

#### 2.4 Identification of fungi





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## Emergence of long range order for sublattice update in coupled map lattices

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# Emergence of long range order for sublattice update in coupled map lattices

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**Abstract.** We study coupled map lattices in which lattice is divided into  $k$  sublattices updated sequentially. We obtain stability conditions for synchronized fixed point for any coupling. For synchronous update and nonlinear coupling, synchronized fixed point cannot be stabilized. But it is possible for a sublattice update. Novel bifurcations such as bifurcation to period-3 can be obtained in this case. Thus the phenomena which are usually not observed in coupled map lattices with synchronous dynamics can be observed with a sublattice update. We define an order parameter to quantify the transition to synchronization and observe a power law decay at the critical point. We also observe a power law decay of persistence at the critical point. The exponents change with  $k$  and approach a limiting value.

## 1 Introduction

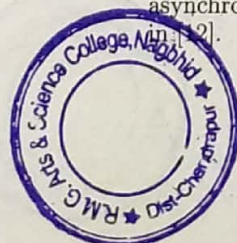
Transition to synchronization in spatially extended systems has been studied for more than two decades now. The transition to synchronized fixed point or a synchronized periodic orbit or an orbit periodic in space and time has been investigated analytically as well as numerically [1]. These studies have been conducted on a regular  $d$ -dimensional lattices as well as on complex networks [2]. The stability conditions are usually related to the eigenvalue spectrum of corresponding Laplacian. These studies are conducted both for coupled oscillators as well as for coupled map lattices (CML) [3]. These transitions are also studied from the viewpoint of dynamic phase transitions [4]. The synchronized state is an absorbing state since equations of motion are such that if we start with a synchronized state, it stays synchronized. One of the most prominent and generic universality class in absorbing state transitions is that of the directed percolation (DP) [4]. It is not surprising that often transition to synchronization in the directed percolation universality class. Of course, in presence of certain symmetries, (or for carefully prepared “designer” systems) different transitions could be obtained in the coarse-grained sense. For example, Miller and Huse [5] obtained Ising type transition for a certain type of maps in coupled maps. A similar transition was obtained for coupled logistic maps in 1-d as well [6].

However, it has been shown that delicate details of the mode of update change the nature of the transition. Marcq, Chate, and Manneville [7] showed that for synchronized update mentioned above, Miller and Huse [5]

model actually shows a transition in a new universality class since the correlation length exponent is different. For the random sequential update, the Ising universality class is restored. Rolf, Bohr, and Jensen [8] showed that for the parallel update, the transition to synchronization in coupled map lattice model does not belong to the directed percolation universality class and the transition is not even universal. However, if the system is updated in asynchronous mode, the transition is in the directed percolation universality class. The transitions in delayed dynamical systems can be mapped on dynamic phase transitions in pseudo-spatiotemporal systems. For a delayed logistic map, this transition is in directed Ising universality class by Lepri [9] and later confirmed by Mahajan and Gade [10]. There are two different absorbing states in this system that are linked by symmetry. In this case, the update is sequential and in “typewriter” mode. Thus the mode of update changes the universality class of dynamic phase transition. This is a very interesting finding since the universality class in seemingly disparate systems in equilibrium phase transition is found to be the same and it depends only on dimensionality and symmetries. (Of course, mode of the update is not a meaningful term for equilibrium systems.) Though there are several reports on the change in the universality class for different updating scheme, the parallel and synchronous update is the most studied updating scheme.

In coupled map lattices Gupte, Janaki and Sinha showed that with the synchronous update, we observe multiple co-existing attractors while for asynchronous update more global attractors are obtained [11]. The asynchronous update of cellular automata is also studied

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## Diversity of Wetland Birds at Bikli Lake near Nagbhid, Maharashtra (India)

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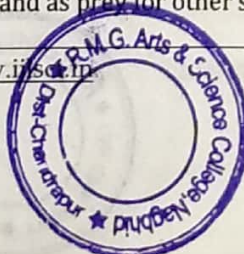
Available online on  
<http://www.ijlsci.in>  
ISSN: 2320-964X (Online)  
ISSN: 2320-7817 (Print)**ABSTRACT**

The present study was undertaken to explore water bird diversity, and their residential status in and around the study area. Bikli lake (20°65'70.07"N and 79 °61'12.74"E) is located within newly approved Ghodazari Sanctuary by Government of Maharashtra, spreads over an area of about 90 Acres. The shallow water reservoir dispersed with shrubby islands and surrounding dense semi-deciduous tropical forest on one and paddyfields on another, presents unique agro-forest ecosystem which provides suitable feeding ground for wetland avifauna. During study period, spanning from, May, 2015 to April, 2017, in total 5022 specimens of 52 species, belongs to 35 genuses, were recorded. They belong to 14 families and 7 orders. Maximum abundance recorded from Ord - Charadiformes with 28.57 % (n=16) of abundance followed by ord-Anseriformes and Peliconiformes 21% (n=12) among the observed community of water birds, fam- Anatidae recorded maximum abundance with 23% (n=12) followed by Fam-Ardeidae 17.30 % (n=9) and Fam - Scolopacidae 15.38% (n=8). The results obtained in the present investigation of bird indicates that, agro-forest ecosystem of Tukuim pond impacted the composition of bird community, as 64% of total birds are residents or residents showing local migration (R and R/LM) is in conformity with other studies on avian diversity in area having agricultural landscape. Painted stork (*Mycteria leucocephala*), Black Headed Ibis (*Threskiornis melanocephalus*) and Darter (*Anhinga melanogaster*) included in the Near Threatened (NT) category. The present study suggested that, as study site has been visited by the numerous migratory during winter season, due to anthropogenic disturbances like intensification of agricultural activities, poaching and intensified fishing activity, there is urgent need to chalk out conservation measures in near future.

**Keywords:** Peliconiformes, Anatidae, Charadiformes, Darter.

**INTRODUCTION**

Birds play many important functions to maintain the health of ecosystems through their actions as pollinators, seed dispersers, predators, scavengers, and as prey for other species. (Gregary, et al., 2003). Wetland



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# Active and Recyclable Gold Metal Nanoparticles Catalyst Supported on Nitrogen-Doped Mesoporous Carbon for Chemoselective Hydrogenation of Cinnamaldehyde to Cinnamyl Alcohol

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**Abstract:** Several supported gold metal catalysts with different Au nanoparticles sizes were prepared and evaluated for the chemoselective hydrogenation of cinnamaldehyde (CA) to cinnamyl alcohol (CAL). To investigate the structure-activity relationship, stability of catalyst, heterogeneity and recyclability, the structural characteristics of materials and Au catalysts (fresh and spent catalysts) were studied by employing variety of physico-chemical techniques. The interrelationship among Au nanoparticles size (nm) with turnover frequency ( $\text{h}^{-1}$ ) of Au catalysts has also been explored. Among the various Au catalysts tested, nitrogen-doped

mesoporous carbon (NMC) supported Au catalyst having homogeneously dispersed (78.8%) Au nanoparticles (1.6 nm) synthesized by sol-immobilization method (Au-NMC-SI) demonstrated improved catalytic activity affording 78% CAL selectivity and 94.2% CA conversion without using any promoter. Moreover, Au-NMC-SI catalyst exhibited good recyclability and stability. The catalyst synthesis approach described in this investigation opens up a novel strategy for the design of highly efficient metal nano-catalysts supported on NMC materials.

## 1. Introduction

In recent years Au metal catalysts have stimulated enormous attention in the scientific community.<sup>[1]</sup> Extensive research investigations have been reported using supported Au metal catalysts, for example epoxidation of propene,<sup>[2]</sup> oxidation of alcohols,<sup>[3]</sup> water-gas shift reaction,<sup>[4]</sup> activation of cyclohexane,<sup>[5]</sup> preparation of hydrogen peroxide,<sup>[6]</sup> hydrogenation reactions,<sup>[7]</sup> etc. The significant aspects, various preparation methods, characterization techniques, catalytic applications and current improvements for Au metal based catalysts are systematically summarized in review article by Alshammari *et al.*<sup>[8]</sup> Porous materials are highly useful in design and development of abundant active heterogeneous catalysts and these catalysts have been efficiently utilized in various chemical transformations.<sup>[9–16]</sup>

Chemoselective hydrogenation of  $\alpha,\beta$ -unsaturated carbonyl substrates to the analogous allylic alcohols is a key step in the chemical industries to synthesized plenty of valuable platform chemicals.<sup>[17–22]</sup> Cinnamaldehyde (CA) is a ideal  $\alpha,\beta$ -unsaturated aldehyde substrate. CA is an important molecule, since CA can be appropriately hydrogenated to cinnamyl alcohol (CAL) and hydrocinnamaldehyde (HCA), controlled by if the C=O bond or C=C bond is hydrogenated (Scheme 1). Importantly, CAL is a vital chemical intermediate species for the manufacture of many chemical entities, pharmaceuticals, fine chemicals, cosmetics, perfumes and so on.<sup>[17–22]</sup>

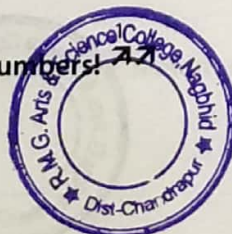
Various research groups have inspected the chemoselective hydrogenation of CA to desired compound.<sup>[23–51]</sup> The Pd/carbon nanofibers (CNFs),<sup>[23]</sup> Pd/multiwalled carbon nanotubes (MWCNTs),<sup>[24]</sup> Pd/C,<sup>[25]</sup> Pd/nitrogen-doped carbon nanotubes,<sup>[26]</sup> Pd/few-layer graphene,<sup>[27]</sup> Pd/ $\gamma$ - $\text{Al}_2\text{O}_3$ ,<sup>[28]</sup> Pd/ $\text{SiO}_2$ ,<sup>[29]</sup> Nickel phosphide/ $\text{SiO}_2$ ,<sup>[30]</sup> and Cu/ $\text{SiO}_2$ ,<sup>[31]</sup> were active catalysts for the hydrogenation of CA to attained HCA. Several metal catalysts were used for the CA hydrogenation to obtained CAL.<sup>[32–51]</sup> Bitter *et al.* studied the consequence of metal particle size on the products selectivity in the CA hydrogenation over Pt and Ru catalysts supported on CNFs.<sup>[32]</sup> Over these catalysts with oxygen functional groups on the CNFs surface, the bigger metal particles (3.5 nm) illustrate elevated selectivity for CAL. Interestingly, when the oxygen groups were removed from the CNFs surface, the smaller metal particles (2 nm) demonstrate superior CAL selectivity. Authors explained this metal particle size effect on products selectivity by an alteration in the adsorption mode of CA molecule with the polarity of the catalyst support. Rong *et al.* achieved 69.6% CAL selectivity at 89.6% CA conversion by using reduced graphene oxide supported Pt catalyst.<sup>[33]</sup> Huang *et al.* reported Pt nanoparticles catalyst restricted within the apertures of an amino-functionalized Zr-terephthalate metal-

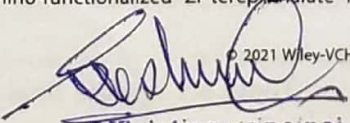
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# Efficacy of clay catalysts for the dehydration of fructose to 5-hydroxymethyl furfural in biphasic medium

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## Abstract

5-Hydroxymethyl furfural (HMF) is one of the important platform chemical obtained from C6 sugars derived from biomass. The efficiency of montmorillonite clay catalysts (K-10, K-20, K-30, and Al pillared clay) has been systematically explored for the synthesis of HMF through dehydration of fructose in a biphasic solvent system. The catalysts were characterized by XRD, N<sub>2</sub> sorption, <sup>27</sup>Al MAS NMR, <sup>29</sup>Si NMR and FT-IR of chemisorbed pyridine. Acid treated K-10 catalyst was found to be the best among the clay catalysts tested. Various reaction parameters such as reaction temperature, catalyst content, solvent were optimized for achieving better yield of HMF. Under optimized reaction conditions, K-10 catalyst affords 80 mol% fructose conversion with HMF yield of 61 mol%. Insight into the type of acid sites essential for such cascade reactions has been furnished. Utilization of clay catalysts for HMF production will be beneficial to improve overall economics for the production of platform chemicals like HMF from biomass-derived raw materials.

**Keywords** Fructose · 5-Hydroxymethyl furfural · Clays · Insights · Acidity

## 1 Introduction

Diminishing fossil fuel reserves, energy crisis, global warming and its detrimental effects on the environment are forcing the society towards sustainable development. In this context, the use of lignocellulosic biomass as renewable feedstock for deriving fuels and chemicals is a judicious approach and

has emerged as a potential area of research [1]. Among the various components of lignocellulosic biomass, saccharides are a promising carbon-based renewable source which are being efficaciously explored for the synthesis of numerous important chemicals [2, 3]. Currently, innovative methods and strategies are being developed to overcome the problems of their low solubility and polyfunctionality hindering their utilization. One such approach is the dehydration of hexose sugar to get HMF. This furan-type molecule is a building block platform chemical, as it can undergo various transformations to give other highly important chemical intermediates [4]. For example, 2,5-furandicarboxylic acid (FDCA), which is obtained on selective oxidation of HMF has potential to replace terephthalic acid in the production of polyesters [5–8]. 2,5-Dimethyl furan (DMF), which is obtained by hydrogenolysis of HMF has excellent fuel properties and is superior to bio-ethanol in terms of calorific value and flammability [9, 10]. Chemicals obtained on reduction of HMF to yield 2,5-bis(hydroxymethyl)tetrahydrofuran and 2,5-dihydroxymethyl-furan are widely seen as alcohol components, highly useful in the production of polyesters [11, 12]. Levulinic acid (LA), a rehydration product of HMF, is significant bulk chemical with versatile applications [13]. Additionally, numerous phenolic resins and polymerizable furanic compounds with promising properties have been

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# Diversity of *Aspergillus* species from Nagpur University Campus

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**Abstract:** *Aspergilli* are cosmopolitan group of mould first described by Pier Antonio. Members of the genus *Aspergillus* are highly opportunistic growing easily on carbon rich substrates with monosaccharide and polysaccharides throughout the year. The present study evaluates the diversity of *Aspergillus* present in the Rashtrasant Tukadoji Maharaj Nagpur University Campus. A total of 14 different species of *Aspergillus* were isolated from the sampling area from the three different medium viz. Air, soil and leaf litter. *Aspergillus niger* was found to be the dominant one among others. The growth response of the isolated species of *Aspergillus* was tested over three different media viz. PDA, CzA and MEA.

**Keywords:** *Aspergillus*, Air, Soil, Leaf litter.

## I. INTRODUCTION

*Aspergillus* is a cosmopolitan fungus whose spore are present in the air whose characteristics are of high pathological, agricultural, industrial, pharmaceutical, scientific and cultural importance and play important role in the degradation of organic substrate, particularly plant material [1, 2, 3]. *Aspergillus* are not only very well known fungus in the world of mycology but also known for their ability to secrete a variety of biologically active chemical compounds including antibiotics, mycotoxins, immunosuppressant and cholesterol lowering agents [2].

The *Aspergilli* have become increasingly important as responsible agents in a number of industrial fermentations. Many of them are being found capable of producing antibiotic substances and their possible use in this field will undoubtedly be exhaustively explored. *Aspergillus flavi* (*Aspergillus oryzae*, *Aspergillus sojae* and *Aspergillus tamarii*) were used in oriental food fermentation process [4]. Up till now More than 250 species of *Aspergillus* have been reported from different parts of the world. Generally, basic essential tool for identification of *Aspergillus* species are macroscopic characteristics such as colony diameter, conidial color, exudates, colony reverse and microscopic characteristics including conidiophore, vesicle, metulae, phialides and conidia [5]. *Aspergillus* species is cosmopolitan, filamentous, saprobic fungus in nature, especially during the autumn and winter months in the Northern hemisphere. It is primarily isolated from soils, especially indoor soil, decomposing plant material and indoor air environment.

There are around one hundred eighty-five species under the genus *Aspergillus*. Around twenty species have been reported so far as causative agents of opportunistic infection in humans. Among these, *Aspergillus fumigatus* is the most frequently isolated species followed by *Aspergillus flavus* and *Aspergillus niger*. Other species not often isolated opportunistic pathogens are *Aspergillus clavatus*, *Aspergillus glaucous*. Invasive fungal infections, particularly "Aspergillosis" is an increasing problem in immune-compromised patients.

The *Aspergilli* has been found cosmopolitan in nature and have become increasingly important as responsible agents in a number of industrial fermentations. Many of them are being found capable of producing antibiotic substances and their possible use in this field will undoubtedly be exhaustively explored. It also hazardously affects the human health. For these reasons, the need for the study of diversity of *Aspergillus* present in the Mahatma Jyotiba Phule Educational Campus of RTM Nagpur University area was undertaken.

## II. MATERIALS AND METHODS

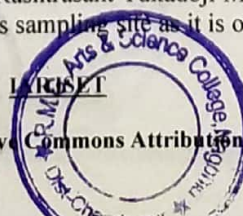
For the present study following methodology were used.

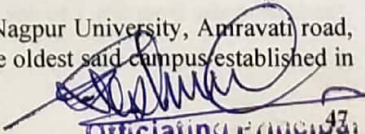
### A. Selection of sample site

Mahatma Jyotiba Phule Educational Campus of the Rashtrasant Tukadoji Maharaj Nagpur University, Antravati road, Nagpur (Maharashtra State) India has been selected as sampling site as it is one of the oldest said campus established in

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**REINVESTIGATION OF ANGIOSPERMIC PETRIFIED FLOWER  
FROM THE DECCAN INTERTRAPPEAN BEDS OF INDIA.**

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**Abstract:** A well preserved dicot flower was collected from Singhpur (Lat 21°, 30' to 22°, 55'N and Long 78°, 15' to 79°, 20' E) in Chhindwara District, M.P. The present fossil specimen is a small Flower stalked, bisexual, hypogynous, monochlamydous, actinomorphic 1.2cm long and 0.7cm broad; perianth lobes five united, valvate, tubular, tips free ; stamen 7-8 of unequal length, epiphyllous, curved inwards anther dorsifixed, 2 lobes, 4 locular, 0.6 mm long, dehiscence longitudinal, pollen 37µ x 40 µ, monocolpate, circular to oval, gynoecium stalked, 5 angled, ovary superior, 5 locular; placentation axile, single rows of ovules in each locule, style short, stigma simple, no nectary. Fossil flower shows resemblance to family **Rhizophoraceae**, **Samydaceae**, **Sorneratiaceae** and **Lythraceae**. It has close affinities with the members of the family **Lythraceae**. It could not conclusively be traced to any particular genus but it broadly placed under **Lythraceae**.

**Key-words:** *Dicot flower, stalked, bisexual, hypogynous, monochlamydous, actinomorphic Lythraceae Deccan Intertrappean, M.P.India.*

**खपीवीलीकेप**

The presence of petrified flower from the Deccan Intertrappean series is very interesting in the history of angiosperm, because the occurrence of petrified flower is a rarity. This new flower from Singhpur locality again proves the importance of Deccan Intertrappean beds in India. The present specimen was very well preserved showing detailed internal structures.

So far, number of flowers have been described from these series which includes *Sahnianthus parijai* (Shukla 1944), *Sahanipushpam shuklai* (Verma 1956), and *Sahnipushpum shuklai* (Prakash and Jain 1964 and Chitaley 1964), *Raoanthus intertrappea* (Chitaley & Patel 1975) *Chitaleypushpam mohagaense* (Paradkar 1971), *Shuklanthus superbum* Verma. (Chitaley & Patil 1971) *Deccanthus savitrii* (Chitaley and Kate 1974), *Tilianthus bensonii* (Yawale and Adhao 1987), *Sahnianthus dinecterium* (Shukla 1958), *Liliaceopushpam deccanii* (Narkhede and Patil, 2006). *Lethraceopushpam Mohagaence* ( Meshram and Narkhede 2010), *Singpuria kapgateii* (Ramteke and Manchester 2020)

The present flower though shows similarities with some of these previously described fossils it has some peculiar characters not observed in any one of the above mentioned flowers.

**चरीशीळरथ रपव चरीहीव**

The study of the flower is based on part and counter part of the specimen. Both these parts were serially sectioned for studying the anatomical details. While preparing the section grinding of the fossil was totally avoided. Camera Lucida sketches of the series and the anatomical details were drawn.

**अशीलीकीकेप**

**Flower:** The petrified flower is stalked, bracteate, actinomorphic, bisexual, monochlamydous with epiphyllous stamen. Dorsifixed with undehisid anthers. Ovary stalked, superior, five locular,





# Biodiversity of *Aeromycoflora* in indoor environment of Nagbhid (M. S.) India

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**Abstract:** The different component of air may have important effect on the health of man and animals, both individually and through their interactions. The present investigation was carried out to monitor the occurrence of indoor aeromycoflora at two different sites of Nagbhid during June 2013 to May 2014. Air sample was collected at each site twice in a month by exposing petriplates containing Potato Dextrose Agar (PDA). Total 498 colonies were recorded. The fungal colonies were asses on the basis of micro and macro morphological characteristics. Winter season favors the occurrence of more fungal colonies. In this investigation, the predominant fungi observed were *Aspergillus niger* (18.29%), *A. flavus* (11.04%), *A. fumigatus* (7.23%), *Curvularia lunata* (6.83%), *Cladosporium* spp. (6.43%). The rainfall (mm), temperature (°C) and relative humidity (%) was noted and occurrence of fungi was correlated with these meteorological factors.

**Keywords:** Air, PDA, fungi, Meteorological factor.

## I. INTRODUCTION

Fungal spores are one of the dominant components in the air and on account of their dimensions (several micrometers), they are classed as a bioerosols [1]. The study of aeromycoflora of particular region provides the clear view about interaction of fungal spores in the form of disease on plants as well as occurrence of allergy in human being. If the specific fungal allergen is identified, the most effective therapy is specific hyposensitization, as complete avoidance is impossible [2]. So, it is of great clinical value to know the identity of the dominant airborne fungi in a particular area, as the fungal population varies from one place to another. The investigation on common airborne fungi and their distribution in a particular region can be helpful in identifying association between fungal sensitization and clinical diagnosis and clinical prevention of the seasonal allergic diseases [3]. Fungal organisms in indoor environment caused spoilage of stored grains and food stuff [4], fabrics, leather and other similar articles [5] and bio- deterioration of books and other material [6]. Fungi have some important structure that may help them to survive even in the unfavorable conditions.

Keeping this in mind a systematic intramural investigation was carried out in Nagbhid for a period of one year from June 2013 to May 2014.

## II. MATERIAL AND METHODS

**Study site:** Aeromycological survey was carried out at Nagbhid, Dist Chandrapur, from June 2013 to May 2014. Two sites were selected for present study viz. Site I - Primary Health care centre (PHC) and site II - Science wing of RMG College Nagbhid, Dist. Chandrapur, India.

**Media used:** Potato Dextrose Agar (PDA) medium is used for the present study. This media probably provides the nutritional need of the fungi.

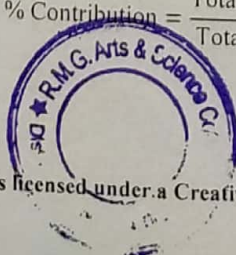
**Collection of sample:** Petriplates were exposed for 5 minutes twice in a month at each site. They were incubated at room temperature for the growth of fungal colonies. After exposing, the Petri plates containing the samples were incubated for 3 to 5 days at room temperature (25 to 28°C).

**Identification:** The fungal colonies were identified by colony morphology and characteristics of sporulation. The fungi were identified up to genus level and in some cases up to species level. The identification of the colonies was done with the help of standard literatures [7-11].

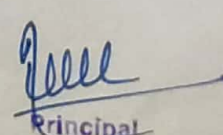
Percentage contributions of individual species were calculated as per the standard formula:

$$\% \text{ Contribution} = \frac{\text{Total no. of colonies of one species}}{\text{Total no. of colonies of all species}} \times 100$$

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## REVIEW

Bacosides from *Bacopa monnieri* extract: An overview of the effects on neurological disordersSamarpita Banerjee<sup>1</sup> | Utpal Anand<sup>2</sup> | Suchhanda Ghosh<sup>1</sup> | Durga Ray<sup>3</sup> |  
Puja Ray<sup>4</sup> | Samapika Nandy<sup>4</sup> | Ganpat Dewaji Deshmukh<sup>5</sup> | Vijay Tripathi<sup>6</sup> |  
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From ancient history, complementary and alternative medicines have played a significant role as holistic therapeutic treatments of various human diseases including cancer, diabetes, neurological diseases, and skin problems. One Indian medicinal plant (herb), *Bacopa monnieri* has been used in many parts of the world as such medicine, particularly for the treatment of various neurological disorders. It is well known as a potent "tonic for the human brain," which serves as a memory enhancer. Multiple studies proved that this herb contains a plethora of potential bioactive, phytochemical compounds with synergistic properties. The main purpose of the present review is to shed light on the use of *Bacopa monnieri* and its active principles (bacosides) in the management of neurological disorders. Furthermore, the signaling pathways modulated by bacosides have been critically discussed in this review. Moreover, we have critically summarized the present knowledge of this perennial creeping herb based upon the literature mining from different scientific engines.

## KEYWORDS

*Bacopa monnieri*, bioactive, complementary and alternative medicines, neurological disorders, nootropic, phytochemical

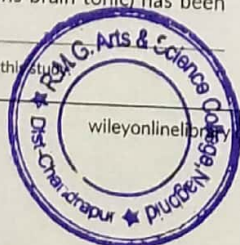
## 1 | INTRODUCTION

Bacosides are compounds extracted from *Bacopa monnieri* (L.) Wettst., belonging to the family Scrophulariaceae. Is a folk-medicinal substance used as a cognitive, memory enhancing, nootropic, antiinflammatory, analgesic, spasmolytic, antiepileptic, anticancer, antischizophrenic, antidiarrhoeal, antiulcer, anticonvulsant, antipyretic, antirheumatic, and sedative agent (Malishev et al., 2017; Mishra, Mishra, & Jha, 2018) (Figure 1). It is also used to treat depression, anxiety and systemic disorders like cardiovascular, hepatic, gastrointestinal, myocardial ischemia, neurological, respiratory problems and opioid-related nephrotoxicity and hepatotoxicity (Kamkaew et al., 2019; Srimachai et al., 2017; Shahid et al., 2016). Brahmi (*Bacopa monnieri*), known as "medhya rasayanas" in Ayurveda (which means brain tonic) has been

considered as a prominent Ayurvedic medicine in India for almost 3,000 years and it is mainly due to the presence of alkaloids, glycosides, flavonoids, and characteristic saponins called "bacosides," which are complex mixtures of structurally similar compounds, glycosides of pseudojубogenin or jубogenin (Charoenphon et al., 2016; Dowell, Davidson, & Ghosh, 2015). Brahmi Ghrita, a popular medhya drug mentioned in Ayurveda contains 20% of bacoside A in 5 µl of Brahmi Ghrita, determined by high-performance thin-layer chromatography (HPTLC) method (Gubbannavar, Chandola, Kalyani, & Shukla, 2012). The hydroalcoholic/alcoholic extracts of the plant are known to have the following constituents: dammarene type of triterpenoid saponins with pseudo-jубogenin or jубogenin as aglycones, bacopasaponins A-G, bacoside I-III, III-V, and bacosides A1-A3. But, the nootropic activity of the plant has been proved to be mainly due to the presence of bacoside A and bacoside B (Deepak & Amit, 2004). The plant has also been reported to have stigmasterol, betulinic acid, flavonoids like

Samarpita Banerjee and Utpal Anand contributed equally to this study.

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## Traditional Herbal Medicines for the Treatment against Snake Bite

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**Abstract:** Since prehistoric time plants has been known to use for different diseases. In India variety of medicinal plants found in different geographical and ecological conditions. So many medicinal plants are used against snake bite either singly or with combination of other plant. The present study was undertaken to recollect information regarding medicinal plants used for snake bite treatment in Deori Tehsil of Gondia district (MS). The information was obtained from Local healers, aboriginal people and local peoples from the area. The data have been compiled with emphasis on the plants, family, local name, parts used etc. 9 different plants were documented during investigation from the study area which belong to 9 different families that act as antidotes against snake bites.

**Key Words:** Antidote, Snake bite, Medicinal plants, Local healers.

### 1. INTRODUCTION:

Human being, from the history of his evolution he is dependent on the nature for his fundamental needs viz. food, shelter, cloths and medicines. This dependency led the aboriginal people to develop an exclusive system of knowledge about plants; which play several important functions in human life. These aboriginal peoples made a sustainable agriculture and natural-resource development which means the utilization, management and conservation of the natural resource base and the orientation of technological change to ensure the attainment and continued satisfaction of human needs for present and future generations [1].

Local healers are the group of people known as "Vaidya or Vaidu" (A person having traditional knowledge of medicinal plants and medicine preparation). According to the World Health Organization, most populations still rely on traditional medicines for their psychological and physical health requirements [2]. In recent past new allopathic drugs have been invented but have many side effects. The plant based medicines have no side effects on the human body. Due to the various undesirable effects of some modern-day drugs, an increasing number of people from both developed and developing countries have turned towards medicinal plants [3].

India is a developing country with the majority of its population living in the rural areas. A typical rural life of Indians includes the houses made with the mud with agriculture in the adjoining areas, herbs, shrubs and trees making the habitat more suitable for the venomous snakes. Villagers are commonly facing the problem of snake bite but these villages do not have any readily available modern medical facilities until they reach to the nearby city area. Common peoples have myth that every snake is poisonous. Of the 2,700 known species of snakes, only about 300 are venomous and rest are non-venomous. Worldwide about 30,000 to 40,000 people die annually because of snake bites. Of these, about 25,000 people die in India, mostly in rural areas [4].

Rural people are dependent on Vaidus for their therapeutic needs unless the disease is complicated. Most of the Vaidu medicinal therapy is based on crude drug where whole plant or plant part is used for treatment in the form of juice, decoction, paste or pills, the administration being either oral or topical depending on the nature of the disease. Venomous snake bites are also treated by vaidus with plants [5].

While there are so many plants reported to use against snake bite, this study concentrate on the plants used by aboriginal and local peoples of the Deori tehsil of Gondia district of Maharashtra state (India).

### 2. MATERIALS AND METHOD:

**Investigation region:** The present study was undertaken in Deori Tehsil of Gondia District. Deori Tehsil is the western most district of the Vidharbha, of the Maharashtra State. The district is situated between 21° .04'N and 80° .22'E. The people of the study area are basically agriculturists and most of them are having domestic animals such as cow, goat, sheep and buffalos. The area has not well supported with the veterinary doctors and hospitals. This facility is present only in the center place Deori from which the distance of different villages is nearly 4 km to 25 kms. After snake bite local healers treat the patient with locally available medicinal plants. Deori is surrounded by deep forest with large number of wild plants and animals. This area is attached to the Nagzira Tiger Reserve forest as well as Navegaon Reserve forest.







## Biotechnological interventions and indole alkaloid production in *Rauvolfia serpentina*

Abhijit Dey<sup>1</sup> · Debleena Roy<sup>2</sup> · Vikas Moreshwar Mohture<sup>3</sup> · Mimosa Ghorai<sup>1</sup> · Md. Habibur Rahman<sup>4</sup> · Uttpal Anand<sup>5</sup> · Saikat Dewanjee<sup>6</sup> · Radha<sup>7</sup> · Manoj Kumar<sup>8</sup> · Dorairaj Arvind Prasanth<sup>9</sup> · Niraj Kumar Jha<sup>10</sup> · Saurabh Kumar Jha<sup>10,11,12</sup> · Mahipal S. Shekhawat<sup>13</sup> · Devendra Kumar Pandey<sup>14</sup>

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### Abstract

*Rauvolfia serpentina* (L.) Benth. ex Kurz. (*Apocynaceae*), commonly known as *Sarpagandha* or Indian snakeroot, has long been used in the traditional treatment of snakebites, hypertension, and mental illness. The plant is known to produce an array of indole alkaloids such as reserpine, ajmaline, amalicine, etc. which show immense pharmacological and biomedical significance. However, owing to its poor seed viability, lesser germination rate and overexploitation for several decades for its commercially important bioactive constituents, the plant has become endangered in its natural habitat. The present review comprehensively encompasses the various biotechnological tools employed in this endangered Ayurvedic plant for its in vitro propagation, role of plant growth regulators and additives in direct and indirect regeneration, somatic embryogenesis and synthetic seed production, secondary metabolite production in vitro, and assessment of clonal fidelity using molecular markers and genetic transformation. In addition, elicitation and other methods of optimization of its indole-alkaloids are also described herewith.

### Key points

- Latest literature on in vitro propagation of *Rauvolfia serpentina*
- Biotechnological production and optimization of indole alkaloids
- Clonal fidelity and transgenic studies in *R. serpentina*

**Keywords** *Rauvolfia serpentina* · Indole alkaloids · Reserpine · Micropropagation · Plant growth regulators · *Agrobacterium* · Hairy root culture · Synthetic seed

### Introduction

*Rauvolfia serpentina* Benth. ex Kurz, commonly known as *Sarpagandha* or Indian snakeroot, belongs to the family *Apocynaceae*. The plant is mostly distributed in the Indian subcontinent and south-east Asia. In Ayurveda, Unani and traditional medicine, the plant was reported against snakebite, insect stings, psychological disorders, insomnia, melancholia, schizophrenia, skin diseases, high blood

pressure, circulatory disorders, hypertension, rheumatism, gastrointestinal ailments, asthma, fever, pneumonia, body pain, malaria, scabies, spleen diseases, eye diseases, AIDS, veterinary diseases, etc. (Dey and De 2010; Dey and De 2021, Pandey and Radha 2016). The important bioactive alkaloids reported from the plant are reserpine, reserpiline, rescinnamine, ajmaline, ajamalacine, deserpidine, serpinine, serpentine, serpentinine, rauvolfinine, deserpidine, vomilenine, yohimbine, picrinine, norseredamine, vinorine, seredamine, etc. (Dey and De 2010; Pandey et al. 2016). Besides, other phytochemicals such as stigmaterol (Dey and Pandey 2014a, b; Dey et al 2016) and rutin were also reported (Dey and De, 2010). The plant has also demonstrated many pharmacological attributes such as antihypertensive, antiarrhythmic, anti-inflammatory, anticancer, and antimicrobial properties (Dey and De 2010; Mukherjee et al 2019). However, the major shortcoming in the propagation

Abhijit Dey and Debleena Roy have an equal contribution.

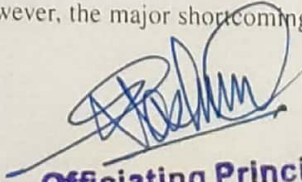
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## Lokmanya Tilak Public Library: A Knowledge Tree

Mr. Chakradhar V. Bhurre

### Abstract

If a public library is doing a good job for the society, it is important to mention it. That is why the present article mentions its past history, number of readers, services provided in open door library, reference services, various departments, computerization programs, library time and awards received.


**Keywords** - Public Library, Library, Services, Library Department, Computerization

### History

Native libraries were started from 1838 in small and big cities of Maharashtra. But his main objective was to quench the hunger of the British who came to India for the sake of rule. So naturally, such libraries were filled with English texts. Marathi books or texts were not included there. Later, Hon. It was shifted to a new building with the help of Madhavraoji Kalikar. When Mahatma Gandhi was assassinated on January 30, 1948, the library was completely burnt down, manuscripts and rare literature were destroyed, and the library was closed and re-established on May 28, 1963.

Today, the library has 39,000 books and currently has 2,000 members of all kinds. These books are made available to the readers free of cost through this library. Books on various subjects have been neatly presented in the library of this library which has been promoting reading culture for 118 years till date.



  
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# Study of Zooplankton Population Density of Pardi Lake Gadchiroli, MS, India

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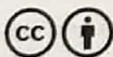
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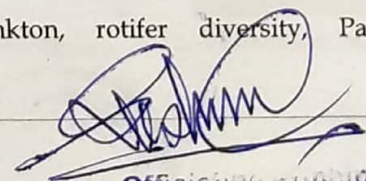
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## Abstract

Zooplankton are diverse groups in nature and they are found in almost all water bodies. The present investigation work was carried out on the zooplankton population density of Pardi lake, Gadchiroli (M.S.) during Feb.2016- Jan.2018. Water quality parameters were analyzed by using standard methods of APHA, whereas zooplankton were collected through plankton net of standard bolting silk cloth no. 25 (mesh size -0.003-0.004 m), and the total number was counted by using the drop count method. Pardi lake, Gadchiroli is situated in the area between a longitude 20°09'45" N and latitude 79°55'39" E. It is 9 km. away from District Gadchiroli headquarter. Observed Zooplankton consisted 26 genera which divided into 04 major groups, viz, Rotifera (11) > Cladocera (07) > Copepoda (05) > Ostracoda (03) and (42.30%) Rotifera, (26.92%) Cladocera, (19.23%) Copepoda and (11.53%) Ostracoda respectively. Rotifer is a dominant group in present investigation which indicates the mesoeutrophic nature of the lake. Zooplankton analysis revealed seasonal variations with high numbers in summer and fall during winter and monsoon. Rainwater is main source to the lake but it is perennial lake. Lake water was mainly used for domestic, fishing and agricultural purpose. Zooplankton population density is recorded in an appreciable number, rotifer is dominant among the group of zooplankton hence there is hope for its utilization for pisciculture, prawn, crab, and pearl culture if it is properly managed.

**Keywords:** Zooplankton, rotifer diversity, Pardi lake, Gadchiroli.



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# Study on Bird species diversity in and around Pardi Lake, Gadchiroli MS, India

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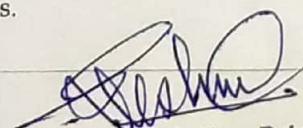
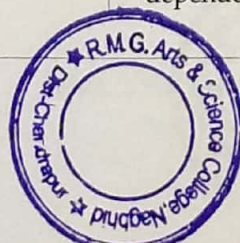
## Abstract

In the present study on bird species diversity in and around Pardi Lake, Gadchiroli recorded total of 50 species. Aquatic birds play a significant and main role in the ecological balance of the ecosystem. The present study helps to evaluate aquatic bird diversity and various species, composition, the density of birds, and distribution of aquatic birds of Pardi Lake. For observation of aquatic birds in and around the lake, the line transects and point transects methods were applied. The present study might help to check the anthropogenic activities for lake management and waterbird conservation. So, an effective way to save these birds is to save their habitats. In the present investigation, observed residential and migratory bird species. The most abundant species were *Bulbulcus ibis* and *Egreta garzetta*.

**Keywords :** Aquatic birds, various bird species diversity, Pardi Lake, Gadchiroli.

## 1. Introduction

Birds are cosmopolitan in nature and have been found all over the world. They have been considered indicator species of the limited area because they are ecologically adaptable and interfere in all types of habitats. Water birds have attracted the attention of the public and scientists because of their beauty, abundance, visibility, and social behavior [1]. In Indian wetlands, 193 bird species out of 318 species are completely dependent on wetlands.



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