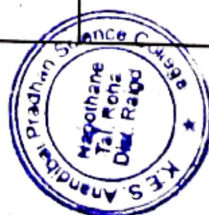


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| 2       | Adsorption of Ni (II) ions from wastewater on adsorbents derived from natural materials: Kinetic and Thermodynamic study | Eco. Env. & Cons. 28 (2): 2022; pp. (815-823)                              | S. D. Patil, S. T. Morbale and N.T. Patel  | 2021-22             | 0971-765X  |
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Eco. Env. & Cons. 28 (2) : 2022; pp. (719-726)  
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ISSN 0971-765X

DOI No.: <http://doi.org/10.53550/EEC.2022.v28i02.021>

# Efficient use of agricultural wastes as Biosorbent in the removal of Fuchsin basic dye from aqueous solutions

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(Received 2 July, 2021; Accepted 26 August, 2021)

## ABSTRACT

Batch mode adsorption studies of Fuchsin basic (FB) on different agricultural waste materials were carried out using parameters including initial FB concentration, adsorbent dosage, agitation time, particle size of adsorbent and temperature. The best fitting isotherm model is elucidated using linear regression coefficient ( $R^2$ ). Both Langmuir ( $R^2 \geq 0.998$ ) and Freundlich ( $R^2 = 0.968$  to  $0.986$ ) isotherms were found to be best fitting model for the adsorption studies. The monolayer (maximum) adsorption capacities were found to be between 142.857 to 250 mg/g of given adsorbents. Lagergren pseudo -second order model best fits the kinetics of adsorption as  $q_{e(theo)}$  values are in consistent with  $q_{e(exp)}$  with whole range of agitation time. Adsorption process was found to be directly proportional to temperature but inversely proportional to particle size of adsorbent. Thermodynamic analysis showed that adsorption was favourable, spontaneous, increased disorder and randomness at the solid- solution interface of FB with adsorbents. Mangrove plant leaf powder was found to have greater adsorption capacity towards FB amongst the adsorbents under study.

**Key words:** Fuchsin basic (FB), Agricultural wastes, Adsorption isotherms, Kinetic models

## Introduction

Dyeing process of textile industry belongs among important sources of contamination responsible for the continuous pollution of the environment. The production of textile industry as well as the volume of waste water containing processed textile dyes, steadily increases colour of the dye interfere with the transmission of sunlight into the stream and therefore reduce photosynthetic action. The colour in the effluent is mostly due to unfixed dye. The concentration of unused dyes in the effluent depends mainly upon the nature of dyes and dyeing processes (McMullan *et al.*, 2001). The biological, physical or chemical methods available for the removal of

dyes from aqueous effluents include anaerobic/ aerobic treatment, coagulation, flocculation, oxidation, ozonation, membrane separation and adsorption. Among these methods, adsorption has been proven to be more efficient, offering many advantages over conventional processes. A number of biological adsorbents have also been investigated for the removal of reactive dyes, these include amongst others; apple pomace and wheat straw (Robinson *et al.*, 2002), corncob and barley husk (Robinson *et al.*, 2001), maize cob, wood and rice hull (Low *et al.*, 1997), wheat bran (Hamdaoui *et al.*, 2006), orange peel (Cui *et al.*, 2008), cashew nut shell (Subramaniam *et al.*, 2015), oil palm leaves (Setiabudi *et al.*, 2016), peach shell (Markovic *et al.*,

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# Adsorption of Ni (II) ions from wastewater on adsorbents derived from natural materials: Kinetic and Thermodynamic study

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(Received 17 August, 2021; Accepted 22 September, 2021)

## ABSTRACT

The excessive exposure of nickel ions to the environment can lead to severe damage of kidneys, lungs, dermatitis and cancer. Therefore, it is necessary to remove nickel ions from wastewater. So batch mode adsorption experiments of Ni (II) ions on different natural materials were carried out in the present study. The parameters studied includes initial Ni (II) ion concentration, contact time, dose of adsorbents, pH and temperature. All Freundlich, Langmuir and Temkin adsorption isotherm models were found to be best fitted models as per the linear regression coefficient  $R^2$  values. The monolayer (maximum) adsorption capacities ( $q_m$ ) ranging from 4.608 to 13.514 mg/g for natural adsorbents under study. As  $q_{e(theo)}$  values are matched with  $q_{e(exp)}$  showed that Lagergen pseudo-second order model fits the kinetics of adsorption of Ni (II) ions on these natural materials. Amount of Ni (II) ions adsorbed on adsorbents was found to be directly proportional with pH and temperature. According to thermodynamic analysis, adsorption of Ni (II) ions on adsorbents was favourable, spontaneous and endothermic physical adsorption. Out of the six adsorbents under study, Mango (*Mangifera indica*) leaf powder was found have greater adsorption capacity and Tamarind (*Tamarindus indica*) fruit shell powder had least adsorption capacity towards Ni (II) ions.

**Key words :** Ni (II) ions, Adsorbents, Adsorption isotherm, Kinetic and thermodynamic.

## Introduction

Many industries such as electroplating, electronic equipment, mining and battery manufacturing processes commonly release Ni(II) ions into water or nickel on surface of earth which is not biodegradable and the accumulation of nickel in ecological system can cause harmful effects to human, animals and plants. Excess nickel concentrations on soils can damage plants and high nickel concentrations in water can cause damage to marine life and also can diminish growth rates of algae and microorganisms. The excessive exposure to nickel leads to severe

damage of lungs and kidneys, skin dermatitis and can also cause cancer (Denkhans *et al.*, 2002). Most common methods used to remove toxic metal such as nickel, copper, chromium, cadmium etc from industrial wastewater includes electro-coagulation, chemical precipitation, ion-exchange, reverse-osmosis and adsorption (Ghodbane *et al.*, 2008). Adsorption on low cost adsorbents/ biosorbents for removal of such toxic metals from wastewater has been reported. These adsorbing materials include, sawdust (Ajmal *et al.*, 1998), Modified soybean hull (Marshall *et al.*, 1999), wild cocoyam biomass (Horsfall *et al.*, 2004), brewery Biomass (Kim *et al.*,

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# Adsorptive removal of ferrous ions from aqueous solutions using plant materials as adsorbents

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**ABSTRACT:** Batch mode adsorption studies of Fe(II) ions on adsorbents originated from plant materials were carried out. Effects of initial Fe(II) ions concentration, adsorbent dose, pH, agitation time, agitation speed, particle size of adsorbent and temperature on adsorption were studied. All Freundlich, Langmuir as well as Temkin adsorption isotherm models showed linearity and were found to be the best fitting isotherm models. The monolayer adsorption capacities ( $q_m$ ) were found between 5.236 to 15.385 mg/g for adsorbents under study. Lagergen pseudo-second order and Elovich Second order kinetic models fits with the adsorption studies indicating adsorption depends on nature of adsorbent as well as adsorbate. Adsorption of Fe(II) ions increases with increase in pH, temperature and agitation speed but decreases with increase in particle size. Thermodynamic analysis also showed that adsorption of Fe(II) ions on the adsorbents under study was favourable. Adsorption capacity of Tamarind (*Tamarindus indica*) Fruit Shell Powder towards Fe(II) ions was found to be more than the other adsorbents under study.

**KEY WORDS:** Fe (II) ions, Plant materials, Adsorption isotherms

## I. INTRODUCTION

Industries like car, aeronautic, coating and steel generate large amount of wastewater containing different concentrations of iron [1]. Water Percolating through soil and rock can dissolve minerals containing iron and hold it in solution. Iron pipes also be a source of iron in water. Ferrous iron is a highly soluble in water that and is easily absorbed into biological species. Therefore, Fe(II) is considered to be the most acutely toxic form of iron. Fe(II) creates oxidative stress by inducing the formation of oxygen based radicals that can cause membrane and DNA damage.

Increased concern by environmentalists and governments on the effects of Fe(II) and an attempt to protect the public health has resulted in increased research in the development of advance methods and technologies to remove Fe(II) from water and wastewater [2]. It involved application of unit operations or unit processes such as chemical precipitation, adsorption, coagulation, ion exchange and membrane filtration [3]. A number of adsorbent materials have been studied for their ability to remove heavy Fe(II) ions and sourced from natural materials and biological wastes of industrial processes [4]. These materials include: chitosan and carrageenan [2], lignite [5], limestone [6], thioglycolic acid modified oil-palm [7],

Adsorption by activated carbon had reported as a technically and economically viable technology for Fe(II) removal [8] [2].

Different types of agriculture wastes such as maize tassel [9], banana peel [10], sawdust and neem bark [11], wheat straw, soybean straw, corn cobs and corn stalks [12] and *Pinus sylvestris* sawdust [13] have been studied,

In the present study, some plant residues used as biosorbents for the removal of Fe(II) ions from wastewater.

## II. MATERIALS AND METHODS

### 2.1 ADSORBENTS:

Adsorbents used in the present study are:

- 1) Pineapple (*Ananas comosus*) Peel Powder (PPP)
- 2) Mangrove (*Sonneratia apetala*) Plant Fruit Powder (MPFP)
- 3) Coconut (*Cocos nucifera*) Coir Pith (CCP)
- 4) Mango (*Mangifera indica*) Leaf powder (MLP)
- 5) Toor (*Pisum sativum*) Plant Leaf Powder (TPLP)
- 6) Tamarind (*Tamarindus indica*) Fruit Shell Powder (TFSP)

### 2.2 ADSORBATE:

**Fe(II) ions:** Ferrous ammonium sulphate with molecular weight 392.12 supplied by S.D. Fine Chemicals, Mumbai, is used for generation of Ferrous ions in aqueous solution.



## Online, Face to Face and Blended Mode of Learning:Opinion Based Study during Covid Crisis

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**Introduction:** Researchers' preliminary investigation into the use of technology for learning purposes reveals a strong correlation between effective learning and face-to-face instructions. With the passage of time, students are no longer considered passive recipients of information, but rather as major creators and constructors of it. With technology playing a major role in imparting knowledge a smooth transition from controlled learning environment to a supportive learning environment has been possible. The affluence of access and flexibility of these courses has made online education an integral part of the education. Researchers suggest that, "the internet is a flawless instrument of learning that offers flexibility and expediency to learners at the same time offering endless opportunities for innovative teaching."

With all this research in global era still online learning is tremendously challengeable in rural area. COVID 19 made a serious impact on many aspects of everyday life. The world saw a paradigm shift in the education system favouring online learning during the constrains of pandemic. A particular challenge has been the urgent and unexpected request for previously face-to-face university courses to be taught online. Previous researches have focused on problems faced by teachers while teaching online. Research by Gratz and Looney (2020) examined the ability of faculty members to teach online and their opposition to reform where teachers indicated that they lack online teaching skills, lack of time for online course planning, and their subject or course is not appropriate for online teaching. Similarly, researchers identified challenges faced by teachers while teaching online. They found network problems, lack of experience, a lack of proficiency in handling online classes, a lack of interest, less participation, a lack of personal contact and a lack of engagement as major challenges while teaching online<sup>1-6</sup>.

Some key features<sup>7-8</sup> of online and face to face teaching are as explained in Fig.1.



## WONDER LEGUME HORSE GRAM

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**Abstract:** Today's generation has move away from traditional foods and it is high time to create awareness about the benefits and importance of lesser known pulses such as HORSE GRAM. Horse gram is a kind of bean commonly used in many south Indian states. This plant is native to the different parts of India. It is high in protein and iron which make it a whole some food that should be added to our diet on a regular basis.

Horse gram is known to have many therapeutic effects but not scientifically proven though it has been recommended in Ayurveda medicine to treat renal stone, gall stone, weight loss, menstrual problems, diabetes, piles, edema etc. In recent years, isolation and utilization of potential antioxidants from legumes including horse gram are increased as it decreases the risk of intestinal diseases, diabetes, coronary heart disease, prevention of dental caries etc. Keeping in view the increasing demand of food having nutraceutical values, the present study described possibilities of exploring the horse gram, as a source of food and nutraceuticals compounds in treatment of kidney stone, diabetes, weight loss and menstrual problems.

**Key Words:** Horse gram, kidney stone, weight loss, menstrual problems.

### I. Introduction

Horse gram is an underutilized and unexplored food legume. In Kerala horse gram is known as "muthira" which sound like "kuthira" which means horse in malayalam this might be because the legumes are used for feeding horses. It is considered as a good source of protein, carbohydrates, energy. It is tolerant to drought, salinity and heavy metal stresses. Horse gram mainly grown in India, Africa, Australia, Burma, Malaysia, Mauritius, and the West Indies under low soil fertility status with few inputs. It is adapted to wide range of temperature regimes where other crops invariably fail to survive. In India, it is generally sown late in the rainy season by resource-poor farmers in marginal and drought-prone condition. Horse gram has high levels of antioxidant and radical scavenging activities in addition to their traditional role of providing proteins and carbohydrates. It has rich source of various natural bioactive substances such as phytic acid, fiber, phenolic acid etc. These bioactive substances have immense potential for curing varieties of diseases such as common cold, throat infection, fever, urinary stones, asthma, bronchitis, leukoderma, etc. BBIs, the proteinase inhibitors have been identified to treat anti-inflammatory, obesity and several degenerative and autoimmune diseases [1-6]. However, there is a dearth of information on the specific health beneficial components in this lesser known legume. Thus, considering its immense potential as health benefit it needs to exploit as a source of nutraceutical and food industries [7].

### II. Results and Discussion

#### *Horse gram in eliminating kidney stone*

Kidney stones are a painful condition and caused due to deposits of Oxalates. Horse gram is recommended for treating kidney stones. Horse gram is the best natural remedy if kidney or gall stones are detected in the early stages and are not big enough to warrant surgical intervention. It is known for its excellent diuretic and astringent property. The horse gram water has diuretic property and dissolve the kidney stone. Diuretics increase the elimination of water from the body.

Materi medica for horse-gram: According to study it is suggested that the patients of kidney and gall stones should follow the following remedy: Soak the little quantity of horse gram in a glass of pure drinking water. Keep it for 8-10 hrs or cook it in pressure cooker. Filter it. Take this infusion (Fig. 1) twice a day.

## 10. COVID- 19 & Higher Education through Open Universities

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### Abstract

There is conspicuous increase in growth of higher education institutions, but only 8-10% population of India is pursuing higher education. Every year our population is increasing, but education percentage remains stagnant. Many candidates tend to school after 10<sup>th</sup> and 12<sup>th</sup>.

As per the latest 2011 census, about 8.15% (68 million) of Indians are graduates. Learning programmes have expanded beyond the traditional classes in brick-and-mortar schools. After post pandemic situation an academic calendar for School, Colleges & professional courses were completely affected. There are very many irregularities in syllabus completion as well as examination. Many regular course Universities completed their syllabus & conducted examination in an online mode. So, in order to boost online learners' engagement to facilitate learning. This article gives little more information beneficial to effective learning particularly in e- learning sources & open universities.

**Keyword-**COVID -19, Distance Education, e-learning, Open University.

### Introduction

The COVID-19 pandemic is having more effect on the education. Most of the governments have closed educational institutions in an attempt to reduce the spread of COVID-19. [1]

Higher education in tertiary education leading to award of an academic degree. Higher education, is an optional final stage of formal learning that occurs after completion of secondary education. According to all India Survey on higher education (AISHE) 2018-19 Report, Gross Enrolment Ratio (GER) in higher education has been increased to 25.8%. [2] This data shows the achievement in numbers of students and institutions of higher education but when it comes to quality it goes down. Today, Indian higher education system ranks third largest in the world, after US and China respectively [3]. Higher education is important to national economies, both as an



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# SYNTHESIS AND CHARACTERIZATION OF SOME NITROGEN CONTAINING HETEROCYCLIC DERIVATIVES VIA NOVEL CHALCONES

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Article Received on 12 October 2021,  
Revised on 02 Nov. 2021,  
Accepted on 22 Nov. 2021,  
DOI: 10.20959/wjpr202114-22403

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## ABSTRACT

Chalcones have great importance in natural as well as synthetic chemistry. It is one of the wonderful precursors used for the synthesis of different 5, 6, 7 – membered heterocyclic compounds. Whereas Nitrogen atoms containing heterocyclic compounds are medicinal important due to their biological activities. After reviewing the literature survey, I found out, that nitrogen-containing five-membered heterocyclic pyrazoles have different synthetic methods & pharmacological activities. This prompted me to prepare highly stable five-membered ring structures like 1, 3, 5-triphenyl 1H Pyrazolone and its derivatives via novel Chalcones synthesized by aromatic ketones

and aldehydes in alkaline medium having heterocyclic moiety. These compounds were characterized using IR, <sup>1</sup>H-NMR, and Mass spectra and Elemental analysis. As per literature, they possess some potent biological activities. Therefore, antibacterial and antifungal activities were screened for these derivatives. most of the compounds were found to be the most active against bacterial & fungal human pathogens.

**KEYWORDS:** Chalcones, Heterocyclic, Nitrogen, Pathogens, Pyrazolone, Screening.

## 1. INTRODUCTION

Heterocycles are an inevitable part of the designing of drug moieties, in that N – heterocycles, constitute an important class of natural and synthetic products many of which exhibit useful biological activities.<sup>[1]</sup> An interest in pyrazoles are five-membered heterocyclic systems having two adjacent nitrogen atoms within rings.<sup>[2,3]</sup> It has only one endo-cyclic double bond and is basic. Substituted Pyrazoline and its derivatives are highly privileged structures and well-known heterocycle. It is embedded with different functional groups &



## Study of Structural and Magnetic Properties of Ni Substituted M Type Calcium Hexaferrite

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### ABSTRACT

Ni substituted M type calcium hexaferrite with composition  $\text{CaNi}_x\text{Fe}_{12-x}\text{O}_{19}$  ( $x=0.5, 1.0, 1.5, 2.0$ ) were synthesized by sol-gel auto combustion method. X-ray diffraction analysis confirms the phase composition of prepared samples and reveals that all the samples belong to M type hexaferrite. The crystallite size was determined by the Debye Scherrer formula and W-H Plot analysis method. Lattice parameters ('a' and 'c') and lattice volume increases with increase in  $\text{Ni}^{2+}$  ion concentration. Morphology of the samples was observed by scanning electron microscopes showing that all the prepared samples were hexagonal structure. The absorption band between  $516\text{cm}^{-1}$ – $527\text{cm}^{-1}$  and  $427\text{cm}^{-1}$ – $462\text{cm}^{-1}$  in the FTIR study confirms the formation of hexaferrite. With increasing  $\text{Ni}^{2+}$  ion concentration the peak position in FTIR and XRD was shifted toward lower frequency and lower angle. Energy-dispersive X-ray spectroscopy analysis confirms the presence of Fe, Ca, Ni and O in all the samples. Vibrating sample magnetometer was used to measure the magnetic parameters such as saturation magnetization, coercivity and remanent magnetization. Saturation magnetization increases from 8.845 emu/gm to 26.05 emu/gm, while the coercivity increases from 162.88 Oe to 184.67 Oe with increasing  $\text{Ni}^{2+}$  ion concentration from 0.5 to 2.0 make substituted hexaferrite material suitable for recording media.[AQ1]

### ARTICLE HISTORY

Received 14 July 2020

Accepted 10 November 2020

### KEYWORDS

-Ni substituted calcium hexaferrite; sol-gel auto combustion method; magnetic properties; energy-dispersive X-ray spectroscopy; Fourier transform infrared spectroscopy

## 1. Introduction

Ferrites are ferromagnetic materials and exhibit the magnetic behavior of ferrimagnetism. Due to many applications of ferrites with low cost, they attract the researchers over the years. These ferrites are classified as spinel, garnet, ortho-ferrite and hexagonal ferrites. Spinel and garnet ferrite possesses cubic structure, while the hexagonal ferrites also known as hexaferrite have hexagonal crystal structure. Depending on the chemical composition and crystal structure these ferrites are classified as M, W, Y, X, U, and Z type hexaferrite [1]. The unit cell of M type hexaferrite is represented by the formula  $\text{MFe}_{12}\text{O}_{19}$  where M is usually barium, strontium, calcium and lead. The unit cell of M type hexaferrite consists of two formula units. The structure of M type hexaferrite consists of 38 oxygen ions and 24 ferric ions distributed in three sites namely octahedral,

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# Adsorption of Phenol, Ortho, Meta and Para Phenols on Granular Activated Carbon And it's Evaluation

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## ABSTRACT

Adsorption of phenol, ortho, para and meta chlorophenols from their dilute aqueous solution on Granular Activated carbon was studied under the laboratory conditions using batch reactor/thermostat. This comparison was studied at 35 °C temperature. In order to conduct the research smoothly, experiments were carried out using a thermostat. It is a simple water bath (tub) of 30 litres capacity, two separate stirrers, heater, electronic relay, motors etc. Granular activated carbon was used for this investigation. Adsorption of all the phenols is separately studied 35 °C and their adsorption data is comparatively studied. This evaluation is studied using Langmuir and Freundlich Adsorption Isotherms. It is observed that Langmuir adsorption data is best fitted for this evaluation. This data highlighted that extent of adsorption of phenol and its ortho, meta and para chlorodrivatives is of the order of O-chlorophenol > M-chlorophenol > Phenol > P-chlorophenol.

**Keywords:** - Adsorption, Granular activated carbon, adsorbent, adsorbate, phenol, nitrophenols Langmuir isotherm, Freundlich isotherm, etc.

## INTRODUCTION

Human being is blessed by gift of environmental resources such as air, water, soil, flora and fauna to fulfil its nature dependent needs and for his development. One of the valuable gifts by him is water. It is the important resource, without which no one can imagine life on earth. But water is being polluted by solids, liquids and gases produced by human activities. This water pollution alters physicochemical properties to that extent, it becomes harmful to the health and hygiene of the living organisms.<sup>[1, 2]</sup> Environmental protection agencies in various countries are taking enormous efforts to reduce this water pollution level at least up to the acceptable level.<sup>[3, 4]</sup> Advance water and waste water treatment technologies involves numerous processes like filtration, coagulation, sedimentation, chemical oxidative methods, adsorption by powered activated carbon or granular activated carbon, etc.<sup>[5, 6, 7, 8, 9, 10, 11, 12, 13]</sup>

Different types of natural adsorbents like activated carbons are available for water purification. The characteristics and performance of activated carbon is greatly depending on the raw material. For the present investigation, Granular activated carbon is selected as natural adsorbent It is prepared from naturally occurring high carbon content material such as coal, petroleum, coconut, husk etc.<sup>[14]</sup>

Phenols and substituted phenols are selected for the present research. The first reason is that, adsorption of substituted phenols at various temperature using batch reactor or thermostat is not been studied in a convincing manner. The second reason is very important. The phenols are very close to the structure of many non-biodegradable insecticides and herbicides.

<sup>[15, 16]</sup> The third reason is that phenols impart bad taste and odour to water. In natural water resources, phenol concentration is expected to be below 50 µg, but the research study emphasis that this concentration nowadays crossed 100 µg, which is almost doubled.<sup>[17]</sup>

## LITERATURE REVIEW

Granular activated carbon adsorption is the most economical and efficient process for the removal of unwanted organic molecules from its aqueous phase. This process is widely accepted as it has a history of water purification. In U.S. charcoal filters were used for the removal of bad odour and dyes from water.<sup>[18]</sup> The use of powdered activated carbon and granular activated carbon for the removal of bad odour and taste was employed in Baylis' work in 1920's.<sup>[19]</sup> After 1940's Hackensack water supply company in new Milford (New Jersey) proved that powered activated carbon can remove taste and odour. Adsorption of phenol and its nitro derivatives on porous activated carbon exhibited decrease upon surface oxidation.



**International Journal of Management Technology and Engineering**

**An ISO : 7021 - 2008 Certified Journal**

ISSN NO: 2249-7455 / web : [www.ijamtes.org](http://www.ijamtes.org) / e-mail : [submit@ijamtes.org](mailto:submit@ijamtes.org)

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# CERTIFICATE OF PUBLICATION

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**“ MANAGEMENT STRATEGIES FOR RESERVOIRS FISHERIES ”**

Authored by

**DR. P. NIRMALA JYOTHI, ASSISTANT PROFESSOR**

From

**KES ANANDIBAI PRADHAN SCIENCE COLLEGE, NAGOTHANE, MUMBAI UNIVERSITY.**

Has been published in

**IJMTE JOURNAL, VOLUME XI, ISSUE II, FEBRUARY -2021**

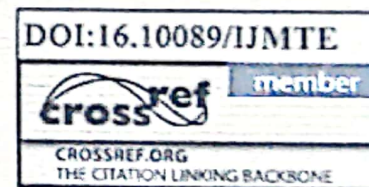


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# Effective Reversed Phase thin Layer Chromatography for detection and separation of some metal ions from their aqueous solutions.

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## Abstract:

Reversed phase thin layer chromatography is an effective tool for separation of heavy metal ions ie Fe (III), Cu(II) ions from their two component mixture. The separation was carried out with thin layer of Silica gel-G as stationary phase using Acetic acid as mobile phase. Observed R<sub>f</sub> values are helpful to determine the mobility of individual ions. Affecting factors like pH & concentration of acetic acid on R<sub>f</sub> values of Fe (III) & Cu(II) ions was studied including determination of optimum conditions .

**Key words:** Reversed phase thin layer chromatography, Detection, R<sub>f</sub> values, mobile phase, etc

## 1. Introduction:-

Reversed phase thin layer chromatographic technique used in identification and separation of metals ions from their aqueous solutions is effective an analytical technique. Now a days environmentalists stress on heavy metal ions removal from environmental samples, due to their toxicness that can be caused due to their bioaccumulative nature. Toxic levels of metal ions like Fe<sup>3+</sup>, Cd<sup>2+</sup>, Ni<sup>2+</sup>, Pb<sup>2+</sup>, Cu<sup>2+</sup>, Zn<sup>2+</sup>, etc .in water samples are harmful to human health .Currently several methods like Atomic absorption spectroscopy, Atomic emission spectroscopy, are available for detection of heavy metal ions, but This chromatographic technique is the most easier , low cost technique of separation of metal ions. So an objective of present studies includes detection and separation of the heavy metals from their aqueous mixtures and optimization of the conditions like pH, concentration.

## 2. EXPERIMENTAL SECTION

1. **Chemicals and Reagents:** Acetic acid , Silica gel - G ; Hydrochloric acid, sprayer for spraying reagents etc. .
  2. **Stationary phase-** Silica gel plate is prepared with a glass plate of 4×2cm size ( coated with silica gel and water), glass jar for the metal ions spot development on glass slides.
  3. **Metal ions studied** – Fe (III), Cu (II).ions. Stock solutions of 0.05M CuSO<sub>4</sub> . 5 H<sub>2</sub>O & of 0.05M FeCl<sub>3</sub> were prepared in the 0.1M Hydrochloric acid .
  4. **Detecting reagents** - 3% aqueous Potassium Ferro cyanide solution.
  5. **Mobile phase:** -Aqueous solutions of Acetic acid.
- ### 3. Thin layer chromatography:
- A. **Preparation of Plates:** Silica gel is mixed with distilled water in 1:3 ratio to obtain perfectly thick slurry. A glass plate is dipped in slurry and dried in oven for five minutes. Cool the plate at room temperature and this plate is used to perform thin layer chromatography.
  - B. **Procedure-** In experiment of thin layer chromatography, a drop of sample mixture is dropped at the bottom of the glass plate and dried .Now dried the plate is kept in a glass jar containing mobile phase solvent taking care that level of solvent remains below the drop of sample solution spot .
  - C. **Separation & Identification of metal ions spots** -The mobile phase solvent level strats ascending on the stationary phase due to capillary action, liquid filling the solid particle. Solutes particles get adsorbed on stationary phase depending upon its affinity towards the stationary phase. Spots of metal ions were identified with appropriate spraying agent ie 3% aqueous Potassium Ferro cyanide solution. The R<sub>f</sub> values is calculated for each metal ion.
  - D. **Optimization of conditions**-To optimize the conditions for best use of this technique for detection of metal ions , and affecting factors are studied as given below in Table 1.





# Study of Heavy Metal contents of Kundalika River water at Roha, Dist. Raigad (M.S.) India

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**Abstract:** A study was carried out to assess the water quality in terms of the heavy metal content of Kundalika River near Roha, Dist. Raigad (Maharashtra), India. Heavy metals are probably harmful and insidious pollutants because of their non biodegradable nature. Most of the heavy metals are toxic to many aquatic organisms and for human being. A study was therefore undertaken to assess the variation in some of the heavy metal contents of Kundalika river water near Roha. Samples were collected mainly from this area in the year 2019-20 and brought to the laboratory for the analysis purpose. Selected metals like Ni, As, Pb, Cd, Zn and Cr are estimated by using atomic absorption spectrometer, Perkin Elmer AA200. It was found that the concentration of few heavy metal of Kundalika river at Roha site exceeds the permissible limit slightly, whereas metal like Cd and Ni were below the permissible limits. The presence of heavy metal concentration in traces can be attributed to regular sand dredging activity in the river. Overall water quality of river at sampling location can be considered as supportive to the aquatic life. The quality of heavy metals in river water should be checked time to time; as heavy metal accumulation will cause numerous problems to living being. Therefore, passing awareness is needed for the betterment of water quality for the sake of its use.

**Keywords:** Kundalika River Water, Heavy Metals, Roha Town, Spectrometer.

## I. INTRODUCTION

“Water quality” is a term used here to express the suitability of water to sustain various uses or processes. Any particular use will have certain requirements for the physical, chemical or biological characteristics of water; for example, limits on the concentrations of toxic substances for drinking water use, or restrictions on temperature and pH ranges for water supporting invertebrate communities. Water environment can be divided into surface and ground water. Surface water bodies include Rivers, lakes, streams, creeks etc. whereas ground water is present beneath earth's surface in soil pores, stone fractures and aquifers. Quality of water plays an important role in determining its use for various purposes. Hence it becomes essential to study quality of water in these resources in order to evaluate any chances of contamination from anthropogenic or developmental activities. The Crises of water pollution by trace metal is now well known to be crucial all over the world and especially in a developing country like India, everybody is facing the problem of ever widening threat of water pollution due to advance modern Technology, industrialization, civilization and urbanization (Ghorade, 2013).

## II. MATERIALS AND METHODS

Over 90% of Kundalika's water is consumed by industries, including RCF's THAL Project and many MIDC all across. This unfortunately has resulted in pollution, especially dues to Roha's chemical industries releasing a lot of effluents (chemical waste) in the river. On the cards are to use 9000 Queseccs of water by the upcoming Reliance and Essar's new projects in the Villa MIDC. This could kill the rafting besides considerably reducing the river's downstream water levels at Kolad. The river will die a little more and become more placid and shallower at Roha town. The latitude of Roha is 18.439472 and longitude is 73.118263.

River water was sampled at three locations, upstream (KW1), at site (KW2) and downstream (KW3) during the year 2019-20. Kundalika River is the only significant surface water body present in the vicinity of the study area. Hence river water sampling was carried out during the study period.

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DOI: 10.48175/IJAR SCT-3076

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## STUDIES ON MIXED LIGAND COMPLEXES OF ZINC (II) WITH PARACETAMOL AND AMINO ACIDS

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### Abstract

The Study was aimed at investigating the suitability of Paracetamol-amino acid novel metal (II) complexes. Synthesis of mixed ligand zinc (II) complexes of type  $[M(\text{par})(\text{L})] \cdot 2\text{H}_2\text{O}$  have been carried out by using Analgesic drugs Paracetamol (par) as a primary ligand and Amino acid (HL) such as L-Valine, L-Threonine and L-Serine as a secondary ligand. Synthesized metal (II) complexes have been characterized on the basis of elemental analysis, electrical conductance, room temperature magnetic susceptibility measurement and spectral analysis which include UV, IR and XRD techniques. An electrical conductance studies indicates non-electrolyte nature and magnetic susceptibility measurement revealed paramagnetic nature of the complexes. UV spectra shows intra-ligand, charge transfer and d-d transition and IR spectra confirm bonding of metal ion through O or N donor ligands which further indicates complexation. The agar cup method and tube dilution method have been used to study antibacterial activity of the complexes against pathogenic bacteria such as Aureus, C. Diphtheriae, S.Typhi and E.coli.

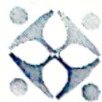
Keywords: Mixed ligand complexes. Paracetamol, Amino acids. Metal ion.

### INTRODUCTION

The advancement of medicinal/bioinorganic chemistry has led to use of metal complexes and metal Nano-particles due to their imperative applications for the development of advance novel technologies which includes chemotherapeutics and diagnostics devices [1]. Amino Acids are well known for their tendency to form complexes with metals having biological significance and metabolic significance [2]. Mixed ligand complexes of copper and Zinc have also been reported to show Anti-tumor activities.[3-4]. The antibacterial and anti-fungal property range of Zinc complexes have been evaluated against pathogenic bacteria and fungi [5] Paracetamol is found to be mild analgesic with weak anti-inflammatory activity. It is commonly used for relief of ache and pain.[6]. However overdose of paracetamol may cause liver damage [7], therefore it decided to synthesize mixed ligand analgesic drug-metal complexes with amino Acids which are characterized by their chemotherapeutic properties [8]. The present paper reports synthesis, characterization of mixed ligand Zn (II) complexes with paracetamol (Par) as primary ligand and Amino acids (HL) such as L-Valine, L-Threonine and L-Serine as secondary ligand and potential of such metal complexes as broad-spectrum antibacterial agents in-vitro. This is continuation of the research activities of our group on search for biologically active metal (II) complexes that could serve as lead compounds in drugs research for pain management and analgesic and as flavoring agents in food and perfume antibacterial studies.

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# Studies on Mixed Ligand Complexes of Zinc (II) With Paracetamol and Amino Acids

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Head, Department of Chemistry, KES Anandibai Pradhan Science College, Nagothane

**Abstract:** The Study was aimed at investigating the suitability of Paracetamol-amino acid novel metal (II) complexes. Synthesis of mixed ligand zinc (II) complexes of type  $[M(par)(L)] \cdot 2H_2O$  have been carried out by using Analgesic drugs Paracetamol (par) as a primary ligand and Amino acid (HL) such as L-Valine, L-Threonine and L-Serine as a secondary ligand. Synthesized metal (II) complexes have been characterized on the basis of elemental analysis, electrical conductance, room temperature magnetic susceptibility measurement and spectral analysis which include UV, IR and XRD techniques. An electrical conductance studies indicates non-electrolyte nature and magnetic susceptibility measurement revealed paramagnetic nature of the complexes. UV spectra shows intra-ligand, charge transfer and d-d transition and IR spectra confirm bonding of metal ion through O or N donor ligands which further indicates complexation. The agar cup method and tube dilution method have been used to study antibacterial activity of the complexes against pathogenic bacteria such as *Aureus*, *C. Diphtheriae*, *S. Typhi* and *E.coli*.

**Keywords:** Mixed Ligand Complexes, Paracetamol, Amino Acids, Metal ion

## I. INTRODUCTION

The advancement of medicinal/bioinorganic chemistry has led to use of metal complexes and metal Nano-particles due to their imperative applications for the development of advance novel technologies which includes chemotherapeutics and diagnostics devices [1]. Amino Acids are well known for their tendency to form complexes with metals having biological significance and metabolic significance [2]. Mixed ligand complexes of copper and Zinc have also been reported to show Anti-tumor activities.[3-4].The antibacterial and anti- fungal property range of Zinc complexes have been evaluated against pathogenic bacteria and fungi [5] Paracetamol is found to be mild analgesic with weak anti-inflammatory activity.it is commonly used for relief of ache and pain.[6].However overdose of paracetamol may causes liver damage [7], therefore it decided to synthesize mixed ligand analgesic drug-metal complexes with amino Acids which are characterized by their chemotherapeutic properties [8]. The present paper reports synthesis, characterization of mixed ligand Zn (II) complexes with paracetamol (Par) as primary ligand and Amino acids (HL) such as L-Valine, L-Threonine and L-Serine as secondary ligand and potential of such metal complexes as broad spectrum antibacterial agents in-vitro. This is continuation of the research activities of our group on search for biologically active metal (II) complexes that could serve as lead compounds in drugs research for pain management and analgesic and as flavoring agents in food and perfume antibacterial studies

## II. EXPERIMENTAL

### 2.1 Materials

Analytical Grade (A.R)  $ZnCl_2 \cdot 2H_2O$  is used and amino acids such as L-valine, L-threonine, L-serine are used from S.D.Fine Chemical Mumbai, India. Solvents like ethanol, chloroform, DMSO (L.R grade) whenever used were distilled and purified according to standard procedure [9-11]. All chemicals of high purity were used and purchased without any further purification

### 2.2 Preparation and Methods

Zn(II) Mixed ligand complexes ion is prepared by adding Zn(II) ion solution over mixture of Paracetamol, primary ligand and Amino Acid, secondary ligand solutions at specific experimental conditions. For that, an aqueous solution ( $10cm^{-3}$ ) of Zinc(II) chloride dehydrate (172.3mg, 1mmol), ethanol solution ( $10cm^{-3}$ ) of paracetamol (138mg, 1mmol) was added. The mixture was stirred and kept in boiling water bath for 10 min. To this hot solution, an aqueous solution ( $10cm^{-3}$ ) amino



# Study of Natural Bio-Coagulants *Moringa Oleifera* and *Cicer Arietinum* for the Purification of Waste Water

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**Abstract:** *Water is the most vital parameter among natural resources. Turbidity impart enormous problem in waste water treatment. In this present study, an attempt has made to evaluate the comparative effectiveness of chemical coagulant alum with natural coagulant such as Moringa Oleifera & Cicer Arietinum seed powder & oil extract. The pH, COD, BOD & turbidity was determined in treated sample of coagulant & maximum reduction efficiency was found in combined use of Moringa Oleifera & Cicer Arietinum seeds. As a result, it shows that the seed extracted powder of Moringa Oleifera and Cicer Arietinum removes the turbidity of water by nearly 96.5 to 98.3%. Moringa Oleifera and Cicer Arietinum seeds are very common & can easily available in nature and having low cost. Hence it was very cheap & every person can prepare it in their own at home in any village and can be used for the purification of water.*

**Keywords:** *Moringa Oleifera & Cicer Arietinum seeds, Waste water, Turbidity, Natural bio coagulants, etc.*

## I. INTRODUCTION

The use of *Moringa Oleifera* and *Cicer Arietinum* seeds for cleaner process in the water treatment has been proposed to treat raw water for the low income location for its abundant availability. Alum increases toxic metals and ions in treated water and can cause diseases like Alzheimer disease. *Moringa Oleifera* seed powder is non-toxic and biodegradable. *Moringa Oleifera* and *Cicer Arietinum* seeds can be used as an alternative to commercial coagulant Poly Ammonium Chloride (PAC) for water treatment in lake water & municipal water. *Moringa Oleifera* Seeds are more efficient than PAC in treating high turbid water. It is one of the most efficient main bio coagulant for water treatment including turbidity of surface water, alkali, organic contaminant in municipal water & industrial waste water including textile, coffee fermentation, pharmaceutical waste water, micro algae.

### 1.1 Objective of the Study

- To replace the use of alum to *Moringa Oleifera* or *Cicer Arietinum* seed extract as it increases toxic metals and ions in treated water & can cause Alzheimer's diseases.
- To reduce the cost for producing coagulants.
- To lower the turbidity of highly turbid water including municipal water and river water.

## II. MATERIAL AND METHODS

Firstly measure the BOD, COD, pH & turbidity of six different water samples having different turbidity. Then we setup two different experiments, one using oil extract and second using powder form as combination of *Moringa Oleifera* and *Cicer Arietinum* seeds. In this experiment, natural coagulant *Moringa Oleifera* & *Cicer Arietinum* seeds were used to treat the samples & process parameters such as pH, turbidity, COD & BOD content were determined. This prepared coagulant includes 50:50 ratios of *Moringa Oleifera* & *Cicer Arietinum* seeds. Seed has a fairly soft kernel, so the oil can be extracted by hand using a screw press (also known as a 'spindle' or 'bridge' press). The seed is first crushed, 10% by volume of water is added, followed by gentle heating over a low fire for 10-15 minutes, taking care not to burn the seed (Meenakshi M. et al, 2015; Amaziah and Arthur Wokocho, 2016 and Suresnarayasamy, hqimimohdsaud, 2014).



## Synthesis and Biological Activity of Mixed Ligand Complexes of Zinc (II) With Paracetamol and L-Serine

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### ABSTRACT

The study was aimed at investigating the suitability and biological activity of Paracetamol-amino acid novel metal (II) complexes. Synthesis of mixed ligand zinc (II) complexes of the type  $[M(\text{par})(\text{L})] \cdot 2\text{H}_2\text{O}$  have been carried out by using Analgesic drugs Paracetamol (par) as a primary ligand and Amino acid (HL) such as L-Serine, L-Proline and L-Isoleucine as a secondary ligand. Synthesized metal (II) complexes have been subjected for characterization using physical methods such as M.P., solubility, elemental analysis, electrical conductance, room temperature magnetic susceptibility measurement and spectroscopic analysis such as UV spectra, FTIR and XRD techniques. An electrical conductance study indicates non-electrolyte nature and magnetic susceptibility measurement revealed the diamagnetic nature of the complexes. UV spectra show intra-ligand, charge transfer and d-d transition and IR spectra confirm bonding of metal ion through O or N donor ligands which further indicates complexation and chemical environment of protons is confirm by NMR studies. Metal (II) complexes were also screened for antibacterial activity of the complexes against pathogenic bacteria such as *S. Aureus*, *C. Diphtheriae*, *S. Typhi* and *E. coli* using agar cup method and tube dilution method. The results were compared with those of tetracycline as a standard material and all complexes have found mild biologically active.

Keywords: mixed ligand complexes, paracetamol, amino acids, metal ion.

### INTRODUCTION

Transition metals elements comprise of incomplete d or f shells and they have tendency to accept electrons from the ligand which make them able to form coordination complexes. Transition metal complexes have been found to be important for their major applications as antibacterial and antitumor agents and biological properties such as antibacterial, antifungal, antimalarial and anticancer activities [1]. Mixed ligand pharmaceutical active molecules play an important role in complexation with numerous transition metals. As such complexes of metals with mixed drugs molecules complexes show wide-ranging pharmaceutical activity, which place them in several biochemical processes [2]. A series of novel Zn (II) mixed ligands complexes with paracetamol and amino acids were synthesized and characterized and found biologically active [3]. Recently, similarly a series of novel Cu (II) mixed ligands complexes with paracetamol and amino acids were synthesized and characterized and screened for biological activity [4]. These mixed complexes models provide information about how biological activity achieve, as well as improve [5]. Paracetamol (acetaminophen) is commonly used for relief pain and fever alone or mixed other medications. It is a major ingredient in many flu and cold remedies as it exhibits anti-inflammatory property [6-7]. Dose is typically given orally, rectally or intravenously [8]. The chemical structures of such pharmaceutical drugs lead to act as ligand in coordination with many transition metals as it alone or as a mixture of two of them. Paracetamol (Para), has IUPAC name N-(4-hydroxyphenyl) acetamide and it is considered as bi-dentate ligand as it is composed of two functional groups such as  $-\text{NHCOCH}_3$  (amide) and  $-\text{OH}$  (hydroxyl) [9]. Synthesis of complexes derived from two or more ligands that are known as pharmaceutically active medications is a very good strategy to improve both the pharmacokinetic and pharmacodynamics properties of the parent drug [10]. Amino acids have at least two principal active sites which lead in formation of metal complexes [11-14]. The important applications of those metal complexes with pharmaceutical drugs are the increasing solubility and bioavailability as well as reduced side effects and toxicity. Also, by using an active metal complex of two active organic molecules (as ligands) gives dual-action drugs which may be more effective than the parent organic drug and are characterised by their biological and the therapeutic properties [15]. Those complexes have been found to exhibit anti-tumour, biological and metabolic enzymatic activities [16-17].

Therefore it was decided to study synthesis and characterization of novel mixed ligand Zn (II)-pharmaceutical drugs complexes with amino acids such as L-Serine, L-Proline and L-isoleucine and to determine biological activity of such complexes by screening those complexes against pathogenic stream *S. aureus*, *C. diphtheria*, *S. typhi* and *E. coli*. This is continuation of the research activities of our group on search for biologically active metal (II) complexes that could serve as lead compounds in drugs research for pain management and analgesic and as flavouring agents in food and perfume antibacterial studies



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## Solvent Free CSA Catalyzed Synthesis of Benzimidazole Derivatives By Microwave Irradiation

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### ABSTRACT

Due to the diversity of their biological actions, there have recently been many publications on the synthesis of heterocyclic compounds including nitrogen, oxygen, and sulphur. Different substituted Benzimidazoles have regulated and prospective medicinal effects.

Numerous findings on the synthesis of heterocyclic compounds in a variety of settings, including solvent-free, with reactants immobilized on a solid support, with microwave irradiation, with a green catalyst, and with a green solvent, have been published in the literature. Modern drug discovery investigations have recently paid a lot of attention to microwave-assisted heterocyclic synthesis. In the current research, we concentrated on studying the microbial activity while synthesizing benzimidazole utilizing CSA (Camphor Sulphuric Acid) as a catalyst in a domestic microwave. The present method is simple, efficient, cost-effective, and eco-friendly.

**Keywords:** Bioactive, Benzimidazole, Imidazolium, pharmacologically.

### 1. INTRODUCTION

The class of biologically active chemicals known as benzimidazole derivatives has emerged during the past decade as a flexible nitrogen-containing heterocyclic compound with a variety of biological and pharmacological activities. Because molecules containing the benzimidazole moiety are so important and display such a wide range of activities, efforts have been made to create libraries of benzimidazole derivatives and screen them for potential biological activities.

Benzimidazole is a white to barely solid substance. It has a melting point of 172 °C, a boiling temperature of 360 °C, is soluble in water to a limited extent, and is totally soluble in ethanol. It is a bicyclic molecule with an imidazoles ring fused to benzene, which has two nitrogen atoms in a nonadjacent position. A phenyl ring is joined to an imidazole ring via the benzimidazole. The Benzimidazoles are also referred to as benzoglyoxalines or Benzimidazoles. They have also been referred to as o-phenylenediamine derivatives, particularly in earlier literature. This terminology would therefore refer to benzimidazole as methenyl-o-phenylenediamine and 2-methyl benzimidazole as ethenyl-o-phenylenediamine.

# Waste crab shell catalysed synthesis of dihydropyrano[c]chromenes

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## Abstract

In present study we have applied green and sustainable route for synthesis of dihydropyrano[c]chromenes catalysed from waste crab shell. Waste crab shell on calcinations converts to calcium oxide which acts as base catalyst to promote formation of dihydropyrano[c]chromenes. Mild reaction media, green route of synthesis, better yield of products with short time are remarkable advantages of method. The method is applicable for synthesis of diversified dihydropyrano[c]chromenes starting from wide range of aldehydes. The products obtained are characterised by IR,  $^{13}\text{C}$ ,  $^1\text{H}$  NMR studies.

**Keywords:** Dihydropyrano[c]chromenes, Crab shell, Sustainability.

## Introduction

MCR, a powerful and virtually reliable target-guided synthetic approach, has extensively been used and applied for the rapid construction of molecular-level complex architectures and interest in it from different branches of science is expanding exponentially.<sup>1</sup> Multicomponent reactions—have become important tools for the rapid generation of molecular complexity and diversity with predefined functionality in chemical biology and drug discovery.<sup>2</sup> Heterocyclic rings are found in many naturally occurring compounds and they compose the core structures of many biologically active scaffolds as well as some industrial compounds.<sup>3-5</sup>

Dihydropyrano[3,2-c]chromenes are a class of important heterocycles, they can be used as cognitive enhancers for the treatment of neurodegenerative disease including amyotrophic lateral sclerosis, Huntington's disease, Alzheimer's disease, Parkinson's disease, AIDS associated dementia and Down's syndrome as well as for the treatment of schizophrenia and myoclonus<sup>6</sup>. In addition, aminochromene derivatives exhibit a wide spectrum of biological activities including antihypertensive and anti-ischemic behavior<sup>7-9</sup>.

Literature study reveals applications of silica gel 5,2-hydroxyethyl ammonium formate,  $[\text{H}_3\text{N}^+-\text{CH}_2-\text{CH}_2-\text{OH}][\text{HCOO}^-]$ <sup>10</sup> as ionic liquid, *N*-propyl-imidazolium hydrogen sulfate ( $[\text{Sipim}]\text{HSO}_4$ ) as a recyclable heterogeneous ionic liquid<sup>11</sup>, thiourea dioxide<sup>12</sup>, diammonium hydrogen phosphate<sup>13</sup>, [TBBDA] and [PBBS]<sup>14</sup> as catalyst for synthesis of dihydropyrano[c]chromenes. Some recently introduced

catalysts for synthesis of 3,4-dihydropyrano[3,2-c]chromenes are DABCO promoted<sup>15</sup>, Piperidinium Benzene-1,3-Disulfonate Ionic Liquid<sup>16</sup> and Ni(II)-functionalized Li<sup>+</sup>-Montmorillonite<sup>17</sup>.

In comparison to the above mentioned catalysts, CaO is cheaper and also possesses dynamic catalytic activity, provides favourable reaction condition and re-usability. Also calcium is available abundantly in natural sources like shells and bones. A study with Li doped CaO derived from egg shell for biodiesel production has been reported previously<sup>18</sup>. A report<sup>19</sup> on transesterification of soybean oil to biodiesel using CaO as a solid base showed that the life time of CaO is longer than that of  $\text{K}_2\text{CO}_3/\gamma\text{-Al}_2\text{O}_3$  and  $\text{KF}/\gamma\text{-Al}_2\text{O}_3$  catalyst.

Boey et al<sup>20</sup> show usage of calcined crab shells for biodiesel production through central composite design approach. By the study of advantages of CaO catalyst in different organic transformation, we herein employed CaO derived from waste crab shell for three component reaction between aromatic aldehyde, malononitrile and 4-hydroxy coumarin for synthesis of dihydropyrano[c]chromenes.

## Material and Methods

All the chemicals used are commercially available and were used without purification.  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were recorded on Avance-300 Bruker NMR spectrophotometer in  $\text{CDCl}_3$  and DMSO. IR spectra were obtained using potassium bromide pellets on Bruker ALPHAFT-IR spectrometer. Melting points were measured on open capillary method on DBK-programmable melting point apparatus. Purity of the substrates and completion of reactions were checked by thin layer chromatography (TLC) using Merck silicagel 60 F<sub>254</sub> plates.

**Preparation of catalyst:** The waste crab shell were collected from local market washed thoroughly with hot water to remove adhesive impurities and dried in oven at 80-90°C for 24 hrs. It was then calcined at 800°C temperature at heating rate 10 degree  $\text{min}^{-1}$  for 3 hr in Muffle furnace which got transformed into white soft powder, which was used as catalyst.

**Catalyst characterization:** After modification by calcinations, absorption bands of  $\text{CO}_3^{2-}$  molecules shift to higher frequency and are observed at 1450, 1050 and 518  $\text{cm}^{-1}$ . A sharp stretching band is observed at 3641  $\text{cm}^{-1}$  due to OH group in IR spectrum of calcined crab shell, which is in raw crab shell displayed at 3480  $\text{cm}^{-1}$  (Fig. 1). The XRD patterns of crab shell (Fig. 2) were obtained in reflection mode with

# UV Light Assisted Biogenic Synthesis of Silver Nanoparticles, their Characterization and Catalytic Activity to Reduce Methylene Blue

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## ABSTRACT

Present study describes biogenic synthesis of Ag nanoparticles by a rapid and simple procedure using leaf extract of *Bryophyllum pinnatum* as the reducing agent with the assistance of UV radiation. Structural characterization of synthesized AgNPs was carried out using SEM, XRD, EDS, FT-IR and UV-vis spectroscopy. SEM showed the formation of particles with average sizes of 20 nm. Energy dispersive spectroscopy (EDS) was used to analyze the AgNPs within the energy range of 3–3.1 keV to detect the presence of silver. The functional groups of the biomolecules present in the aqueous extract of *Bryophyllum pinnatum* and their interaction with AgNPs were identified through FTIR analysis. The catalytic degradation of MB was completed within 10 min, remarks excellent catalytic properties of silver nanoparticles in reduction of MB.

Keywords: *Bryophyllum pinnatum*; AgNPs; UV Light; Biogenic Synthesis; Methylene Blue

## INTRODUCTION

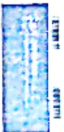
The chemical community has endorsed remarkable investigation and interest in the field of nanoscience and nanotechnology in the past decades<sup>1-6</sup>. The numbers of publications dealing with metal nanoparticles has increased almost exponentially and research outcome is highly multidisciplinary in the field of physics, chemistry, biology, material science, engineering and medicine, etc.

As per green chemistry principles there is growing need to develop green procedures for synthesis of nanoparticles providing advancement over chemical and physical methods. These methods are environment friendly, cost effective and there will be no need to use high pressure, energy, temperature and toxic chemicals<sup>7</sup>. The biogenic synthesis of AgNPs involves either living organisms such as bacteria, fungi and plants or biomass, like plant extracts<sup>8-14</sup>. Biological synthetic processes have emerged as a simple and viable alternative to more complex physicochemical approaches to obtain nanomaterials with adequate control of size and shape<sup>15-16</sup>.

The present study aimed to synthesis of Silver Nanoparticles in aqueous medium using leaf extracts of *Bryophyllum Pinnatum* (BPE). Here we report an ecofriendly, cost effective and green approach for synthesis of Ag-nanoparticles using the aqueous leaf extracts of *Bryophyllum pinnatum* as the reducing and capping agent as well. Specific plants contain specific chemical compounds which can act as active substances in the process of reduction and stabilization of nanoparticles. Biomolecules in plant extracts that can reduce metal ions into nanoparticles include proteins, polysaccharides, alkaloids, flavonoids, terpenoids, and phenolic acids<sup>17,18</sup>. *Bryophyllum Pinnatum* is rich in alkaloids, triterpenes, glycosides, flavonoids, cardenolides, steroids and lipids. In addition to these leaves contain a group of steroids called bufadienolides (Fig.1), which display a wide range of biological actions<sup>19-20</sup>. Different combinations and concentrations of these organic reducing agents under UV light results in reduction of Ag<sup>+</sup> to Ag<sup>0</sup><sup>21,22</sup>.



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Current Journal of Applied Science and Technology

40(18): 88-93, 2021; Article no.CJAST.71640

ISSN: 2457-1024

(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843,

NLM ID: 101664541)

## Development and Study of Plant Based Mosquito Repellent Cakes in Combination with Natural Binders

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*Authors' contributions*

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

**Article Information**

DOI: 10.9734/CJAST/2021/w401831446

Editor(s):

Reviewers:

(1) Elsayed A. Omer, Egypt.

(2) Sadek Abdelwahed Salem, Egypt.

(3) Mittal P., Kurukshetra University, India.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/71640>

Received 01 June 2021

Accepted 06 August 2021

Published 07 August 2021

Short Communication

### ABSTRACT

**Background and Objective:** Plants are perceived as a safe and trusted means of mosquito bite prevention. Many plant extracts and oils repel mosquitoes, with their effect lasting from several minutes to several hours. The present investigation is aimed to evaluate the mosquito repellent activity of *Calendula officinalis* (Marigold leaves), *Citrus madurensis* (Calamondin leaves), *Carica papaya* (Papaya leaves), *Origanum vulgare* (Oregano leaves), in combination with natural binders. **Materials and Methods:** In present work we have produced an effective and purely natural mosquito repellent cakes using marigold leaves, calamondin leaves, papaya leaves, oregano leaves, and to determine if the component present on them are suitable as mosquito repellent. To recognize this new combination and in addition use of natural binder in making these mosquito cakes is innovation of method. Evaluation was carried out in a net cage (45 cmx30 cmx25 cm) containing 100 blood starved mosquitoes. **Results:** Study provides an herbal repellent with long lasting protection, safe for human life, and human with no side effect. The combination Paste of leaves + charcoal + 20% cow dung was found to be more repellency against mosquitoes under study.

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## Effects of some micronutrients from soil with reference to *Lablab purpureus* crop (L.)

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### Manuscript Details

Received :29.05.2020

Accepted: 21.07.2021

Published: 30.07.2021

Available online on <https://www.irjse.in>  
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

### Cite this article as:

Chavan VS. Effect of phosphorus from soil with reference to *Lablab purpureus* crop (L.), *Int. Res. Journal of Science & Engineering*, 2021, Volume 9(4): 105-118.



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### Abstract

The experiment was carried out to find the effect of micronutrients with respect to *Lablab purpureus* (L). This crop is cultivated as rabbi crop in Raigad district. The soil samples were collected from different location. In this experiment effect of Zinc (Zn), Manganese (Mn), Iron (Fe), and Copper (Cu) was studied for successive three years. During the experiment it was observed that these micronutrients play important role for normal growth, development and production of this crop.

**Keywords:** Micronutrients, ppm, Rhizosphere and non-Rhizosphere.

### 1. Introduction

*Lablab purpureus* (L) is cultivated as a pulse crop in Asia, Africa and Caribbean. The immature seeds, pods and young leaves are edible and cooked as vegetables. This experiment was carried out at Raigad district to find out the productivity of this crop. During this it was observed that not only chemical fertilizer, manure plays important role but also macro-elements and micro-elements are important [1]. It was observed that the micronutrients like Zinc (Zn), manganese (Mn), iron (Fe), and copper (Cu) are important [2]. These nutrients varies amount depending upon the texture and physical and chemical properties of soil. These micronutrients constitute in total less than 1% of the dry weight of most plants. Soil system is the most important ecological factor on which the plants are dependent for their establishment, nutrition, water and mineral supply.

## Comparative study of structural and magnetic properties of Ni and La substituted calcium hexaferrite

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### Abstract

Ni and La substituted M-type Ca hexaferrite of composition  $\text{CaNi}_1\text{Fe}_{11}\text{O}_{19}$  and  $\text{CaLa}_1\text{Fe}_{11}\text{O}_{19}$  were synthesized by sol-gel auto combustion method using metal nitrates as oxidants and citric acid as reducing agent. The prepared samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), energy dispersive X-ray analysis (EDAX), and vibrating sample magnetometry (VSM). XRD study revealed that both samples had lattice parameters *a* and *c* within the range of M-type hexaferrite. The SEM micrographs displayed grains having irregular shapes and sizes in the nanometer range. FTIR peaks confirmed the structure of M-type hexaferrite. EDAX spectra showed the homogeneous distribution of ions in both samples. In  $\text{CaNi}_1\text{Fe}_{11}\text{O}_{19}$ , we found saturation magnetization ( $M_s$ ) of 12.18 emu/g and coercivity ( $H_c$ ) of 193.2 Oe. On the other hand, in  $\text{CaLa}_1\text{Fe}_{11}\text{O}_{19}$ , we found  $M_s$  of 0.55 emu/g and  $H_c$  of 404.4 Oe. Saturation magnetization and coercivity values obtained for La substituted M-type Ca hexaferrite are suitable for low-density magnetic recording devices.

**Keywords:** M-type calcium hexaferrite, sol-gel, saturation magnetization, coercivity.

### INTRODUCTION

Nowadays, the demand for microwave absorption devices and recording media is increasing tremendously due to the increase in high-frequency signals and to fulfill the requirement of strong growth of information. The materials with high saturation magnetization and low magnetic coercivity values are suitable to absorb high energy waves. Such materials can be used for high-frequency circuits and microwave devices [1, 2]. The material having coercivity values between 300 to 400 Oe can be used for low-density magnetic recording applications, while a coercivity value greater than 1000 Oe is required for high-density video recording applications [3]. The ferrite materials having low coercivity are beneficial for magnetic recording applications such as in hard disks, floppy disks, videotapes, etc. [4]. For data storage and re-recordable memory devices, saturation magnetization, as well as coercivity values, need to be low so that a small magnetic field is required to overwrite the data [5]. Low-cost, easy manufacturing, better structural, electrical, and magnetic properties are the most important parameters while considering material for a particular application. Hexagonal ferrites are one of the most important materials that fit these criteria [6]. M-type calcium hexaferrite  $\text{CaFe}_{12}\text{O}_{19}$  exhibits high saturation magnetization, strong uniaxial crystalline anisotropy, and large coercivity. These ferrites are extensively used in permanent magnets, magnetic recording media, data storage devices, microwave components, high-frequency

circuits, and operating devices [7].

Nandotaria et al. [8] studied the structural, magnetic, and dielectric properties of Mg substituted Sr-Cu hexaferrite synthesized via a one-step solvent-free synthesis technique. It has been found that the lattice parameters and lattice volume decrease with increasing  $\text{Mg}^{2+}$  ion substitution. This decrease is due to the smaller ionic radius of  $\text{Mg}^{2+}$  ions than  $\text{Cu}^{2+}$  ions, here,  $\text{Mg}^{2+}$  ions replace  $\text{Cu}^{2+}$  ions in the crystal structure. The *c/a* values were found to be lower than the standard value of 3.98 of M-type hexaferrite. The average crystallite size ranged between 31 to 54 nm. The morphology of the samples was almost the same and it exhibits hexagonal faceted structure. The maximum coercivity value was found to be 1995 Oe for the  $\text{Mg}^{2+}$  ion concentration  $x=0.3$  [8]. Parmar et al. [9] studied the structural, magnetic, and dielectric properties of Cu substituted M-type Pb hexaferrite synthesized via a co-precipitation method. It has been found that, with increasing  $\text{Cu}^{2+}$  ion concentration from 0 to 1 in steps of 0.2, lattice parameters and lattice volume decrease. The position of (107) diffraction peak shifted towards higher angles with increasing  $\text{Cu}^{2+}$  ion concentration. These changes are due to the smaller ionic radius of  $\text{Cu}^{2+}$  ions as compared to  $\text{Fe}^{3+}$  ions. The average crystallite sizes were between 39 to 43 nm for all samples. FTIR spectra show two absorption bands between 400 and 600  $\text{cm}^{-1}$ , which confirm the formation of M-type hexaferrite. The small value of the squareness ratio ( $M_r/M_s < 0.5$ ) indicates a multi-domain structure for all samples. The saturation magnetization was found to increase while the coercivity value decreased from 257 to 103 Oe with increasing  $\text{Cu}^{2+}$  ion concentration [9]. Rane et al. [10] synthesized single-phase polycrystalline M-type Ba hexaferrite via solution combustion synthesis using glycine as a fuel. It has been observed that the

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## Acquisition and Promotion of Electronic Information Resources in University Libraries

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### - Abstract -

*Electronic information resources are becoming the most important collection types in university libraries. This paper is discussed on acquisition and promotion of electronic resources in university libraries. This paper also studies guidelines of the acquisition and selection procedure of electronic information resources. There are so various methods for promoting electronic resources. The researcher has focused on promotion and marketing methods.*

- E-journal (Full Text and Bibliographic Databases)
  - E-books
  - Online Databases
  - Web sites
- B) Another type of e-resources may include the off line resources that are kept inside the library in the form of electronic materials. Users can be able to touch physically and use it. Some examples of resources are given below:

### Introduction

The emergence of electronic information resources (EIR) arising from advancements in Information and Communication Technology (ICT) has brought changes to teaching, learning and research activities in University libraries. Electronic information resources are becoming crucial in University libraries because of the unique benefits to students and research scholars. It provides unlimited and easy access to current information.

Electronic information resources are the electronic version of print formats, which is a crucial part of the library collection in the digital era. They are materials requiring computer access using desktops or handheld mobile devices such as Ipad, laptop and Smartphone in the library or at home for the purpose of teaching, studying and or research. Electronic Information Resources include databases (online and offline), E-books, E-journals, E-newspapers, E-research reports and E-lecture

abstracting, reference databases such as bibliographies, dictionaries as well as sounds and files (IFLA, 2012).

### Types of Electronic Resources

The E-resources are divided into two types depending on their features. They are:

- A) Online e-resources, which may include online resources, are providing information to their users via the internet and www. Online resources are considered virtual ones. Users are able to use the information in an intangible manner. Some examples of online resources are given below :

- Diskettes.
- Other portable computer databases.

### Selection Procedure of electronic Information resources in university libraries

#### Selection criteria of E- resources :

University library selecting e-resources according to user recommendation, consulting to other libraries, free online trial base from vendor and recommendation by HOD and Faculty members. They also focus on subject relevance; back issues files, distributed access, period of access.

- It should taken into consideration the following steps
- To identify library needs
- To identify content and scope of the e-resources
- search capabilities
- To estimate the cost
- To check either subscription based or web based when acquiring
- To evaluate the systems and technical support
- To review licensing agreements
- To evaluate application software and installation, updated sporadically or in regular schedule
- To check the facilities for educational support and training

## STUDY OF pH OF RHIZOSPHERIC AND NON- RHIZOSPHERIC SOIL OF *Lablab purpureus* (L)

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### Abstract:

In present study hydrogen ion concentration of different samples of rhizospheric and non- rhizospheric soil of *Lablab purpureus* (L) was recorded. The pH of soil controls many of the chemical and biological activities that take place in the soil and indicates about the climate, vegetation and hydrologic conditions under which the soil formed.

**Key Words:** Physicochemical parameter-pH, Rhizosphere, Non- Rhizosphere, Microorganism.

### Introduction:

Soil has different types of microorganisms which increase the living population. This living population increase the humus in soil to produces enzymes and liberate CO<sub>2</sub>, Organic acids etc. They are responsible for bringing about numerous transformations which change the nutrients in to readily available forms which can be formed by plants. Hence the biological population has an important role to play in this planet.

The various types of micro-organisms present in soil. Among that VAM fungi are an important group of organisms. The VAM symbiotic association with the roots of the plants. The existence of these organisms is dependent on the physical and chemical properties of soil. The physical factors that influence VAM population and other microbial populations are texture, moisture content, temperature and pH etc of soil.

The chemical factors include pH, nitrogen, phosphorus, potassium etc. Several workers have studied the effect of these chemical factors on mycorrhiza. Soil system is the most important ecological factor on which the plants are dependent for their establishment, nutrition, water and mineral supply. Soil system is very complex and dynamic ,undergoing continuous change in its physicochemical parameters throughout the year. In the present study, physicochemical parameters, namely pH, was recorded. These parameters vary in amount depending upon the texture and physical and chemical properties of soil. Their status is recorded to detect the available nutrients from all the sites for Sweet bean plants during the study. Seasonal variations are focused to study the effect of physicochemical parameters on the development of AM fungi,their number and the rate of colonization. Variations in physicochemical parameters for each selected sites for three years were recorded.Rhizosphere and non-Rhizosphere soil were collected from four different sites,which includes L-1 Chochinde, L-2 Dasgaon, L-3 Kondivate and L-4 Kol, for the year 2015-2017.

### Materials and methods:

During present investigation four villages from Mahad Taluka of Raigad District, Maharashtra (India) were selected as a case study. These localities were Chochinde, Dasgaon, Kondivate and Kol. Maharashtra state is divided in six divisions like Konkan, Nashik, Pune, Aurangabad, Amravati and Nagpur. Konkan division is divided into five districts viz. Raigad, Ratnagiri, Thane, Palghar and Mumbai. Raigad District is located between 17° and 51° North latitude and between 73° and 40° East longitude at 720 meters above mean sea level. Total area of the district is 7152 sq. km. Average rainfall of the district is 3028.9 mm. The maximum temperature in summer is 42°C and minimum temperature in winter is less than 30°C. Relative humidity ranges from 65% to 75%. Raigad District has Raigad, Pen, Panvel, Uran, Karjat, Khopoli, Alibag, Murud, Pen, Roha, Sudhagad, Tala, Mangaon, Shrivardhan and Mahad Taluka. The present work was conducted for understanding the association of Arbuscular Mycorrhizal Fungi (AMF) with respect to their morphotaxonomy, ecology, water stress and relation of AM fungi and Rhizobium with *Lablab purpureus*.

The pH is one of the important parameters that determine the chemical nature of a soil sample. For determining the pH, 50 g of dried soil was mixed with 50 ml of water (1:1) thoroughly with the help of a glass rod, and then it could settle for some time.

The pH of the supernatant was measured using the pH paper by dipping it and comparing with the standard colour against its corresponding value. The pH requirements for germ tube production relates to the ability of different AM fungal isolates to survive and adapt to the environment. Very less attention has been given on the effect of pH on AM fungi [4] however, for specificity of AM fungal species to pH and its effect, some attempts were made.

### Result:

Soil pH is an indication of the soil's chemistry and fertility [6]. The pH affects the chemical activity of the elements in the soil, as well as many of the soil properties [5]. The pH of soil controls many of the chemical and biological activities that take place in the soil and indicates something about the climate, vegetation and hydrologic conditions under which the soil formed. The pH or the amount of hydrogen ions in a sample is an important consideration when studying soil. As in the study of hydrogen, the pH scale is used as an indication of the concentration of hydrogen ions in the soil. pH is measured on a logarithmic scale and represents the negative logarithm of the hydrogen ion concentration in moles/L.

When soil contains a high concentration of hydrogen ions, it is considered to be acidic and when it has a low number of

# Effect of phosphorus from soil with reference to *Lablab purpureus* crop (L.)

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## Manuscript Details

Received :29.05.2020

Accepted: 29.06.2021

Published: 30.06.2021

Available online on <https://www.irjse.in>  
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

## Cite this article as:

Chavan VS. Effect of phosphorus from soil with reference to *Lablab purpureus* crop (L.), *Int. Res. Journal of Science & Engineering*, 2021, Volume 9(3): 77-81.



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## Abstract

Phosphorus is an essential macronutrient nutrient, as a part of key plant structure compounds and as a catalysis in the conversion of numerous key biochemical reactions in plants. Phosphorus can be found in the soil in organic compounds and also in minerals. Nevertheless, the amount of readily available phosphorus is very low compared with the total amount of phosphorus in the soil. This study was conducted in rhizospheric and non-rhizospheric soil of *Lablab purpureus* (L) for successive three years.

**Keywords:** Phosphorus, Macro -element, Rhizosphere, Soil-microorganisms

## 1. Introduction

Phosphorus is a macro element within the soil that represents soil fertility. It is available in the form of phosphate ions in soil which is converted by soil microorganisms [1]. Plants obtain converted phosphorus from ions of phosphate from the soil with the help of AM fungi. The rate of phosphorus is examined to check the effect on AMF colonization and propagules. The availability of phosphorus in kg/ha was categorized as very low (<15), low (16-30), moderate (31-50), High (51-65) and very high (>66). The presence of phosphorus in the collected soil samples can be determined by two methods. The Olsen's method [2] was used for neutral alkaline soils while the Bray and Kurtz [3] method is used for acidic soils.

SYNTHESIS AND ANTIBACTERIAL ACTIVITY OF SOME FORMAZANS VIA BIOACTIVE SCHIFF BASES

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ABSTRACT

The chemistry of formazans derivatives was reviewed in largely due to wide variety of physiological activity of compounds. These compounds are belonging to azo dye family. They found to active against antiviral, antibacterial and antifertility. Various formazans derivatives occupy an important role in medicinal chemistry. Important and interesting roles of formazans are in Dyestuff Chemistry. In living systems, they show microbiological activities. Application of formazans is in testing sensitivity of anticancer drugs. Different formazans compounds were used for dyeing and printing. Various formazans have attracted considerable attention as they have wide range of bioactivity.

Keywords: Formazans, Azo dye, Medicinal Chemistry, Microbiological activities.

INTRODUCTION

The chemistry of formazans derivatives was reviewed in largely due to wide variety of physiological activity of compounds. These compounds are belonging to azo dye family.<sup>1</sup> They found to active against antiviral<sup>2</sup> and antibacterial<sup>3</sup>, antiviral,<sup>4, 5, 6</sup> antimicrobial,<sup>7-8</sup> and anti-inflammatory.<sup>9</sup> Several formazans show promising anticonvulsant and therapeutic agents.<sup>10-11</sup> Many formazans derivatives occupy an important role in medicinal chemistry. They also found to possess anti-fertility activity<sup>12</sup>.

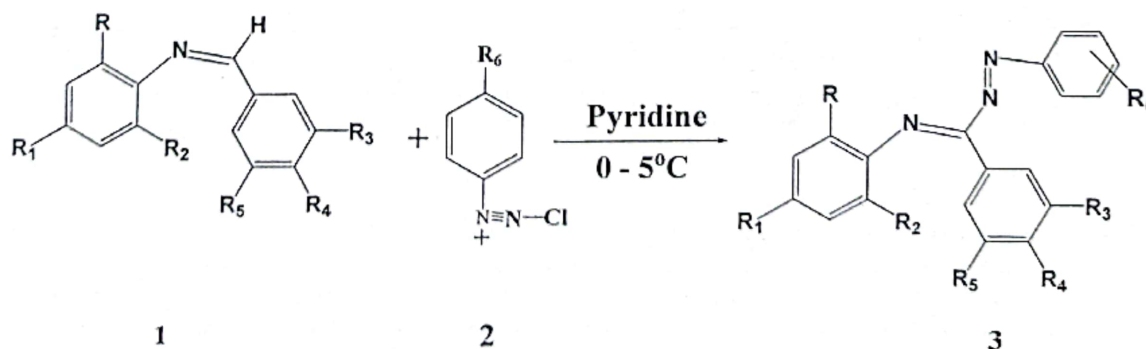
The chemistry of formazans derivatives was reviewed in depth largely due to wide variety of physiological activity demonstrated by this class of compounds. An interesting feature of formazans is that, they were prepared from Schiff Bases which are known for their various biological activities and benzene diazonium Chloride in laboratory. Schiff bases are utilized as starting material in the synthesis pharmaceutically important compounds such as formazans derivatives which have already attracted considerable attention in the analytical chemistry because of their high sensitivity toward many metals and organ metals. Marjadi *et al.*<sup>13</sup> & Ahmed M. Jasmin<sup>14</sup> were synthesized a series of formazans by condensation of Schiff bases and diazonium salt of various substituted aromatic amines. Shivaji Chavan *et al.*<sup>15</sup> were synthesized formazans and evaluated for antimicrobial activity and these found potent active. Several 1,3,5-triarylformazans were synthesized using a new methodology. Azo-coupling of aryl diazonium salts with aryl-aldehyde aryl hydrazones under mild basic conditions in two-phase liquid-liquid media is efficiently promoted by phase-transfer catalysts.

PRESENT WORK AND METHOD:

In present study we have synthesized five different substituted formazans by coupling Schiff Bases<sup>16</sup> with appropriate aryl diazonium chloride derivatives.

Different Aromatic bases in acetic acid and hydrochloric acid were diazotized at 0-5<sup>o</sup>C and resultant solution was added to the solution of Schiff bases in pyridine with continuous stirring within 15 minutes. The reaction mixture was allowed to left overnight at room temp. A dark coloured solid separates out was filtered and recrystallized from ethyl alcohol. The purity was checked by TLC.

Scheme: I



Where R<sub>6</sub>= -H, -CH<sub>3</sub>, NO<sub>2</sub> etc.



## CORRELATION AND REGRESSION STUDIES ON PHYSICO- CHEMICAL PARAMETERS OF SMALL WATER RESERVES IN NAGOTHANE AREA IN RAGAD DISTRICT (M.S)

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### Abstract:

This research work involves the studies of physico-chemical parameters of water samples in small reserves in Nagothane area in Raigad District, Maharashtra. A stastical correlation studies among physico-chemical parameters of water quality is carried out and studies showed that all different parameters are interdependent and show association with each other. Correlation and regression studies proved to be excellent tool to calculate various water quality parameters. The observations and result of the study will propose some solutions to use this water.

**Keywords:** Small reserves, Physico-chemical factors, Correlation coefficient, Linear regression, etc.

### Introduction

Small reserves of water like ponds can be best water resource for domestic and agricultural use for the residents in rural area. Water pollution is major problem all over the world .Restoration of such lakes may be future help to villagers in solving difficulty of potable water.

These small water reserves can be contaminated due to anthropogenic and natural activities. To maintain the potablity of the reserves continuous monitoring and appropriate actions are to be taken. The result of the proposed study will help in suggesting proper water treatment method.

Present physico-chemical analysis of water samples included the parameters like pH, Electrical conductance, dissolved oxygen (mg/l), alkalinity (mg/l) etc. Application of statistical tool to experimental data in environmental science provides good results .So Correlation coefficient and regression study of small reserve water samples for physical and chemical factors is carried out .

### Experimental section

Nagothane is at 18.53°N 73.13°E. on the bank of river *Amba*, in *Roha* taluka ,in *Raigad* District in *Maharashtra* State in *India*. There is industrial area with petrochemical industries (Google- Nagothane Wikipedia). Beautiful lakes in village area are pride of this area and are the area under the study for present research. Figure 1 shows Map of Nagothane area in Raigad District.







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**BIOGENIC SYNTHESIS OF MANGANESE NANOPARTICLES: A  
REVIEW**

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Received 8<sup>th</sup> Jan. 2021; Revised 27<sup>th</sup> March 2022; Accepted 27<sup>th</sup> May 2022; Available online 1<sup>st</sup> Nov. 2022

<https://doi.org/10.31032/IJBPAS/2022/11.11.6620>

**ABSTRACT**

Nowadays, nanotechnology is the emerging field of medical research. Nanoparticles are intermediate structure between micro materials and atomic structures which are responsible to enhance the physical properties such as surface area, volume ratio caused more attention to many technological, environmental, and medical challenges. Today, green synthesis of different nanoparticles (NPs) using plant extract, synthesis using microorganism, and low-temperature synthesis has been extensively studied. However, less attention has been paid to manganese as a high performance metal in various applications such as medicine, biomedicine, biosensors, water treatment and purification, electronics, electrochemistry, photo electronics, catalysis etc. Manganese (Mn) is a transition metal, existing in oxidation states of -3 to +7; however, the most common are +2, +3, +4, +6, and +7. Manganese oxides (Mn-oxides) has wealthy structures such as MnO, Mn<sub>5</sub>O<sub>8</sub>, Mn<sub>2</sub>O<sub>3</sub>, MnO<sub>2</sub>, and Mn<sub>3</sub>O<sub>4</sub>, and can be used in a variety of fields. Mn-oxide NPs potentially hold great promise for sustainable nanotechnology. This review attempts very recent research findings to summarize the data for green synthesis, applications and future perspective of Mn NPs. Also, various applications of the green synthesized Mn NPs have been reviewed.

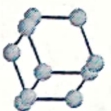
**Keywords: Metal nanoparticles, Mn NPs, Plant extract, Green synthesis, Metal reduction**

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Nanoscience & Nanotechnology-Asia, 2022, 12, e140322202120

RESEARCH ARTICLE



BENTHAM  
SCIENCE

## Green Synthesis of MnO<sub>2</sub> NPs Using *Blumea lacera* Leaf Extract and its Antimicrobial Study



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**Abstract:** *Background:* Green synthesis of nanoparticles has emerged as an interesting and expanding research area due to environmental friendliness, non-toxicity, cleanliness, and cost-effectiveness. Moreover, it can be performed at room pressure and temperature. *Blumea lacera* is described as a valuable medicinal plant in many vital systems of medicines. The study explored the eco-friendly green synthesis of MnO<sub>2</sub> NPs using *Blumea lacera* leaf extract.

*Methods:* Reduction of potassium permanganate (KMnO<sub>4</sub>) using *Blumea lacera* leaf extract was carried out at room temperature. The crude extract of *Blumea lacera* was added to metal ion reagents of specific volume and specific concentration at ambient temperature and stirred continuously using a magnetic stirrer. The aqueous leaf extract reduced and stabilized the KMnO<sub>4</sub> into MnO<sub>2</sub> NPs. The MnO<sub>2</sub> NPs obtained from the solution were purified and separated by repeated centrifugation using Remi cooling centrifuge model C-24.

*Results:* The biosynthesized MnO<sub>2</sub> NPs, characterized by UV-Vis spectroscopy showed an absorption peak at 400 nm. The XRD studies revealed the spherical shape of MnO<sub>2</sub> NPs with an average particle diameter of 20 nm. FT-IR analysis confirmed the presence of functional groups -OH, C=O, C=C, and C-H triggering the synthesis of MnO<sub>2</sub> NPs. Vibrational mode at around 606.62 and 438.81 cm<sup>-1</sup> supports the occurrence of the O-Mn-O bond.

*Conclusion:* The synthesized MnO<sub>2</sub> NPs were found to be good antibacterial and antifungal agents against bacterial strains *Staphylococcus aureus*, *B. subtilis*, *Pseudomonas aeruginosa*, *E. coli*, and fungal strains *C. albicans*, *Aspergillus niger*, and *Sclerotium rolfsii*.

**Keywords:** *Blumea lacera*, plant extract, MnO<sub>2</sub> NPs, green synthesis, UV-Vis spectroscopy, antimicrobial study.

### 1. INTRODUCTION

As per green chemistry principles, there is a growing need to develop green procedures for the synthesis of metal nanoparticles providing advancement over chemical and physical methods. These methods are environmentally friendly and cost-effective, and high pressure, energy, temperature, and toxic chemicals are not needed [1]. Generally, nanoparticles (NPs) are produced through chemical or physical methods. However, both approaches need significant amounts of energy and hazardous chemicals for reduction and capping, and they are not readily scalable [2]. A critical issue is that these methods jeopardize the biocompatibility of NPs owing to using dangerous chemicals in the manufacturing process, which remain on the NPs' interface also after repeated washing, as a result, their biological applicability is jeopardized [3]. Thus, the synthesis of NPs utilizing biological

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2210-6820/22 \$65.00+0.00

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approaches, particularly those based on plants, offers a solution to these established methodologies [4]. The biogenic synthesis of nanoparticles involves either living organisms such as bacteria, fungi, and plants or biomass, like plant extracts [5]. Biological synthetic processes have emerged as a simple and viable alternative to more complex physicochemical approaches to obtain nanomaterials with adequate control of size and shape [6, 7]. Among the "Bottom-up" and "Top-down" approaches for the synthesis of metal nanoparticles, the green synthesis of nanoparticles is categorized as a bottom-up approach in which molecules or atoms are assembled into NPs (Fig. 1). This new approach has emerged as non-toxic, environmentally friendly, clean, and less costly and can be done at room pressure and temperature [8-10]. Specific interest in Mn-oxides among different 3d transition metal oxides is due to their various structures and compositions, such as MnO, MnO<sub>2</sub>, Mn<sub>2</sub>O<sub>3</sub>, Mn<sub>3</sub>O<sub>4</sub>, and Mn<sub>2</sub>O<sub>4</sub> [11]. Mn-oxide NPs potentially hold great promise for sustainable nanotechnology [12]. Mn-oxides can be used in solar cells, batteries, catalysis, optoelectronics, magnetic materials, drug delivery ion sieves, molecular sieves, as well as other fields

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IJARSCCT

ISSN (Online) 2581-9429



International Journal of Advanced Research in Science, Communication and Technology (IJARSCCT)

IJARSCCT

Impact Factor: 6.252

Volume 2, Issue 4, March 2022

# Review on Adsorption of Different Heavy Metals on Natural Adsorbent Sawdust

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**Abstract:** Natural adsorbent i.e. Sawdust has been proved to be effective low cost adsorbent for removal of metals, dyes from their aqueous solutions. Sawdust is available in ample amounts in nearby area, so its use can be greener way of water purification. This paper reviews the findings of some researchers for the use of saw dust in different forms for heavy metal removal. Reported optimizing factors of adsorption, its isotherm analysis and kinetics are reviewed in this paper. It has been found that generally Langmuir and Freundlich adsorption isotherms fit well to batch experimental data. Pseudo-Second-order kinetic model best describe these processes. In some cases intraparticle and Elovich models are also used. Observations of effectiveness of Saw dust can be useful in future for designing water purification technology.

**Keywords:** Adsorption, Sawdust, Heavy Metals, Adsorption Capacity, Isotherms, Kinetics

## I. INTRODUCTION

Water pollution is biggest problem that world is facing today. In need of potable water new techniques of water purification are in demand. Scientists, Chemists, Environmentalist are aiming towards proper water treatment and management processes. Different sources for water contamination are industries, agriculture and human activities. Excessive levels of heavy metals causes problems to human beings and also ecosystems. Industrial effluents, agricultural runoff increase the levels of metals like Iron (Fe), Nickel (Ni), Cadmium (Cd) etc in water bodies and therefore their removal is necessary. Adsorption with natural adsorbents is attempted in last decades by researchers. This is an attempt to find efficient adsorbents to reduce the contamination. Many researchers tried saw dust of different trees as natural adsorbents. Many scientists reviewed the use of sawdust as adsorbent. (R. Chikri), (Renu, Agarwal, & Singh, 2017) This paper aims to summarize the different types of saw dusts, their use as adsorbent, their application by different researchers, their use to remove heavy metals.

### 1.1 Saw Dust as Good Adsorbent

Saw dust works as adsorbent because it has functional groups like -COOH, -OH, amide groups in which are responsible for chemisorption. (Renu, Agarwal, & Singh, 2017). Saw dust is composed of lignin, Cellulose, hemicellulose (R. Chikri). In process of adsorption on adsorbent, modifications in surface area is focused. This cheap adsorbent can be used also in its activated carbon form which can be prepared by chemical and physical activation methods

### 1.2 Adsorption Experiments with Saw Dust Adsorbent

Many researchers used Sawdust of different trees such as Beech sawdust for removal of Cu, Ni, Zn (Dragana Bozic, 2013), Sawdust of Walnut for removal of Lead, Cadmium and Nickel (Bulutaysemin, 2007), algae, sawdust of pine and Absol (Mehmet Emin Argun, 2007), modified oak sawdust by means of HCl treatment for removal of Zn, Cu, Pb, Ni and Cd (Mehmet Emin Argun, 2007), UAD, TAD & CAC Adsorbent prepared from *Borrassus aethiopum* (Adaji Idoko Johnson, 2021), the wooden biomass of *Dalbergia sissoo* for removal of Ni & Zn (Samin Sirasbakti, 2017). Sawdust for removal of Cr(VI) (Samin Sirasbakti, 2017). Batch experimental studies are carried out and best efficiency of saw dust is determined by optimizing factors like pH, contact time, adsorbent dose, etc. A. At optimized conditions different researchers reported maximum efficiency of the saw dust as follows

1. Ola Andersson (2016) reported the adsorption efficiency of algae, sawdust of pine and Absol (Sand, lime, cement and water). Out of them percentage of adsorbed metals on sawdust in single-metal system is for Cu, Ni,



## Ethnobotanical Investigation on Wild Edible Vegetables used by Thane Residents

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 Botany, Research Centre, GES's Arts, Comm. and Sci. College, Shrivardhan Dist. Raigad

### Abstract

A field research study was conducted in the years 2020-21. This type of comprehensive survey technique could help aspiring scientists learn about the health benefits of wild edible plants, which can then be combined to create profitable crop plants. The reduction of food shortages, the regeneration of barren regions and the strengthening of rural economies will get benefitted from such a system. A total of 23 wild edible plant species from 18 families and 20 genera were discovered, identified and discussed in this study. The botanical names of plants, as well as their common names, habits, families, parts used, modes of uses, ethnomedicinal applications and tribal recipes are arranged alphabetically. With three species Amaranthaceae followed by Dioscoreaceae and Malvaceae with two species and the rest with one species each. Leaves (09), followed by fruit (06), tuber (04), stalk (02) and the rest with one species each, were the most commonly used among 23 wild edible plants.

**Keywords:** wild vegetables, tuber, ethnobotany, traditional knowledge, healers.

### Introduction

The term "wild edible plants" refers to plants that can be used as food if collected at the appropriate stage of growth and properly utilized. (Kallas, 2010). WEPs (wild edible plants) are species that are not farmed or domesticated but are available in their native habitat and exploited as food sources (Beluhan and Ranogajec, 2010). Wild edible plants have played an essential role in human life from ancient times; they have been utilized for food, medicine, fiber and other purposes, as well as feed for domestic animals (Kanchan, 2011). Several studies have revealed that wild edible plants are a possible source of nutrients and are often more nutritious than conventionally consumed crops. (Grivetti and Ogle, 2000).

Wild edible plants serve an important role in providing food for poor rural populations, particularly tribal people who live near woodlands. Forest dwellers/tribal populations' subsistence methods rely heavily on wild food plants. While these plants are not widely

available, though they are important for nutrition and food security in many countries, including China, India, Southeast Asian countries, Africa and Australia. Several wild edible plants are consumed alongside domesticated in many countries, including China, India, Southeast Asian countries, Africa and Australia (Mazhar et al., 2007). Edible wild plants have always been used as the first food source, providing the necessary energy for human growth, development and reproduction (Rai et al., 2012).

Forests play a vital role in ensuring tribal food security. Forest dwellers' livelihood methods rely heavily on wild edible fruits as a source of nourishment. India has a large forest region and more than 4 million tribal people rely on wild edible plants.

The monsoon season is when uncommon wild foods are most plentiful. From July through September, these vegetables can be found in abundance in forests, along hill slopes, near river banks, surrounding ponds and in and around their hamlets, where cow dung is plentiful. During the first two months of the monsoon, most wild vegetables are available for good development. Though most wild vegetables are available to tribals during the first two months of the monsoon, due to high demand at the local taluka market, just a handful are left behind for their family members. The uncommon wild vegetables bring in extra money for the tribals because of their ethnomedicinal worth (Pant, 1996).

Earlier work on wild edible plants from many parts of Maharashtra like Annavati, Konkarn, Thane and Palghar was carried out by Bhoggonkar et al., (2010), Khan & Kakte, 2014; Khyade et al., 2009; Majumdar et al., 2009; Satvi and Marathe, 2018, Oak et al., 2014 Palekar, 1993.

The current research was designed to describe the variety of wild vegetables consumed by urban residents in the Thane.

### Materials and Methods

#### Collection of wild vegetables

Frequent monthly visits were arranged and collected wild edible vegetables from Thane Market areas, Villagers, farmers and small vegetable sellers and brought in the

## Medicinal Application of Adhatoda vasica(L)



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### Abstract:

Herbal medicine is still the mainstay of about 75-80% of the world population, mainly in the developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body lesser side effects.

In Ayurveda vasica have great role in cure the specific disease. Vasica is popular for its beneficial effects, particularly in bronchitis. Vasica herb is used for treating cold, cough, chronic bronchitis and asthma. The decoction of fresh leaves can be used for cure above diseases. Vasica leaves, bark, root, fruits and flowers are useful in the removal of intestinal parasites. The decoction of root and bark of vasica is also useful to cure cough, cold, chronic bronchitis and asthma. A warm decoction of its leaves is useful in treating scabies and other skin diseases. In acute stages of bronchitis, vasica gives unfailing relief, especially where the sputum is thick and sticky, it liquefies the sputum. In asthma the dried leaves should be smoked. Gulkand which prepared from vasica flowers is used to treat tuberculosis. The juice from its leaves should be given in doses of 2 to 4 grams in treating diarrhea and dysentery. A poultice of its leaves can be applied with beneficial results over fresh wounds rheumatic joints and inflammatory swellings. In ancient times leaves decoction with pepper and dried ginger was taken. but, now a day because of modern technology it is possible to searched out its active components likes vasicine, oxyvasicine and vasicinone and alkaloids for expelling sputum from the body.

**Key Words:** Adhatoda vasica, Herbal medicine, traditional uses.

**Introduction:** The name of vasica is based on Sanskrit name. vasica is indigenous to India. Its grow all over the India, and lower the Himalaya ranges. Vasica also called as Malabar nut tree, through the India. It is tall, with several branches, dense, and an evergreen shrub. Leaves are large and lance-shaped. It has capsular four seed, fruits. The flower are either white or purple in colour. Adathoda vasica is a very well know remedy available everywhere

and its especially popular in rural areas.in Ayurveda medicine, Malabar nut has been used for a multitude of disorders including bronchitis, leprosy, blood disorder, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leukoderma, jaundice, tumours, mouth troubles, sore-eye, gonorrhoea.(Prasad et al.,2011) Acknowledging its medicinal properties, it has been adopted by modern medical practitioners also. A decoction of the leaves of vasica may be used to help with cough and other symptoms of cold. In many cases where bronchitis is due to lack of appetite and poor digestion, the juice of vasica is mixed with the juice of ginger and honey and given in the early morning on an empty stomach. there soothing action helps irritation in the throat and the expectorant will help loosen phlegm deposit in the airway. A poultice of the leaves of vasica may be applied to wounds for their antibacterial and anti-inflammatory properties. The poultice is also helpful in relieving rheumatic symptoms when applied to joints. Vasica has been used to control both internal and external bleeding such as ulcer, piles, and bleeding gums. This growth in almost all part of the world and their bark, leave, flowers are used in the medicine. Leaves are used to cure cough and bronchitis. The plant has pungent and astringent test. ( Patel and Venkata-Krishna-Bhat 1984) It is cold in action. It normalizes kapha and pitta and improves the voice. Vasica special virtue is stopping bleeding due to the aggravation of pitta, through the mouth, nose genitals, or the urinary systems. This is not to say that it always cures all these diseases but it does give immediate relief. in many of the cough syrups that are available, vasica has been used either as a base or as an ingredient. In ancient time the roots of the vasica was tied on the back below the navel region and it is said that it produced safe, painless delivery. Vasica avalaha, useful in easing all sorts of cough, especially in the case of asthma, and bronchial congestion, is made in the following manner: the juice of 1 seer of vasica leaves is boiled with 1/4 seer of white sugar, 4 total pure Ghee, until the mixture is reduced to a jelly form. After cooling 1/4 seer of honey is added and the preparation is mixed thoroughly. Person suffering from

## Diversity of Succulents Plants from the Region of Navi Mumbai, Maharashtra



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### Abstract

The present study was based on extensive surveys and field observation in different localities like parks, gardens, roadside and nurseries of Navi Mumbai city in 2020-21. During the field visits, the plant specimens were surveyed. The plants had been picked and digital photos of them were taken. Specimens were identified using standard procedures and flora. Plant species, botanical names, as well as local names, habits, families, significance of the plants are arranged alphabetically. The exploration and field survey resulted in the documentation of 17 species belonging to 10 families and 10 genera distributed in the different localities of Navi Mumbai. With four species Portulacaceae family takes the lead, followed by the Agavaceae with three species, Euphorbiaceae and Asparagaceae with two species and the rest with one species each. According to the survey, many of the plants were cultivated in public parks, gardens, industrial areas and roadsides for the beautification of the city.

**Keywords:** diversity, floristic, succulents, cactus and draught.

### Introduction

Succulents and cacti are plants with specific features that allow them to store water in thick fleshy leaves or stalks. They are light-loving plants, attractive towards sun. Except when actively growing, they require little attention. There is a distinct difference between the two. The presence of areoles, which resemble woolly cushions with spines, hairs or glochids, distinguishes cactus and the flowers emerge from or near the areoles. Cactus spines are modified leaves that gives shelter from the harsh sunlight and aid in moisture conservation while also protecting the plant from birds and animals. Cacti are all succulents because they store water, however not all succulents are cacti. Gardeners love succulent plants and are used to brighten up sunny locations in gardens, homes, window frames and rock gardens (Bose et al., 1999).

Succulent plants are found in practically every habitat

type and have a global distribution. Succulent plant species can be found in over 30 botanical families, ranging in size from tiny annuals to massive trees (IUCN, 1997).

The world's most diversified succulent flora can be found in the "Succulent Karoo" of South Africa and Namibia. Mexico boasts the most variety of cactus of any country on the continent (Ortega and Hector, 2006). More than 60 species are recognized in the Union for Conservation of Nature of Nature's (IUCN) Red Data Book (IUCN, 2003). Most of these species are significantly vital biologically, culturally and economically.

Succulents originated from other related plants that grew in a normal environment by adapting to their habitat's shifting climatic circumstances, particularly the frequency and amount of rainfall. Every family's adaption process was different, and many plants undoubtedly died in the quest for survival. Water is required for the growth and survival of all vegetation, including succulents, which have perfected the art of water conservation (Rudolf, 1980). The earth's climate altered over time, becoming drier as mountains were pushed higher, creating rain shadows and deserts. Other plant families have adapted to these conditions in a similar way and there are thousands of succulent species to choose from (Edwards and Donoghue, 2006).

Succulent plants are becoming increasingly popular among plant lovers, home gardeners and professional landscapers for a variety of reasons. With their colorful foliage, sculptural shapes and ease of maintenance, succulents are a striking and forgiving plant for pots (Bald, 2010). Succulents are available in a wide range of sizes and shapes. The succulents studied in this study are diverse. Gardeners in Maharashtra largely disregard them because many of them are aesthetic. Succulents are now widely employed in outdoor and indoor gardening in Navi Mumbai, including malls, industries, colleges, hospitals and gardens. As a result, documenting such decorative groups is equally critical. Succulents are commonly planted as pot herbs, but some are also produced as succulent shrubs. Most of these attractive succulents



## Inspecting Occurrence of Pathogenic Fungi on *Solanum melongena* (L.) cultivated in Different Areas of Ahmednagar District.

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### ABSTRACT

Brinjal crop is highly prostate plant susceptible to various fungal pathogens which lead to different diseases in root, shoot, leaf and foliage affecting diseases. This crop is prone to massive attacks by several species of fungi and bacteria that cause wilt, soft rot and root rot because of the increasing restriction in the use of chemical fungicides due to concern for the environment and human health, microbial inoculants have been experimented extensively during the last decade to control wilt and other plant diseases Bacteria have been explored as bio-control agents for plant and also as plant growth promoters and inducers of disease resistance Apart from improving plant health, they also meet the increasing demand for low-input agriculture.

**KEY WORDS:** Fungicides, Bio-control, Inducers, Diseases

### INTRODUCTION

Brinjal also known as eggplant belonging to family Solanaceae is the major vegetable crops cultivated in India. It is an annual crop grown commercially and serves as a staple vegetable crop in many parts of the world. It is widely used in many food preparations like, pickles and industrially processed foods and in daily consumption. The raw fruits are used as a vegetable cooked alone or mixed with other vegetables. Brinjal has originated from Indo-Burma region but distributed in South and South-East Asia, Southern Europe, China and Japan but (Vavilov, 1926). Asia accounts for about 94 percent of the world eggplant area, with about 92 percent of world output (FAO, 2012). Asia is the main producer, in particular China (53% of the world production), India (28%) and Turkey (4%) (Daunay, M.C et al., 2001) China, India, Japan and Turkey are the major producers of brinjal. Indonesia, Egypt, Iraq and the Philippines are also the other eggplant growing countries. In India cultivation of brinjal according to media reports, is approximately 83 lakh tonnes. In India, brinjal is cultivated in the states of Orissa, West Bengal,

Bihar and Maharashtra. Eggplant is adapted to a multi ranged climatic conditions, such as high rainfall and high temperatures from North to South and West to East. It is also one among the few vegetables capable of high yields in hot-wet environments (Hanson et al., 2006). It is grown commonly in almost all parts of the country and liked by both poor and the rich community. India is considered as the primary center of origin and diversity of brinjal (Patil et al., 2008). Brinjal fruit (unripe) is primarily consumed as cooked vegetable in various ways and dried shoots are used as fuel in rural areas. It is low in calories and fats, contains mostly water, some protein, fiber and carbohydrates. It is a good source of minerals and vitamins and is rich in total water soluble sugars, free reducing sugars, amide proteins among other nutrients. Brinjal is a nutritious vegetable with short growth duration but it requires more chemical fertilizer especially nitrogenous ones and pesticides. Huge amount of agro-chemicals causes severe health hazard and affect fertility status of soils. A report reads about 355,000 people die globally every year for the poisoning of different agrochemicals especially pesticides and two third of the global death due to chemical farming is from the developing countries like India (Sharon and Nishanthlalu, 2014). It is commonly grown and popular vegetable crop grown in the subtropics and tropics. The name eggplant has been derived from its shape which is white and shaped very similarly to hen's egg. It is called brinjal in India, and is also known by different names in different languages like badane (Kannada), baingan (Hindi), peethabhala (Sanskrit), begun (Bengali), baigan (Oriya), waangum (Kashmiri), vange (Marathi), Kathiri (Tamil), venkaya (Telugu), vashuthana (Malayalam) and ringna (Gujarathi).

Eggplant is a bushy, erect, and herbaceous, branched and grows up to 60 to 120 centimeters upwards in height. Stem is spiny with purple pigmentation due to presence of pigment anthocyanin. It shows fibrous or surface root system. The leaves are large, simple, lobed and alternately arranged on the stem. Flowers are bisexual, pentamerous and are solitary or in 2- 7 flowered cymose. Calyx is

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## Uses of Indoors Plants and Why we Response Positively to them



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### Abstract ;

For survival of living life plants are essential.. People have been bringing plants into their homes for thousands of years. They provide food, fiber, building material, fuel, and pharmaceuticals. Plants also produce intangible benefits for people, such as improving our health. These benefits occur with plants outdoors and indoors. We increasingly work indoors, and we are making ample use of plants in these spaces as well. Indoors plants have many uses and benefits. Their contribution is great, normally they contribute to cleaner, healthier air for us to breathe, thus improving our well-being and comfort. They also help to make our surroundings more pleasant, and they make us feel calmer. Interior plants have been associated with reduced stress, increased pain tolerance, and improved productivity in people. Research studies associated with interior plants which are discussed. Of increasing interest to many people is the question of why plants have intangible positive effects on us. If we understand this, then we can make better recommendations regarding the use of plants indoors and out to enhance their effects on people. Studies indicate that people have learned and innate responses to plants. Some of these responses appear to have genetic components. Particular studies are summarized, and potential applications of the results of these studies are presented in this paper.

**Key words:-** interior plants, Foliage plants, human problem, well-being, people-plant interaction, response to nature.

### INTRODUCTION:

We know very well that plants are essential for our life. Because they provide food, fiber, building material, fuel, and pharmaceuticals. Another thing that plants are used to decorate our homes, both inside as well as outside, which helps to make our occasions special, such as birthday, Pooja, traditional function, weddings and funerals. Many years ago people all over the world have grown plants in the containers and brought them into their living spaces.

For many years ago plants and gardening have also been considered as good for people, like physically, mentally, and socially, yet until recently, information about the intangible effects of plants on people were based on case studies, such as people saying working in their gardens made them feel better. Now a days there are numerous scientific studies in between people and plants, in their relationship both indoors and outdoors (for summaries, see: Lohr, 2000; Pearson-Mims and Lohr, 2000; Relf and Lohr, 2003). The range of benefits that has been documented is broad: air quality is improved (Wood et al., 2002), recovery from illness is faster (Ulrich, 1984), mental fatigue is reduced (Tennessen and Cimprich, 1995), and productivity is higher (Lohr et al., 1996). Stress is lowered (Dijkstra et al., 2008)

After studies on the benefits of plants are clear that their contribution helps to increase to solve both environmental and health problems. The physical cause of the tangible effects, such as removing air pollutants, are relatively well understood. The basis for the intangible effects, such as increased happiness, is not well understood. A lack of understanding of the theoretical basis hinders the most effective use of plants to deal with these issues. This paper examines some of the studies that have documented the beneficial effects of plants, focusing on those used indoors, and then examines some of the postulated reasons why humans respond positively to plants. And why they feel more relaxed in between them.

### Uses of Indoors Plants;

#### Indoor Air Quality;

One of the ways plants affect people is through the physical changes that plants

cause to their surroundings. For example, plants release oxygen and moisture into the air. Some of these changes to the environment can increase the health and comfort level for humans in enclosed environments. Interior plants are now playing a role in phytoremediation, and significant work has been done in this area.



## Synthesis of Some Novel Isoxazoline from Sec 3-Amino Pyridazine Chalcones and Their Antimicrobial Studies

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Article Received: 27 January 2023

Article Accepted: 28 February 2023

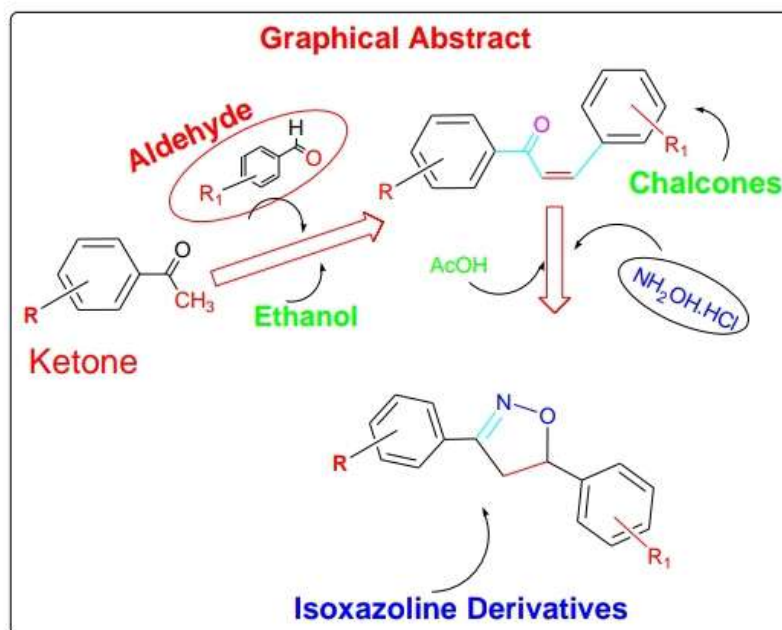
Article Published: 30 March 2023

### ABSTRACT

Different novel isoxazolines were synthesized by the cyclization of secondary amino derivatives with pyridazine as a substituted intermediate in the presence of hydroxylamine hydrochloride. Isoxazoline is an important class of nitrogen and oxygen-containing five-membered heterocyclic compounds having great medicinal importance. Many heterocyclic, pharmaceutically active compounds have been synthesized using it as an intermediate. Due to this activity, it is found useful in the treatment of anti-fungal, anti-bacterial, anti-cancer, anti-amoebic, and anti-inflammatory agents. The structures of the isoxazoline derivatives were confirmed by spectral analysis. The synthesized isoxazoline shows moderate activity against bacteria and fungus.

**Keywords:** Anti-bacterial; Antifungal chalcones; Isoxazoline.

### 1. Graphical Abstract



### 2. Introduction

The di-hydro derivatives of isoxazoles are called isoxazolines. The classical synthesis of isoxazoline compounds involves the base-catalyzed condensation of substituted aromatic ketone and various aromatic aldehydes to yield an unsaturated compound known as Chalcones, which can then be cyclized with hydroxylamine hydrochloride in an alkaline medium to yield the corresponding isoxazoline derivatives. In recent years, attention has increasingly been given to the synthesis of isoxazoline derivatives as a source of new antibacterial agents. The synthesis of novel isoxazoline derivatives remains a main focus of medicinal research. Heterocycles, like isoxazoline, have

# Reviews of Synthesis and Characterization of Some Pyrazine Ring Containing Heterocycle's

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**Abstract:** Heterocyclic chemistry has numbers of applications in the field of pharmaceutical chemistry. These compounds are synthesized worldwide by different synthetic methods. Two or more hetero elements containing heterocycles are synthesized and all these compounds were found stable. Chalcones a precursor has great importance in natural as well as synthetic heterocyclic compounds. Nitrogen atom containing heterocycles has very important role in medicinal field due to their biological activities. After reviewing literature, it was found that, nitrogen containing five membered heterocycle like pyrazoles, six membered Pyrimidines, seven membered benzodiazepines were synthesized by different synthetic methods. This literature survey promoted us to prepare highly stable five, six and seven membered ring structure using pyrazine ring containing derivatives and check their pharmacological activities. These compounds were characterized using IR, <sup>1</sup>H-NMR and Mass spectra and Elemental analysis. The compounds were found to be the most active against bacterial & fungal human pathogens.

**Keywords:** Benzodiazepines, Chemistry, Heterocycles, Pyrazole, Pyrimidine, etc.

## I. INTRODUCTION

Heterocyclic compounds were prepared in different synthetic methods. But if they are prepared from chalcones, found more stable and potent. Chalcones are common natural pigment & one of the most important classes of flavonoids & iso-flavonoids across the whole edible plant kingdom. [1, 2] It is one of the oldest but remain popular in 21<sup>st</sup> century due to the large number of replaceable hydrogens that allows a large number of derivatives and a variety of biological activities such as anticancer, anti-inflammatory, antioxidant, antiplatelet, antibacterial, antifungal, antileishmanial, antimalarial, antiviral etc. Chalcones are also key precursors in the synthesis of many biologically important heterocycles such as benzothiazepine, pyrazolines and flavones. Hence, the synthesis of chalcones has generated vast interest among organic as well as medicinal chemists. Some of their derivatives are used as sweeteners, drugs, and sunscreen agents. [3]

Several methods are available for the synthesis of chalcones. The most widely used method is the base-catalysed such as sodium hydroxide (NaOH), potassium hydroxide (KOH), barium hydroxide Ba(OH)<sub>2</sub> and lithium hydroxide (LiOH·H<sub>2</sub>O). The acid-catalysts had been also used to synthesize chalcones includes aluminium trichloride (AlCl<sub>3</sub>), dry HCl, boron trifluoride-etherate (BF<sub>3</sub>·Et<sub>2</sub>O), titanium tetrachloride (TiCl<sub>4</sub>) and ruthenium trichloride (RuCl<sub>3</sub>).

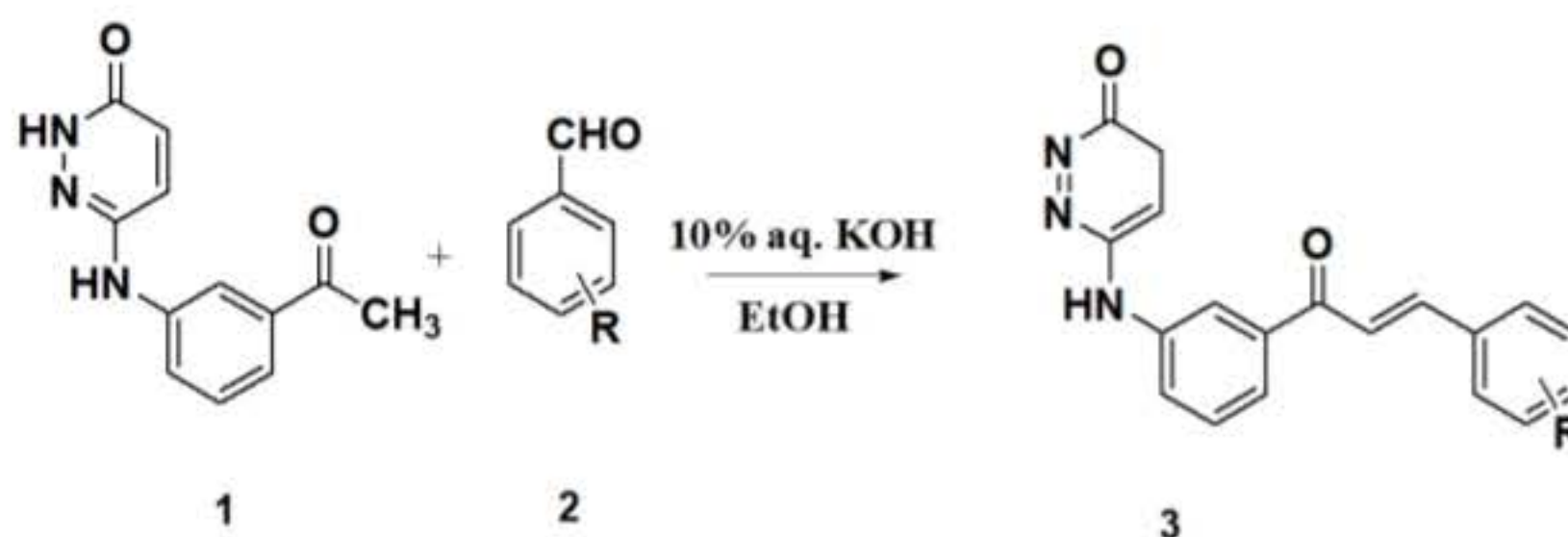


Figure 1