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Current Green Chemistry, 2017, *4*, 50-56

RESEARCH ARTICLE

Solvent-Free Synthesis of Thiobarbituric Acids Using Amberlyst-15 as a Green Catalyst

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ARTICLE HISTORY

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Abstract: ***Background:*** Solvent-free reaction for the synthesis of thiobarbituric acids (TBAs) by the reaction of 1,3-disubstituted thioureas and malonyl chloride using Amberlyst-15 as a green catalyst has been reported. Recyclability of the catalyst was possible up to five runs without loss of catalytic activity.

Conclusion: The simple workup, isolation without column, excellent yields, is main advantages of present protocol.

Keywords: Thioureas, malonyl chloride, thiobarbituric acid, recyclability, amberlyst-15, plausible mechanism.

1. INTRODUCTION

In recent years, reactions under solvent free conditions have been widely used in synthesis of certain categories of organic compounds [1-5]. Expansion of clean methodologies with least environmental damage is key requirement of sustainable synthesis. Syntheses of organic compound with use of huge amount of organic solvents instigate serious environmental threat [6, 7]. To reduce the environmental damage due to waste stream of organic solvents, organic chemists are under constant pressure of developing synthetic plan which includes use of more environmental benign solvents. It has been said that, "no solvent is the best solvent" [6] so called solvent free. Therefore, solvent free reactions obviously reduce pollution and being down handling costs due to generalization of experimental method, work up skill and thereby reducing the labor. Solid heterogeneous catalysis is one of the most promising areas in organic synthesis and it has gained considerable attention in the field of heterocyclic synthesis because of simple work-up, cost effectiveness, non toxicity, easy recyclability, non corrosiveness, stable, and good environmental compatibility [8, 9]. Therefore, Amberlyst-15 is one of the effective promoters that can enhance the reactivity and selectivity of various organic reactions [10-18].

C-N cross couplings have special significance in modern organic synthesis [19-22], and have numerous applications in natural products like, pharmaceutical [23], and manufacture of fine chemicals [24]. Thiobarbituric acid (TBAs) belongs to the family of pyrimidine-2,4-dione derivatives which is an important class of heterocyclic compound that exhibit biological and pharmaceutical applications [25-35]. TBAs have active methylene group [36], act as key precursor in the various organic transformations like Knoevenagel condensation, hetero Diels-Alder reactions, dyes formation, complex formation, intermolecular and intramolecular cyclisation to synthesize various compounds such as polymers, pigments, and dyes, *etc* [37-41].

Literature review revealed that large number of efforts are being made to find new methodologies for the synthesis of TBAs and their activities by the reaction of thioureas and malonic acid in acetyl chloride [33-35, 42-45]. In addition, there are few reports on the synthesis of TBAs by the interaction of thioureas with malonates in DMSO and potassium *tert*-butoxide [46] and *N*-acyl thiourea with methyl malonyl chloride in dry 1,2-dichloroethane [47].

Environment compatibility has been increased in order to avoid use of organic solvents for synthesis of highly functionalized organic compounds [48-56]. Green chemistry concept has been used for synthesis of heterocyclic derivatives [57-60], and also widely incorporated by the chemical industry and the academic community [61, 62]. In this regard, efficient, greener, and facile methodologies for constructing nitrogen and sulphur heterocycles are valuable. All the reported methods have one or other limitations which usually require long reaction times, more energetic conditions and insufficient yields of the products. To the best of our knowledge, there is no report on the synthesis of TBAs without solvent using organo catalyst Amberlyst-15 (Scheme **1**).

2. MATERIALS AND METHODS

2.1. General Procedure for the Synthesis of 1,3-diaryl-2-thioxo-dihydro-pyrimidine-4,6-diones (3-17)

To stirred solution of appropriate 1,3-diaryl thioureas (**1a**: 228mg, **1b**: 256mg, **1c**: 256mg, **1d**: 256mg, **1e**: 297mg,

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https://www.imedpub.com/articles-pdfs/ultrasonic-study-of-molecular-interaction-in-binary-liquid-mixturetriethylamine-in-benzene-at-30115k.pdf

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Ultrasonic Study of Molecular Interaction in Binary Liquid Mixture Triethylamine in Benzene at 301.15K

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ABSTRACT

The Ultrasonic velocity, density, and viscosity have been measured for binary mixture of triethylamine (TEA) and benzene at four different temperatures for a constant frequency (5 MHz). These experimental data have been used to estimate the thermodynamic parameters such as ultrasonic velocity (u), viscosity (ƞ), density (ρ), excess adiabatic compressibility (β_a^E), excess free length (L_f), excess free volume (V_f^E), excess viscosity (η^E), excess acoustic impedance (Z^E) for the solution. The excess values of the parameters are also evaluated and discussed.

Keywords: Ultrasonic velocity, Viscosity, Molecular interaction, Adiabatic compressibility, Acoustic impedance

INTRODUCTION

The studies of thermo-dynamical and transport properties of multi-component (binary and ternary) liquid mixtures and solutions have found wide application in chemical, textile, leather and nuclear industries. Ultrasonic investigations of liquid mixtures consisting of polar and non-polar components enable to understand the molecular interactions and structural behaviour of molecules and their mixtures [1-3]. The intermolecular interaction influences the structural arrangement along with the shape of the molecules.

For a better understanding of the physio-chemical properties and the molecular interaction between the participating components of these mixtures, ultrasonic velocities together with density and viscosity are measured at different temperatures for different concentration of the components in the mixture. These data furnish wealth of information about the interaction between ions, dipoles; hydrogen bonding, multi-polar and dispersive forces [4,5]. In order to understand the nature of molecular interactions between the components of the liquid mixtures, it is of interest to discuss the same in terms of excess parameters rather than the actual values. The dispersion forces which are caused by correlated movements of the electrons in interacting molecules are responsible for positive excess values. Dipole-dipole, dipole-induced dipole, charge transfer interaction and hydrogen bonding between unlike molecules are responsible for possessing negative excess values [6-12].

MATERIALS AND METHODS

Experimental

The chemicals benzene and triethylamine used were of analytical grade and obtain from Merck chemicals private Ltd. (Purity 99.5%). The densities of pure components and binary mixtures were measured by pycnometer method with an accuracy 1 part in 10^4. Special attention was given to avoid the vaporization of solution [13-17]. Comparing their density with literature values checked the purity of chemicals. The mixtures of various concentrations in mole fraction were prepared. The ultrasonic velocities in pure liquids and their mixtures have been measured by ultrasonic interferometer supplied by Mittal Enterprises, New Delhi at a central frequency of 5 MHz with accuracy ± 0.01 m/s. The viscosity of pure and mixture is measured by an Ostwald's Viscometer with accuracy ± 0.001 $Nm^{-2}s$. The temperature of pure liquids and their mixtures is maintained constant with the help of constant temperature water bath with an accuracy of ± 0.01 K.

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ACOUSTICAL STUDIES OF BINARY LIQUID MIXTURES OF TETRAHYDROFURAN IN ACETONITRILE AT DIFFERENT TEMPERATURES

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Abstract: The ultrasonic velocity, Viscosity and density for the binary liquid mixture containing tetrahydrofuran with acetonitrile have been measured over the whole composition range at 309.15K and 313.15K. These values have been used to calculate the adiabatic compressibility (β_{ad}), free length (L_f), free volume (V_f), relaxation time (τ), acoustic impedance (Z), internal pressure (π_i), molar volume (V_m), Gibb's free energy (ΔG), Rao's Constant (R), Wada's Constant (W) and enthalpy (H). The excess values of these parameters are also evaluated over the whole concentration range. The result is interpreted in terms of molecular interaction such as dipole-dipole interaction through hydrogen bonding between components of mixtures. The dependence of excess properties of mixture compositions were compared and discuss in terms of the intermolecular free length and other factors affecting the solvation and self-association effect. The excess values of these indicate dipole-dipole interaction complexity in the binary liquid mixture.

Keywords : Intermolecular interaction, binary liquid mixture, ultrasonicvelocity, Rao's Constant, Gibb's free energy and enthalpy.

INTRODUCTION:

The thermodynamic and transport properties of liquids and liquid mixtures are used to study the molecular interactions (Naidu and Prasad, 2002) between the various components of the mixtures the various components of the mixture and also to understand engineering applications concerning heat transfer, mass transfer and fluid flow. In chemical process industries, materials are normally handled in fluid form and as a consequence, the physical, chemical and transport properties of fluids, assume importance. Thus, data on some of the properties associated with the liquids and liquid mixtures like density, viscosity and Speed of Sound find extensive application in solution theory and molecular dynamics (Ramteke, 2012). Such results are necessary for interpretation of data obtained from the chemical, electrochemical, biochemical and kinetic studies. Tetrahydrofuran is used as a component in mobile phases for reversed-phase liquid chromatography. It has a greater elution strength than methanol or acetonitrile, but is less commonly used than these solvents. In the present paper the densities, viscosities and ultrasonic velocities for the binary liquid mixtures of tetrahydrofuran with acetonitrile have been measured over the entire range of compositions at 309.15 and 313.15K. To study the physico-chemical behavior of tetrahydrofuran with acetonitrile by evaluating different thermo acoustic parameters like molar volume (V_m), Gibb's free energy (ΔG), Rao's Constant (R), Wada's Constant (W), enthalpy (H) and t heir excess properties were derived over the entire mole fraction range.

MATERIALS AND METHODS :

The chemicals tetrahydrofuran and acetonitrile were used of analytical grade and obtained from Merck chemicals private Ltd. (Purity 99.5 %). Special attention was given to avoid the vaporization of solution. Comparing their density with literature values checked the purity of chemicals. The mixtures of various concentrations in mole fraction were prepared.

Measurements

(i) Velocity Measurement:-

The velocity of ultrasonic wave in the binary mixture have been measured using ultrasonicinterferometer with an high degree of accuracy operating at 5 MHz frequencies (Model F-81) supplied by M/sMittal Enterprises, New Delhi. The measuring cell of interferometer is a specially designed double walled vesselwith provision for temperature constancy. An electronically operated digital constant temperature bath supplied by M/s Mittal Enterprises, New Delhi, operating in the temperature range 5°C to 99.9°C with anaccuracy of ± 0.1°C has been used to circulate water through the outer jacket of the double walled measuring cellcontaining the experimental liquid.

(ii) Density Measurement:-

The densities of the mixture were measured using a 25ml specific gravity bottle. The specific gravity bottle with theexperimental mixture was immersed in a temperature controlled water bath. The density was measured using the formula

$$\rho_2 = \left(\frac{W_2}{W_1}\right)\rho_1$$

Where, w_1 = weight of distilled water, w_2 = Weight of experimental liquid, ρ_1 = Density of water, ρ_2 = Density ofexperimental liquid

(iii) Viscosity measurement:-

The viscosities of the ternary mixture were measured using an Oswald's viscometer calibrated with double distilledwater. The Oswald's viscometer with the experimental mixture was immersed in a temperature controlled waterbath. The time of flow was measured using a digital racer stop watch with an accuracy of 0.1 sec. The viscosity wasdetermined using the relation.

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Role of Groundwater and Surface Water in Geochemical Exploration

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Abstract

Geochemistry of natural waters provides an important option to evaluate mineral prospects in both two dimension (area) and in three dimensions (depth). The fundamental principles of aqueous geochemistry bring out the means to understand element mobility and intern interpreting dispersion patterns. It has applications in mineral exploration and environmental hazard studies. The use of hydrogeochemistry in mineral exploration had peaked during 1970s, which decreased during 1980s and early 1990s. However, in late 1990s, there was increase again due to improved analytical capabilities for water analysis. In the initial stages, the use of hydrogeochemistry to mineral exploration was restricted to sulphide deposits; however the widespread use of hydrogeochemistry in 1970s corresponded with intense uranium exploration. It was also noticed that relatively fewer hydrogeochemical surveys have been documented for volcanogenic massive sulphide, base-metal or gold deposits.

Keywords: Hydrogeochemistry, Groundwater, Surface water, Geochemical exploration, Mineralisation.

Introduction

Exploration geochemistry encompasses methods of prospecting for mineral deposits based on the systematic sampling and analysis of naturally occurring materials. The sampling media are rock, soil and stream sediments. The other important medium are water, vegetation, lake-bottom sediment, organic debris, soil gas and air (Webb and Thompson, 1977). The purpose is to determine spatial patterns in the distribution of elements and abnormal patterns or geochemical anomalies related to the presence of concealed mineral deposits. Such anomalies are the result of natural processes resulting in dispersion of elements at the time of ore formation or during the course of weathering, soil formation and erosion (Hawkes and Webb, 1962; Webb and Thompson, 1977; Govett, 1983; Solov, 1987; Ghoshal, 2012). Webb and Thompson (1977) have opined that the scope of exploration geochemistry has been determined by three factors *viz.*, i) increasing demand for mineral resources coming at a time when most of the deposits had already been discovered, (ii) advances in the concepts and understanding of geochemical processes bearing on dispersion of the elements and (iii) development of rapid, low-cost analytical techniques for the determination of elements in parts per million (ppm) or even lower levels of concentration in solid, liquid and gaseous media. Applied hydrogeochemistry in mineral exploration peaked in 1970s; however advancement in technology has generated robust element anomalies and dispersion patterns, at concentration levels unattainable earlier.

This paper deals with the use of hydrogeochemistry in mineral exploration and takes an overview of some fundamentals of inorganic aqueous geochemistry, controlling element mobility and a brief historical perspective of the use of hydrogeochemistry in mineral exploration.

Inorganic Aqueous Geochemistry

Geochemical mobility in natural waters is determined by three fundamental processes: element speciation in solution, precipitation of minerals and surface sorption processes (Taufen, 1997).

Element Speciation in Solution

The laboratory analyses, which furnish the total element concentrations of water, do not indicate about the form of elements in the solution (Taufen, 1997). For example, copper in water may be present as a free Cu^{+1} ion, a Cu-hydroxide ion

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Full Length Article

Neuroanatomical demonstration of calbindin 2a- and calbindin 2b-like calcium binding proteins in the early embryonic development of zebrafish: mRNA study

Rahul C. Bhoyar, Arun G. Jadhao, Sridhar Sivasubbu, A.R. Singh, Ankit Sabharwal, Nikhil V. Palande, Saikat Biswas

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Abstract

Certain calcium binding proteins (CaBPs) are essential for metabolic processes but the role of these proteins in the development is not well known. We have investigated the mRNA expression of CaBPs, calbindin 2a (*Calb2a*) and calbindin 2b (*Calb2b*) in the zebrafish embryos 24, 36, 48 and 72 h post fertilization (hpf). We have seen very high *Calb2a* mRNA expression in the tegmentum (Tg), midbrain–hindbrain boundary (Mhb), hindbrain (Hb), spinal cord (Sc), retina and cranial ganglion (Crg). Also very high *Calb2b* mRNA expression was noted in olfactory cells, cerebellum, Tg, Mhb, Hb, optic tectum, retina, retinal ganglion cell layer, retinal inner nuclear layer, Sc, Neural crest, infraorbital neuromasts, pharyngeal arch 3-7 skeleton and mandibular neuromasts. It is known that many factors are involved in the differentiation of Mhb. Here we are reporting for the first time the mRNA expression of CaBPs (*Calb2a* and *Calb2b*) in the Mhb indicating their role in the differentiation of Mhb and development of the brain, eyes and other tissues in the zebrafish. We suggest that *Calb2a* and *Calb2b* play an important role in the regulation of zebrafish early embryonic development.

Conflict of interests

The authors declare no competing financial interests.

Citing Literature

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National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Impact of bioaerosol exposure on respiratory health of saw-mill workers

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ABSTRACT

Background: Occupational environments with organic dust and bioaerosols pose danger to the respiratory health of the personnel of such environments. Respiratory health of the workers of saw-mills in relation to airborne bacterial and fungal concentrations has rarely been studied in India. **Aims and Objectives:** This study was, therefore, designed to assess and compare the pulmonary functions (PFs) of saw-mill workers with those of matching controls. The study also aimed at assessment of bioaerosol exposure in saw-mills as compared to indoor air in a residential area as a control. **Materials and Methods:** The study design was cross-sectional case-control. PFs (percent predicted of forced vital capacity [FVC], forced expiratory volume 1 s/FVC ratio, peak expiratory flow rate, forced mid expiratory flow 25-75%, and maximum ventilatory volume) were assessed by computerized spirometer (Helios, Recorders and Medicare System, India) in 30 saw-mill workers with minimum exposure of more than 5 years. 30 age and sex matched controls were also evaluated for the same parameters. Bacterial and fungal concentration (CFU/m^3) in the air of saw-mills with residential indoor air as a control was evaluated by volumetric air sampler (Hi-Air, Hi-Media, India). Appropriate statistical tests were used to compare respiratory symptoms, PFs, and bioaerosol levels. **Results:** Statistically significant lower values of PF parameters were observed in cases as compared to controls. Bacterial and Fungal concentrations in saw-mill air were significantly higher ($P < 0.001$) than control indoor air. **Conclusion:** The output of this study suggests a compromised respiratory status in workers of saw-mills with more exposure to bacteria and fungal spores. The results call for urgent measures to reduce environmental bioaerosol exposure in organic dust environments like saw-mills.

KEY WORDS: Bioaerosol; Organic Dust; Pulmonary Function Test; Saw-mill Workers

INTRODUCTION

Bioaerosols may consist of pathogenic or non-pathogenic live or dead bacteria and fungi, viruses, high molecular weight allergens, bacterial endotoxins, mycotoxins, peptidoglycans, β (1→3)-glucans, pollen, plant fibers, etc., It is now appropriately recognized that exposures to biological agents in both the occupational and residential environment are associated with a wide range of adverse health effects with major public health impact, including contagious infectious diseases, acute toxic effects, allergies, and cancer.[1]

The pollution of air in saw-mills with microorganisms results from the primary or secondary infection of timber with bacteria and fungi, respectively. Secondary infection of wood proceeds on chopped wood chips and planks which are stored in sawmills in conditions favoring microbial growth. It is characterized by abundant growth of molds. Thus, sawmill workers may be exposed at work to the inhalation of various allergenic and immunotoxic agents, comprising wood derivatives and microorganisms associated with timber.[2] This exposure to bioaerosols in work environment

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REVIEW OF RESEARCH

A CASE STUDY ON USE OF CaC_2 IN CROP RIPENING AND ITS ETHICAL CONCERNS ON HUMAN HEALTH

Rashmi R Gupta
Mohota Science College, Nagpur, Maharashtra, India.

ABSTRACT:
Ripened fruits are a vital part of a country's economy. All the ripeningagents in one way or another, recreate the action of a natural plant hormone Ethylene and artificially mimic the natural process of fruit ripening. Farmers, in their pursuit to boost profit, have started using excessive ripening agents. Calcium carbideexpedites the ripening process, butits excessive use mayintroduce toxiccompounds in the fruit. In this review, we try to consolidate the various studies conducted on the toxicity of Calcium Carbide and the methods for its Detection in artificially ripened fruits.

KEYWORDS : CaC_2 Crop Ripening, Human Health

Introduction:

Fruits are widely distributed in nature, commercially important and nutritionally imperative part of a balanced diet. Fruits play a pivotal role in human health by supplying the essential nutrients and vitamins required for a normal health[1].

Profitability of a farmer increases if they can somehow reduce the ripening period of a crop, and get a multitude of crops from the same piece of land essentially taking advantage of multiple crop cycles. The natural process of ripening involves a cascade of physiochemical changes that produces an edible fruit with high nutritional value.

In recent years, there has been research towards the action of different chemicals on the ripening processes of fruits.

Natural process of ripening takes place when the plant produces Ethylene gas (C_2H_4). Ethylene is an extremely flammable hydrocarbon with a sweet and musky odour in its pure gaseous state. Ethylene was one of the first identified naturally occurring plant hormone known to regulate numerous plant process such asdevelopment, growth and response to biotic and abiotic stresses[2].

The physical changes of ripening can be seen when the concentration of ethylene increases from 0.1 ppm (0.1mM) to 1 ppm(1mM)[1].

In the natural ripening process plants produces C_2H_4 in extremely low concentrations and transport it to the site of ripening, this process being extremely slow and using low concentrations of ethylene, rarely introduces toxicity to the ripened fruit. The best alternative to natural ripening is externally applying Ethylene gas in low quantities. But considering the safety and economic aspects involved in use of ethylene, this option is notfeasible for the farmers.

One convenient alternative to ethylene gas is using an analogue of ethylene gas i.e. acetylene gas (C_2H_2).

REVIEW OF RESEARCH

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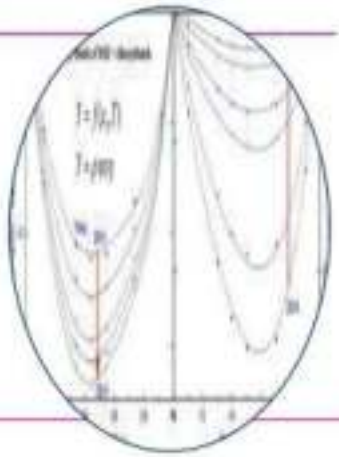
VISCOSITY AND OPTICAL PROPERTIES OF BINARY {AQUEOUS-2-[(DIMETHYLAMINO)METHYL]-1-(3-METHOXYPHENYL) CYCLOHEXANOL HYDROCHLORIDE} SOLUTIONS AT DIFFERENT TEMPERATURES



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ABSTRACT

In view of pharmaceutical value of narcotic like pain reliever, 2-[(dimethylamino)methyl]-1-(3-methoxyphenyl)cyclohexanol hydrochloride (DMH), the density (ρ), relative viscosity (η_r) and refractive index (n) of its aqueous solutions were measured at 297.15, 302.15 and 307.15 K as a function of drug concentration. Relative viscosity data has been fitted to *Jones-Dole relation* to get viscosity *A* and *B*-coefficients. Linearity relations of refractive index with density and drug concentration were studied. Refractive index and density data has been used to calculate molar refractions and polarizability of solution. Results have been interpreted in terms of temperature effects on drug-solvent molecular interactions.

KEYWORDS: Drug, Molecular interactions, Jones-Dole equation, Molar refraction, Polarizability

INTRODUCTION:-

Physical chemistry of pharmaceutically significant drug molecules is of great interest to number of researchers which are looking for various physical properties of drug molecules in solution. Drug-water molecular interactions are immensely important in pharmaceutical and industrial processes and in many fundamental sciences. These interactions are characterized by measurement of different thermophysical properties of aqueous drug solutions. Complex association of drug molecules, drug action and pharmaceutical dosage forms can be recognized from thermophysical properties. Thermophysical properties of solutions over a wide range of drug concentrations and temperature give information regarding drug-solvent and drug-drug molecular interactions, solvent structure making/breaking ability of drug and overall structural fittings in solution. Drug action can be understood from drug-water molecular interactions and their temperature dependence [1-2]. Increasing interest in understanding molecular interactions in drug solutions can be seen from recent publications in this area [3-11]. Changing molecular environment with composition and temperature leads to modifications in forces acting between molecules that lead to variations in thermodynamic properties of solutions.

The 2-[(dimethylamino)methyl]-1-(3-methoxyphenyl)cyclohexanol hydrochloride (DMH, Tramadol Hydrochloride) is used as a narcotic like pain reliever. In this context and in continuation with our interest for studying thermophysical behavior in drug solutions [12-14], and in view of pharmaceutical importance, present work reports systematic study of density, relative viscosity and refractive index of aqueous solutions of DMH at different temperatures.

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ASSESSMENT OF AVAILABLE SOIL NUTRIENT STATUS IN SOILS OF UMRI VILLAGE, SAONER TEHSIL, NAGPUR DISTRICT, MAHARASHTRA.

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[2]Shree Govindrao Munghate College of Arts and Science, Kurkheda tehsil, Gadchiroli, Maharashtra, India .

ABSTRACT

Nine composite(0-20cm) soil samples were collected and analyzed as per standard procedure for assessing chemical properties and available nutrient status of soil. The data indicates that all the nine samples under study were moderately alkaline in reaction and it ranged from 7.9 to 8.5. Electrical conductivity varied between 210-285 µS/cm. All the soil samples were moderately calcareous to calcareous due to presence of CaCO3 in soil. In context of nutrient status, soils were low to medium in available nitrogen (11.31 to 15.05 meq/100g), medium in available phosphorous (4.70 to 7.09 meq/100g) and high in available potassium (2.22 to 3.61meq/100g).

KEYWORDS : *collected and analyzed , nutrient status, soils.*

INTRODUCTION

Soil is an important natural resource gifted to us by nature. The ability of soil to produce crops largely depends on soil fertility, management practices and climate. Soil fertility depends upon proper macronutrients and micronutrients.

The three primary macronutrients are nitrogen(N), phosphorus(P), and potassium(K); all are required in relatively large quantities by plants. The secondary macro nutrients, calcium(Ca), magnesium(Mg), and Sulphur(S), are required in lesser quantities relative to primary category.

The overall productivity and sustainability of a given agricultural sector is highly dependent on the fertility and physicochemical characteristics of soil resources (Wakene,2001: Mohmmed et. al 2005). According to IFPRI (2010), the major causes of nutrient depletion include farming without replenishing nutrients over time (loss through continuous crop harvest), removal of crop residue, low level of fertilizer use and unbalanced application of nutrients. Soil characterization in relation to evaluation of fertility status of the soils of an area is an important aspect in context of sustainable agricultural production (Singh and Mishra 2012). The present study was therefore undertaken to assess the soil available nutrient status in soils of Umri village of Saoner tehsil.

MATERIAL AND METHOD

Umri is a village in Saoner taluka in Nagpur district of Maharashtra state, India. It belongs to Nagpur division. It is located 37 km towards North from district headquarters Nagpur,808 km from state capital Mumbai. It is surrounded by Kalmeshwar taluka towards south, Parseoni taluka towards East, Sausar taluka towards North, Nagpur taluka towards South[1].

https://ijrbat.in/abstract_view&paper=1288

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LACELLINOPSIS SACCHARI SUBRAM. REPORT FROM NAGPUR DISTRICT, MAHARASHTRA

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ABSTRACT:
Fungi belongs to class Hyphomycetes are ubiquitous and shows immense diversity in various ecological habitat, there are some fungi belongs to this class are rare in occurrence, *Lacellinopsis* is one of such rare hyphomycetes fungus isolated from Nagpur District, for the first time. *Lacellinopsis sacchari* Subram; is isolated and identified from the decaying leaf of *Typha latifolia* L. from *Pench* River. *Lacellinopsis* is saprophytic hyphomycetes fungus shows characteristic dark pointed setae and conidia developed on cupulated conidiophores.

Keywords : *Hyphomycetes, Lacellinopsis sacchari, Nagpur, India*

INTRODUCTION:

Hyphomycetes fungi referred to Fungi imperfecti or belong to phylum Deuteromycota. Based on phylogenetic investigation most of the imperfect fungi are currently allotted to the phylum ¬Ascomycota. Fungi imperfecti in which the vegetative stage is typically well-developed branched with septed mycelia. Fungi usually shows conidial states, species of this group do not show sexual reproduction. Classification mainly based on the macro- and micro-morphological characteristics. Class Hyphomycetes is characterized by formation of distinct types of exogenous conidia.

Classification of Lacellinopsis sacchari: Fungus imperfectus, Hyphomycete, Dematiaceae, Amerosporae. (Subamanian, 1953). As per recent understanding classification sited in Index fungorum this species have been assigned to Pezizomycotina as phylum – Ascomycota, where as ranking from class to family are Incertae sedis.

From India Lacellinopsis spp. recorded by C.V. Subramanian (1953-54) from Madras, Roy and Dwivedi (1961), Satynarayana and D. Rao (1965), Sreeramulu and Vittal (1970) from Andhra Pradesh, Dev Rao (1972) from Hyderabad. From other place of the world Lacellinopsis spp. recorded by M.B. Ellis (1957) Ghana, S.Hughes (1958), and reported by Camino et al. (2006), Mena Portales and Delgado-Rodriguez (2017).

Comparatively, rare fungus Lacellinopsis recorded from few states of India as mentioned above, Lacellinopsis sacchari first time recorded from Nagpur District of central India.

METHOD AND MATERIAL:

Sampling area: Decomposing Leaf samples of Typha latifolia collected from Pench river near Parshivani, Nagpur district of Maharashtra state in India (location 21°22'04.4"N 79°11'26.3"E).

1. Culturing of fungus by moist chamber method described by Hawksworth, 1974. Samples was incubates in moist chamber in sterile Petri plates at room temperature (30°C± 1°C), observed these plates at regular intervals 4-5 days, allowed to see the growth of fungi.

2. Direct mounting: from the decaying leaf of Typha latifolia direct mounting of the sample, stain with cotton blue-lactophenol and observed under the microscope. Camera Lucida diagrams drawn and microphotography carried out.

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EVALUATION OF MICRONUTRIENT STATUS OF SOILS OF UMRI VILLAGE, SAONER TEHSIL, NAGPUR DISTRICT, MAHARASHTRA, INDIA

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ABSTRACT:
Agriculture in Vidarbha continues to be caught in a vortex of nutrient deficiency in soil, affecting yield of varieties of crops in the region. Though the entire state is considered deficient in iron and zinc, problem is more pronounced in Vidarbha region. The present study was carried out to ascertain the status of micronutrients in soil samples of Umri village, Saoner Tehsil, Nagpur district. The available status of micronutrients. In all ten composite soil samples were collected and analyzed as per standard procedure for assessing micronutrient status of soil. Copper, Iron, manganese, Zinc and Nickel in the soils was found to range from 0.83- 1.23 mg/kg, 21.18 to 36.73 mg/kg, 96.70 to 110.34 mg/kg, 11.52 to 19.37 mg/kg and 0.70 to 0.92 mg/kg respectively.
Keywords: Soil, Micronutrients, Copper, Manganese, Zinc, Iron and nickel

INTRODUCTION:

Macro and Micronutrients are essential plant nutrients that are found in trace amounts in tissue, but play an important role in plant growth and development.

Without these nutrients, plant nutrition would be compromised leading to potential declines in plant productivity. Of the 17 elements essential for plant growth, eight are micronutrients: boron (B), chlorine (Cl), copper (Cu), iron (Fe), Manganese (Mn), molybdenum (Mo), zinc (Zn) and nickel (Ni). The micronutrients i.e., Fe, Cu, Zn, Mn, Co, Ni, Mo, and S in soil play a very important role in plant growth, productivity, soil fertility and animal nutrition. The main functions of the micronutrients in living organism are structural components of cell constituents and its metabolically active compounds, in the maintaining of cellular organization, in energy transformation in enzyme action, etc. There is increasing interest from the agricultural community in micronutrient fertilization for a variety of reasons including: 1) soil erosion and long term cropping have resulted in the removal of micronutrients from soils; 2) increasing crop yield generally leads to greater micronutrient removal rates in grain and other harvested products; and 3) the widespread replacement of micronutrient-rich manures with mineral fertilizers has reduced micronutrient addition from fertilizer source.

Vidarbha soil is inherently alkaline with 70-80 percent of soil with pH exceeding the desirable value. Though phosphorous is present in soil sufficiently, which has been formed from Basalt rock in Vidarbha, being chemically very active nutrient Phosphorous converts into complex compounds in due course of time. Soil should ideally have pH value between 6.5 and 7.5 for better yield of crops. According to data available with Soil Survey and soil Testing laboratory at Nagpur, soil was found to be 44 percent deficient in iron (Fe) and 40 percent deficient in Zinc (Zn). With the number of cattle declining over the years, farm yard manure and compost addition to soil is declining, leading to deficiency of both Zinc and Iron. Soil is also marginally deficient in Copper and Manganese.

MATERIAL METHODS:

The study area, Umri is a village in Saoner Taluka in Nagpur district of Maharashtra state, India. It is located 36 km towards North from district headquarters Nagpur. 808 km from state capital

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C-S and C-N coupling reactions of barbituric acid via selective and complete bromination using greener KBr/H_2O_2 as a brominating agent

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1,3-Disubstituted/unsubstituted barbituric acids on treatment with $KBr-H_2O_2$ as a greener brominating reagent give mono and dibromo barbituric acids. With aqueous HCl selective bromination and without aqueous HCl complete bromination of active methylene group of barbituric acids took place. The reaction of monobarbituric acids with thiosemicarbazide and thioglyoxalic acid under refluxing in aqueous medium, simple C-S coupling products were obtained. The spiro C-N coupling product was obtained by the interaction of dibromo barbituric acid with thiosemicarbazide and C-N condensation product was obtained by the interaction of dibromo barbituric acid with guanidine nitrate, both reactions took place in aqueous medium under refluxing conditions. An environmentally benign, aqueous mediated C-S and C-N organic transformation by the interaction of barbituric acids mediated by $KBr-H_2O_2$ as a greener brominating reagent is described. The simple product workup, use of inexpensive greener reagent $KBr-H_2O_2$ for bromination and simple purification without column are the additional advantages of synthetic protocol.

Keywords: Mono and dibromo barbituric acids, KBr/H_2O_2 greener brominating agent, C-S and C-N coupling products.

Introduction

The carbon sulfur bonds are prevalent present in organic compounds and have numerous applications like medicinally important natural products, biologically active drugs, paints, and spectroscopic probes[1,2]. Therefore, in the recent era, C-S coupling reaction has been of immense importance in organic synthesis and researchers developed diverse cross coupling methodologies for pharmaceuticals. Some important methods involved in the reduction of aryl sulfones or aryl sulfoxides using strong reducing agents like DIBALH or $LiAlH_4$[3], thiol addition to α β unsaturated carbonyl compounds at RT[4]. In 1980, Migita *et al.* have reported the Pd catalyzed thiation of aryl bromides using $Pd(PPh_3)_4$[5]. Subsequently, other metals like nickel[6], copper[7], cobalt[8], iron[9], rhodium[10], and manganese[11] have also been employed. The bromination of active methylene compounds is an important electrophilic substitution in organic synthesis. These important classes of compounds are useful synthetic intermediates for various transformations[12-16], especially, α-bromo carbonyl compounds have become an important motif for the development of various biologically active compounds[17-21]. The selective bromination of carbonyl compounds have been challenging task, because monosubstituted is main product but small amount of disubstituted product is also produced as an impurity during the reaction[22,23]. Literature survey revealed that the synthesis of α-halo carbonyl compounds is a challenge for organic chemists in 19th century hence considerable efforts have been taken for development of various useful reagents[24-27].

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ORIGINAL PAPER

Poly(methyl methacrylate) reinforced poly(vinylidene fluoride) composites electrospun nanofibrous polymer electrolytes as potential separator for lithium ion batteries

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Abstract
Fabrication of nanofibrous polymer electrolyte membranes of poly(vinylidene fluoride) (PVdF) and poly(methyl methacrylate) (PMMA) in different proportion (PVdF:PMMA = 100:0, 80:20 and 50:50) by electrospinning is reported to investigate the influence of PMMA on lithium ion battery performance of PVdF membrane as separator. As-fabricated polymer electrospun nanofibrous membranes were characterized by SEM, FTIR, XRD, TGA and DSC for morphology, structure, crystallinity and thermal stability. PVdF–PMMA (50:50) polymer electrolyte membrane showed ionic conductivity 0.15 S/cm and electrolyte uptake 290% at room temperature. After 50 cycles, the discharge capacity 140 mAh/g of Li/PE/$LiFePO_4$ cells with PVdF–PMMA (50:50) as polymer electrolyte (PE) membrane was found to be retained around 93.3%. The electrolyte uptake, ionic conductivity, and discharge capacity retention were improved by optimizing the proportion of PMMA in PVdF. Nanofibrous PVdF–PMMA (50:50) polymer electrolyte membrane was found to be a potential separator for lithium ion batteries.

Keywords Poly(vinylidene fluoride) · Poly(methyl methacrylate) · Polymer electrolyte · Electrospinning · Nanofibers · Lithium ion batteries

Introduction

Lithium ion batteries have been improved using polymer nanofibrous electrolyte membrane with its highly porous structure, high electrolyte uptake and ionic conductivity to transport as much as lithium ions through it. Polymer nanofibrous electrolyte membrane provides wide electrochemical operating window and good thermal stability useful to prevent electrolyte leakage and to minimize the firing hazard for high safety of batteries as compared to liquid polymer electrolyte [1–6]. Poly(ethylene oxide) (PEO), polyacrylonitrile (PAN), poly(methyl methacrylate) (PMMA), poly(vinylidene fluoride) (PVDF), poly(vinyl alcohol) (PVA) and poly(vinylidene fluoride-*co*-hexafluoropropylene) (PVDF–HFP) have been studied as host polymer for fabricating nanofibrous polymer electrolyte membrane [7–16]. Among these polymers, poly(vinylidene fluoride) (PVdF) has been mostly used as a semi-crystalline polymer with excellent film-forming ability, high dielectric constant and thermal stability [17]. But the crystalline domains of PVdF restrict the penetration of liquid electrolytes and the movement of lithium ions from between the electrodes during charging and discharging which show low ionic conductivity. Therefore, researchers in this field are more engaged to prepare polymer electrolyte membranes by blending or forming composites using different polymers or metal oxides to increase ionic conductivity, electrolyte uptake, and electrochemical stability than that of pure polymer electrolytes [18–22]. Li et al. prepared PVDF/PMMA membrane by anchoring PMMA to multiporous PVDF surface via electron beam preirradiation grafting technique and showed ionic conductivity 6.1×10^{-3} S/cm [23]. Also, Idris et al.

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STUDY OF CASEIN CONTENT IN VARIOUS MILK BRANDS AVAILABLE IN NAGPUR, MAHARASHTRA, INDIA

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ABSTRACT

Milk is a nutrient-rich, white liquid food produced by the mammary glands of mammals. It is important part of human life. Milk is viewed as a nutritious food with lots of vitamins, minerals, fats and proteins, thus used for drinking purpose. Milk contains Casein which is a slow digesting protein and is suspended in milk in a complex called micelle. Samples of milk brands available in market were obtained and subjected to estimation of the casein along with the cow, goat, skimmed milk powder and buffalo milk. The technique of precipitation of casein was used to predict the protein content in the milk samples. The percentage and gm/ml content of casein in the samples were estimated and analyzed in results. The results were compared with the available other studies in the literature and discussed.

KEY WORDS: *milk, protein, casein, branded.*

INTRODUCTION:

Milk is an opaque white fluid rich in fat and protein secreted by female mammals for the nourishment of their young. Milk contains important nutrients like Calcium, Phosphorous, Vitamin B, Potassium and Vitamin D. Plus it's an excellent source of protein. Drinking milk and dairy products may prevent Osteoporosis and Bone fractures and even help in maintaining a healthy weight. The nutritional profile of milk is impressive. Potassium, B_{12}, Calcium and Vitamin D, which are lacking in many diets. Milk is also a good source of Vitamin A, Magnesium, Zinc and Thiamine (B_1).

Additionally, it's an excellent source of protein and contains hundreds of different fatty acids including conjugated linoleic acid (CLA) and Omega- 3s. Just one cup (244 grams) of milk contains: -Calories-146, Protein-8 grams, Fats-8 grams,

Calcium-28 %of Recommended Daily Allowance (RDA), Vitamin D-24% of RDA, Riboflavin (B_2)- 26%of RDA, Potassium -10% of RDA, Phosphorus-22% of RDA, and Selenium- 13% of RDA.

Milk is essentially an emulsion of fat and protein in water, along with dissolved sugar, minerals including calcium and phosphorous and vitamins particularly vitamin B complex. Commercially processed Cow's milk is commonly enriched with vitamins A and D [2]. Milk has energy required for human activities and nutrients needed for building up the human body [3].

3.3.1 - Number of research papers per teachers in the Journals notified on UGC website during the year -2018-19

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Synthesis of thiazol, thiazinan, thiadiazin, thiazolidin, triazine, thioxo-pyrimidin and thioxo-imidazolidine by inter-intra molecular cyclization

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Syntheses of five and six membered heterocyclic derivatives by the reaction of disubstituted thiocarbamides with inter-intramolecular cyclizations in catalyst free condition have been reported. The simple product isolation without column, good yields under mild condition, and applicable green matrix are the advantages of present protocol.

Keywords: Thiocarbamides, thiazol, thiazinan, thiadiazin, thiazolidin, triazine, thioxo-pyrimidin, thioxo-imidazolidine

Thiazols, triazines, imidazolidines, thiadiazines, thiazolidines and thiones are key structural motif and attracted considerable attention because of their applications in pharmaceutical and biological systems. Many of the scaffolds interestingly exhibits anti-proliferative[1], anti-asthmatic[2-4], anti-inflammatory[5,6], anti-tubercular[7], anti-depressant[8-11], anti-cancer[12,13], anti-viral[14], anti-ulcers[15], anti-hypertensives[16], anti-histaminics[17], anti-diabetic, anti-protozoal[18,19], neuroprotective, anti-oxidant[20], and molluscicidal[21-27] activities. Furthermore, literature explorations revealed that, much work have been reported on inter molecular cyclization reaction of thiourea with phenacyl bromide[28-31], chloroacetic acid[32-35], chloroacetyl chloride[36], and α,β-unsaturated acid[37] in various reaction condition. Synthesis of aza-heterocycles from N,N'-disubstituted thioureas[38] and 2-phenyl-amino-thiazolines from (2-hydroxyethyl)-phenylthioureas[39] have been reported by intra molecular cyclization using TsCl/NaOH.

The development of useful organic transformations from simple starting materials with few synthetic steps to unite compounds to form highly functionalized and diversified molecules while keeping environmental aspects with interesting properties is highly desirable and have great synthetic challenge for chemists[41-42]. Although various methods for the syntheses of heterocyclic compounds have been reported many of them exhibit one or other limitations such as use of more quantity of organic solvents, catalysts, formation of hazardous waste product, and carbon emission during chemical reaction that have serious environmental threats[43,44].

To reduce the environmental damage by developing the synthetic plan includes minimum quantity of environment benign solvents and or dilute acid solution with catalyst free conditions. Therefore, the development of environmentally benign, catalyst free condition and green chemistry matrix remains a main objective for the synthesis of heterocyclic derivatives[45,46]. To best of our knowledge, we wish to report the environmental benign synthesis of heterocyclic compounds which affords good yields under mild and catalyst free condition (Scheme I and Scheme II).

Results and Discussion

We have found that, synthesis of heterocyclic derivatives by monitoring reaction under mild conditions can be achieved. Regarding the optimization of reaction conditions, we have applied basic concept to reduce more quantity of organic solvents, hazardous catalyst, longer reaction time and to enhance yield with green chemistry matrix.

We examined reaction of **6a** by the interaction of diphenyl thiourea with phenacyl bromide under stirring, refluxing and or microwave irradiation methods. In initial experiment, we have studied the reaction in aqueous medium due to environmental impact for organic synthesis but water did not give any desirable impact (Table I, Entry **1**). We have

Paper is not available online (only print version)

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Groundwater Potential Zonation of Panchdhara Watershed, Wardha District, Maharashtra Using Remote Sensing and GIS

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Abstract : The Panchdhara watershed located in the southwestern part of the Wardha District of Maharashtra, covers an area of about 153.73sq. km. This study has taken care of integration of remote sensing and GIS tool with inputs from field checkups, and brought out output in terms of groundwater resource assessment and management of Panchdhara watershed. In the watershed the Deccan basalts occupies 141.82 sq km whereas alluvial deposits are restricted to 11.91 sq km area. The watershed area has been classified into four main landuse classes namely, i) Agricultural Land, ii) Fallow land, iii) Water Bodies and iv) Forest land. The geomorphology of the area comprises of Plateau, Pediment, shallow Pediplain, deep Pediplain and Flood Plain of Wardha River. In the present investigation, the drainage morphometric analysis has been carried out with reference to their order and arrangement in watershed. The morphometric analyses bring out dendritic drainage pattern. The average bifurcation ratio of 3.98 indicates that the area has not been affected by any structural disturbance. The drainage density value of 2.16/km suggest more infiltration than the run-off.

Keywords : Groundwater, Panchdhara Watershed, Morphometry, Drainage, Wardha District, Maharashtra.

INTRODUCTION

Watershed is the natural hydrological unit that covers the specific aerial extent of land where from water drains out with single outlet. The size of the watershed depends on the number and size of the streams, drainage density and distribution of drainages. In addition, lithology, slope characters, land use cover etc are the other important parameters which govern the dimension of any watershed area. The concept of watershed as a planning unit for development of land and water resources gained importance in 1973 (WDG,2003), when the Ministry of Agriculture, Government of India initiated various developmental programs like Drought Prone Area Program (DPAP), Desert Development Program (DDP), and Hill Area Development Program (HADP) etc.

The physico-mathematical computations in the watershed area are represented as morphometric study. Horton, (1945) has carried out the pioneering work of morphometric study, which incorporates the quantitative study of the area, altitude, volume, slope as well as profiles of the land and drainage basin characteristics of the area. According to Clarke (1966) morphometric study mathematically analyzes the configuration of shape and dimension of its landform on Earth's surface Davis (1894) considered that the landforms are functions of three variables viz. structure, process and time wherein structure reflects attitude of rocks. Process corresponds to the action of both external and internal forces that disintegrate the rocks and time refers to the length of time in which a particular area has been at work on by process or a combination of processes (Strahler, 1964). An integrated study of the geology and study of landform characteristics is useful for understanding the occurrence of porous and permeable zone in the rock formations (Karanth, 1999). Thus morphomeric study helps in understanding the groundwater potential zones (Murkute and Joshi, 2011) and also provides the data for watershed management programs.

Remote Sensing (RS) and Geographic Information System (GIS) have emerged to meet ever-increasing demand of more precise and timely information. By combining the RS information with adequate field data, particularly land use pattern, cropping pattern, well inventory and the yield data in GIS environment, it is possible to predict the ranges of depth, the yield, the success rate and the types of wells suited to various terrains under different hydrogeological conditions.

With reference to hitherto expressed views, Panchdhara watershed, of Seloo taluka, Wardha district of Maharashtra state has been selected for the present research work.

In this present study an attempt has been made to understand the geomorphological characteristics of the Panchdhara watershed with special reference to remote sensing data interpretation and hydrological data through field checkups. Besides, slope characters, lithological characteristics and land use cover of the area have been deciphered with the help of satellite imagery and MapInfo professional 7.5 software. The methodology for evaluating various morphometric analyses has been summarized in flowchart (Fig.1).

STUDY AREA

The Panchdhara watershed constitutes a part of survey of India Toposheet 55L/9 and bounded by latitudes 20°48' to 21° 15' N and longitudes 78°34' to 78°41' E (Fig.2). The extent of surface irrigation is very limited due to lack of well developed canal network and hence irrigation practices are mainly dependent on groundwater resource.

The study area is characterized by plateau in northern part

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EVALUATION OF ANTIFUNGAL POTENTIAL OF ENDOPHYTIC FUNGUS *PREUSSIA ISABELLAE* ISOLATED FROM *AZADIRACHTA INDICA*

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ABSTRACT:

Azadirachta indica (Neem tree) harbors fungal endophytes that are continuously screened for their useful secondary metabolites including with antimicrobial potential. This investigation deals with an endophytic fungus *Preussia* isolated from Neem tree, evaluated for lovastatin production and was analyzed for its antimicrobial potential. The endophyte was identified as *Preussia isabellae* evaluated for its antifungal activity. Culture extract from *P. isabellae* shows prominent inhibition against *Saccharomyces cerevisiae*. Neem tree is important source of endophyte with antifungal potential.

Keywords: *Azadirachta indica, endophyte, lovastatin, antifungal, Preussia.*

INTRODUCTION:

Endophytes are the micro-organisms that are symbiotically associated within the plants, at all or some phase of their life cycle. Endophytic fungi are the rich source of secondary metabolites which shows varying bioactivities like antiviral, antifungal, antibacterial, antioxidants, ant insecticidal and immunosuppressant (Strobel 2003; Tejesvi 2007).

Lovastatin is one of the important secondary metabolite obtained from fungi with hypocholesterolemic potential. Lovastatin treatment has shown reduction in prevalence of Alzheimer's disease. Apart from that lovastatin helps to prevent kidney related disorders and shows antifungal activity (Buemi, 2002).

Azadirachta indica commonly known as Indian lilac is known for its medicinal properties. Studies have been carried out that indicate *Azadirachta indica* harboring endophytic fungi and such endophytes showing properties of secretion of pharmaceutically important secondary metabolites, (Kharwar 2009).

Present investigation an attempt has been made to isolate the endophytic fungi from *Azadirachta Indica* and extract lovastatin and evaluate its antifungal activity.

MATERIALS & METHOD:

Isolation of fungal endophytes from leaves of the *Azadirachta Indica* (Neem tree): Leaves of Neem tree were surface sterilized and placed on sterile plates with nutrient medium Potato Dextrose Agar (PDA) supplemented with antibiotic chloramphenicol to avoid bacterial contamination. The plates when incubated at 27°C, fungal colonies start appearing after 5 days, that are separated and pure endophytic fungi were isolated following incubation (Schulz *et al* 1993).

Identification of Endophytic fungi:

Isolated pure culture was examined and identified by both for morphological and colony characteristics, identification confirmed with the help of standard literature.

Solid state fermentation and lovastatin extraction:

Spore suspension of seven days old pure culture of selected fungal endophyte was inoculated in sterilized wheat bran in Erlenmeyer flask to carry out solid state fermentation, with moisture content of medium maintained to 70%. The experiment was set in triplicates with one control without fungi and incubated at 25° C for 10 days of solid state fermentation. Fungal extract was prepared by ethyl acetate extraction, the extract was evaporated and dissolved in acetonitrile and used for further analysis (Raghunath 2012).

HPLC analysis:

The extract obtained was run on HPLC unit to detect the presence of lovastatin using C18 column. The retention time was noted by comparing with the HPLC chromatogram of standard lovastatin.

Antifungal activity of lovastatin:

Sterile Petri plates containing potato dextrose agar were swabbed with suspension of test organism *Saccharomyces cerevisiae*.

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Photoluminescent electrospun europium complex Eu(TTA)$_3$phen embedded polymer blends nanofibers

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Electrospinning

ABSTRACT

Europium complex Eu(TTA)$_3$phen (TTA = 2-thenoyltrifluoroacetone, phen = 1,10-phenanthroline) was incorporated into polymer blends made of polystyrene (PS), poly(methyl methacrylate) (PMMA) and poly(vinylidene fluoride) (PVDF) to fabricate Eu(TTA)$_3$phen/PVDF-PS, Eu(TTA)$_3$phen/PVDF-PMMA and Eu(TTA)$_3$phen/PS-PMMA nanofibers by electrospinning for photoluminescent fabric designing. These nanofibers have been characterized by scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDX), Fourier transform infrared spectroscopy (FTIR) and x-ray diffraction (XRD). Photoluminescence of Eu(TTA)$_3$phen/polymer blends nanofibers was systematically compared with pure Eu(TTA)$_3$phen which showed typical Eu^{3+} ion red emission, assigned to the transitions between the first excited state ($^5D_0$) and the multiplet ($^7F_{0-3}$). The presence of different polymer blends as matrix for Eu(TTA)$_3$phen increases the fluorescent intensity of the $^5D_0 \rightarrow {}^7F_2$ hypersensitive transition of Eu^{3+} ions. Eu(TTA)$_3$phen/PVDF-PS and Eu(TTA)$_3$phen/PVDF-PMMA nanofibers showed better photoluminescence properties compared to that of Eu(TTA)$_3$phen/PMMA-PS nanofibers because of influence of polymers on the coordinative environment of europium ions and the dimensional effect of polymer blend fibers. Eu(TTA)$_3$phen/PVDF-PS and Eu(TTA)$_3$phen/PVDF-PMMA nanofibers are found to be potential materials for photoluminescent material designing.

1. Introduction

The photoactive lanthanide complexes such as europium with β-diketones have great curiosity due to their intense emission peaks in the visible and near infrared region under ultraviolet excitation. The trivalent europium ion (Eu^{3+}) exhibits strong and intense emission bands based on their f-f electronic transition and wide range of luminescent lifetime suitable for various applications. But, trivalent europium ions (Eu^{3+}) have low absorption coefficient which limits the lighting output. However, this can be enhanced by forming complexes of the rare-earth ions with organic ligands. The absorption bands of the chromophores of organic ligands are very strong, and hence ligand Eu(TTA)$_3$phen can absorb much more light than the Eu^{3+} ions. These ligands can proceed as an antenna to absorb the excitation light and to transfer the excitation energy to the higher energy levels of the Eu^{3+} ion, from which the emitting excited levels can be populated. Phen is a synergic shielding ligand which can reduce the rate of non-radiative decays and strongly enhance the luminescence intensity of the complex [1–3]. The presence of the ligand surrounding the ions acts as a physical buffer between the rare-earth ions [4]. The increase of the absorptivity of the ligand may improve the luminescent intensity of the complex. In these complexes, the Eu(TTA)$_3$phen has attracted a lot of attentions due to their high fluorescence emission efficiency as the result of the high absorption coefficient of the β-diketone ligand (TTA) and the synergistic effect of 1,10-phenanthroline (phen) [5–7]. Therefore, Eu(TTA)$_3$phen as a successful lanthanide organic complex has great concentration in high merit of the intense emission peaks in the visible and near-infrared region upon UV excitation. However, shortcoming of Eu(TTA)$_3$phen complexes with low processing ability, poor thermal stability and low mechanical strength which bound its direct applications in the earlier period. In order to overcome these limitations, europium complexes are usually incorporated into organic, inorganic or organic/inorganic hybrid matrices [8,9]. The incorporation of europium complexes into organic polymers presents an ideal and multipurpose approach to

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Polypyrrole/MnO_2 nanocomposites as potential electrodes for supercapacitor

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Abstract

Due to the ever growing demand of energy for various applications attention of researchers is aroused by Supercapacitors due to its superior power, energy density and cyclic life. Electrode material mainly determines the performance of Supercapacitors. Conducting polymers, metal oxides and carbon based materials are mainly used as electrode materials in Supercapacitors. Among these three categories of materials, Conducting polymers and metal oxides shows pseudo-capacitance. This paper reported the synthesis of Pure Polypyrrole (PPy) and Polypyrrole/Manganese dioxide (PPy/MnO_2) nanocomposites by in-situ chemical oxidative polymerization. The synthesized materials were tested as potential candidates for the electrodes of supercapacitor. X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM) revealed that nanoparticles of MnO_2 are well incorporated into PPy matrix. Cyclic Voltammetry (CV) indicated that PPy/MnO_2 nanocomposites have an ideal capacitive behaviour and an excellent cyclibility. Electrochemical impedance spectroscopy (EIS) and Galvanostatic charge-discharge (GCD) measurements proved that nanocomposite electrode with 10% MnO_2 composition showed the smallest charge transfer resistance and highest specific capacitance compared to other compositions. The electrochemical studies of PPy/MnO_2 nanocomposites showed that PPy/MnO_2 nanocomposites are suitable advanced materials for electrodes of the supercapacitors. Copyright © 2018 VBRI Press.

Keywords: Polypyrrole, manganese dioxide, nanocomposites, supercapacitor.

Introduction

Humanity is demanding a large quantity of energy as its level of development is growing, coupled with the severe climate change. The need of electronic portable equipment, wireless sensor networks and other micro systems are responsible for increasing demand for better energy storage and power supply under various conditions. Power devices integrated with other elements can fulfill the desire to further miniaturize existing on-chip systems. Energy storage becomes a critical factor that can solve the problems described above. The development of energy storage devices is extremely important to store the harvested energy for wide applications, thus it is gaining extensive research interest due to growing world population, global climate change, concerns about exhaustion of fossil fuels **[1, 2]**.

Fuel cell, batteries, Supercapacitors, and conventional capacitors are the major energy storage and conversion devices. Amongst these devices supercapacitor is most efficient energy storage device due to their simple fabrication method greater power density, long cycle life **[3]**. Supercapacitors also known as electrochemical capacitors have attracted much attention due to fast charging and discharging within seconds, superior cycle life time, high reliability and high power density. Supercapacitors, based on their charge storage mechanism can be broadly classified into two catogories: electrical double layer capacitors (EDLCs) and pseudo-capacitors. Energy storage in an EDLC is due to the charging of the electrical double layer at electrode and electrolyte interface while a pseudo-capacitor utilizes faradic reactions in addition to double layer charge. A conducting electro-active electrode with large surface area accessible to the electrolytic dopant ions is major factor responsible for high performance Supercapacitors **[4]**. Conducting polymers, carbon-based materials and transition-metal oxides have been investigated to explore the great potential and applicability for advanced supercapacitors with high capacity performance. However, from earlier attempts it can be concluded that the electrochemical properties of individual material separately for supercapacitors were limited by their intrinsic structural shortcomings. For example, carbon nanotubes (CNTs) exhibits high conductivity, good mechanical properties,large surface area and chemical stability **[5,**

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17. Polarizibility constants and Refractometric Measurments of Schiff's Base Hydrazone in Water-Dioxane Mixture

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Abstract

The ultrasonic velocity, density has been measured for the mixture of 2,4-hydroxy acetophenone-2,4,-dichlorobenzoyl hydrazone (H_2L_1) and 2,4-dihydroxy-5-nitroacetphenone-2,4 ,-dichlorobenzoyl hydrazone (H_2L_2) at different concentrations in dioxane at 303 K temperature. From the experimental data different acoustical properties like apparent molar volume, apparent molar compressibility, adiabatic compressibility, intermolecular free length (Lf), relative association (RA), acoustic impedance z etc. have been calculated. These parameter obtained have been interpreted in term of solute-solvent and solute-solute interactions. Molar refraction and polarizability constant for (H_2L_1) and (H_2L_2) at different percentage of dioxane have been calculated.

Introduction

Hydrazone are versatile ligand having biological activity with use as reagent for selective chemical separation of metal ions[1], insecticides anticoagulants antitumor agent, antioxidant, plant growth regulators[2] antibacterial anti- inflammatory and enzymatic reaction inhibitors.[3-7] The nature and relative strength of molecular interactions between the components of liquid mixture have been successfully investigated by the ultrasonic method.[8-10] These interaction helps in better understanding the nature of solute and solvent i.e. whether solute modified or distorts the structure of solvent. The measurement of ultrasonic speed enable the accurate determination of some useful acoustic and thermodynamic parameters and their excess function which are highly sensitive to molecular interactions in liquid mixture.[11-12] Ultrasonic velocity and adsorption studies in case of electrolyte solution have led to new insight into process of ion association and complex formation.[13-14] Sondawale and Narwade [15] have studied ultrasonic velocity of monochloro acetic acid and trichloro acetic acid in THF and dioxane-water mixture.

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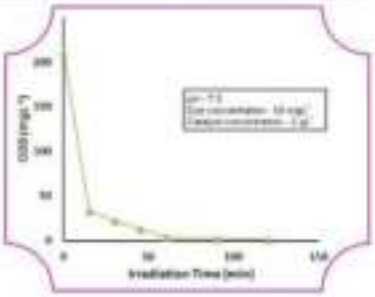
PHOTOCATALYTIC DEGRADATION OF INDIGO CARMINE DYE ON COMBUSTION SYNTHESIZED MGZRO$_3$ CATALYST UNDER SOLAR LIGHT IRRADIATION



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ABSTRACT

The Magnesium Zirconate ($MgZrO_3$) catalyst was prepared by solution combustion synthesis method and extensively characterized by XRD, SEM, TGA, DTA, Reflectance spectroscopy, BET surface area and powder density. An indigo Carmine (IC) dye was used as model pollutants to study its photocatalytic degradation under solar light irradiation. The degradation of IC was investigated by COD analyzer and UV-Visible spectroscopy. The influences of catalyst amount, initial dye concentration, pH of the reaction solution and irradiation time were investigated. Results of characterization confirmed the formation of $MgZrO_3$ catalyst. Recycling experiments confirmed the relative stability of the catalyst.

KEYWORDS: *Photocatalysis; Degradation; SEM; $MgZrO_3$; Combustion Synthesis.*

INTRODUCTION

Environmental protection, which requires strictly sustainable development to avoid jeopardizing current natural resources, is gradually becoming a matter of major social concern. Every day, increasingly tough legislation is being imposed with regard to effluent discharge (Martínez-Huitle, Rodrigo, Sirés, Scialdone, 2015). The textile effluent is highly colored; its emancipation in the environment is a considerable source of non aesthetic pollution and encumbers light penetration, thus disturbing aquatic life (Barka., Assabbane, Nounah, Ait Ichou, 2008;Neelamegam, Baskaran, Dhanasekar, Viruthagiri, 2004). Waste water is commonly characterized by its strong color, highchemical oxygen demand (COD), variable pH, total dissolved solids (TDS) content and low biodegradability, implying the presence of refractory organic matter (Korbahti, Tanyolac, 2008). Especially azo dyes, which are non-biodegradable, toxic and potentially carcinogenic in nature, are widely used (Sun, Wang, Sun, Sun, Sun, Qiao, 2006). These azo dyes were found to have immense hazardous effects on human health and environment (Akbari-Fakhrabadi, Saravanan, Jamshidijam, Mangalaraja, Gracia, 2015). Hence removal of these dyes from effluents is a major environmental problem because conventional physicochemical and biological treatment methods are ineffective for decolorization and degradation. Many chemical and physical techniques including adsorption, coagulation, precipitation, filtration, electrodialysis, membrane separation and oxidation have been used efficiently for removal of dye pollutants (Ozacar, Sengil, 2003). However, they are non destructive, since they transfer organic compounds from water to another phase, thus causing secondary pollution (Lam, Sin, Abdullah, Mohamed, 2012). Recently, Advanced oxidation processes (AOP's) in which heterogeneous semiconductor photocatalysis emerge as an promising destructive method, leading to mineralization of organic pollutants from wastewater (Ahmed, Rasul, Brown, Hashib, 2011; Vo, Thi, Kim, Kim, 2014; Saravanan, Khan, Gupta, Mosquera, Gracia, Narayanan, Stephen, 2015;Khan, Ansari, Khan, Ansari, Min, Cho, 2015;Hisaindee, Meetani, Rauf, 2013).Photocatalysis is based on the principle that when a semiconductor is exposed to a

SYNTHESIS OF AMINO AND THIOL FUNCTIONALIZED REDUCED GRAPHENE OXIDE COMPOSITES

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ABSTRACT

The world of nanotechnology has been transformed since graphene came into existence. Researchers all over the world have exploited graphene for its various potentials. Graphene find many applications in photo-devices, adsorption, food and medical industry, polymer fillers, sensors and energy storage devices etc. This has become possible due to unique layered structure of graphene and oxygen moieties present on graphene. These oxygen moieties have been tailored in many of its applications. Nitrogen and sulphur atoms are more nucleophilic than the oxygen atom in graphene. So, it is expected that thesubstitution of graphene with amine and thiol groups increase the nucleophilic properties of graphene. These interactions are expected to improve performance and functionality of the applications of graphene.

In this work of research,reduced graphene oxide is functionalized by amino and thiol groups by treating it with 4-aminothiophenol by two different methods to prepare adsorbing polymers.These composites are then characterized and confirmed by FTIR, XRD, TEM, SEM, and CHNS analysis.

Keywords: Graphene oxide (GO); reduced Graphene oxide (rGO),4-Aminothiophenol

1.Introduction :

Graphene (Gr), a two dimensional structure of sp^2 hybridized carbon[1], shows extraordinary properties including high electron mobility at room temperature[2,3],exceptional thermal conductivity[3]and amazing mechanical properties.[4,5]Particularly, the electronic properties of this material has pulled in attention among lot of analysts. However, a significant number of these intriguing and one of a kind properties can be enhanced by means of synthetic functionalization of the surface or edge defects.[6-8] These preliminary adjustments empower chemical covalent bonding between the Gr and organic materials of interest and furthermore, make Gr as a perfect stage to anchor various functional moieties such as metal nanoparticles.[9]The addition of graphene to a host framework has accomplished various improved properties with promising applications in many industries such as aviation, electronics, energy, structural and mechanical, ecological, medicinal, nourishment and beverage.[8,10-17] Functionalized Gr is usually easier to be dispersed in organic solvents and water, which can help the functionalization of Gr by various functional groups.[18-24]In this circumstance, synthetic functionalized Gr having utilities in polymer composites, energy-related materials[25] sensors, field impact transistors, photo-devices[26-32], transparent conductive electrodes[27], adsorption, separation, chemical synthesizes and biomedical frameworks, have been generally reviewed.[36] Graphene oxide (GO), itself have few sorts of oxygen carrying functional groups[28], hence, it has been specifically utilized as a platform for adsorption of metal ions in

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HPLC purification technique: synthesis of unsymmetrical thiobarbituric acids

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ABSTRACT

Synthesis of thiobarbituric acids by the reaction of 1,3-disubstituted thiourea and malonic acid in acetyl chloride-acetic acid medium and synthesis of cyclized pyrimidin-7-one by the interaction of 1-(2-hydroxyethyl) aryl thiourea, with malonic acid in *p*-tolyl sulphonic acid and acetyl chloride-acetic acid medium at room temperature stirring has been reported. The present protocol is highly eco-friendly alternative to existing methods, reduces the excess use of acetyl chloride and purity of all synthesized molecules checked with the help of reverse phase high performance liquid chromatography with photo diode array (PDA) detection at 254 nm with spectral characterization by 1H, 13C NMR, and MS spectra.

1. Introduction

Currently, developments of synthetic methodology have great challenge for organic chemists because active methylene group containing compounds are versatile organic precursors with exceptional chemical reactivity. Organic solvent is play a significant role for the synthesis of such active molecule but utilization of huge amount of organic solvents have adverse effect on human health and environment due to emission of volatile organic compounds (VOCs) [1]. Environmental impact for the use of organic solvents in synthesis can be minimizing by replacing non-hazardous solvents [2, 3]. In this regard, use of unsafe solvents in synthesis can represent an issue of health and environmental hazards, hence safer solvent is good alternative for synthesis of organic compound. Therefore, safe synthetic methods under the principle of green chemistry [4, 5, 6, 7] have been used for organic synthesis. The inexpensive, non-hazardous and efficient synthetic approach in recent time is constantly challenged by expanding environmental concern [8], use of natural fruits, vegetables juice [9] also attracting to research groups. Such materials are examples of biocatalyst and carried out organic reactions like preparation of amides [10], triazole [11], Knoevenagel condensation [12], Biginelli reaction [13] etc.

TBAs have gained considerable attention and their biological scaffold such as antimicrobial, antituberculer [14, 15], antifungal [16], antitumor [17], antidiabetic and antibacterial activities [18]. TBAs are good building block to be use in varied organic transformations as precursor [19, 20, 21, 22]. Hence, large number of efforts are being made to find out new routes and methodologies for the synthesis of TBAs [23, 24]. In earlier literature, synthesis of thiobarbituric acids by the reaction of malonic ester with urea in sodium alkoxide [25], malonic acid with thioureas in Amberlyst-15 [26], acetyl chloride [27, 28, 29, 30, 31, 32], $POCl_3$ [32], malonates with thiourea in potassium tert-butoxide [33] and methyl malonyl chloride with thiourea in dry 1,2-dichloroethane [34] have been reported.

Therefore, higher temperature, long reaction time and excessive use of organic solvent has major drawback of the reactions protocol. We wish to report herein very simple, highly expedient, modified and efficient technique for the synthesis of thiobarbituric acids by the reaction of 1,3-disubstituted thiourea and malonic acid with 1:2 proportion of acetyl chloride-acetic acid medium (Schemes 1 and 2).

2. Material and methods

2.1. General method

Melting points were taken in open capillary tubes and are uncorrected. Purity of all newly synthesized compounds checked by HPLC technique using Dionex Ultimate 3000 with PDA detection in reverse phase column phenyl 5 μm, 150 × 4.6 mm, at 254 nm. ^{1}H (400 MHz) NMR spectra were recorded on a Bruker Advance-II 400 spectrometer from $CDCl_3$ solution with TMS as an internal reference. Chemical shift are recorded as ppm on the δ scale and multiplicities are described as s (singlet), d (doublet), dd (doublet of doublet), ddd (doublet of doublet of

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Rapid synthesis of garnet structured aluminosilicate phosphors

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Cyan emitting $Ca_3Sc_2Si_{1.5}Ge_{1.5}O_{12}:Ce^{3+}$ phosphor with 10.4 ns lifetime

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ABSTRACT

Synthesis and photoluminescence properties of $Ca_3Sc_2Si_{1.5}Ge_{1.5}O_{12}:Ce^{3+}$ phosphor are described and compared with that of $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$. Partial replacement of Si by Ge, produces interesting changes in luminescence properties of $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$. Emission maximum shifts from 516 to 485 nm and that of excitation from 450 to 428 nm. The blue shifts are attributable to the splitting of Ce^{3+} 5d levels by crystal field. Centroid shift also contributes to these shifts. Cyan emitting phosphor, in combination with other phosphors, can be useful for generating true white spectrum. Moreover, lifetime of $Ca_3Sc_2Si_{1.5}Ge_{1.5}O_{12}:Ce^{3+}$ phosphor is very short, 10.4 ns, as compared to 62.7 for $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$. Short lifetime makes $Ca_3Sc_2Si_{1.5}Ge_{1.5}O_{12}:Ce^{3+}$ suitable for applications like scintillator, time of flight camera, etc.

1. Introduction

Synthesis and crystal structures of garnet compounds of Scandium viz. $Ca_3Sc_2Si_3O_{12}$, $Ca_3Sc_2Ge_3O_{12}$, and $Cd_3Sc_2Ge_3O_{12}$ have been described as early as 1977 [1]. However, luminescence in $Ca_3Sc_2Si_3O_{12}$ was studied only during the last decade. Shimomura et al. obtained intense luminescence in $Ca_3Sc_2Si_3O_{12}$ activated by Ce^{3+} in 2007 [2] and patented it [3] as a wavelength converter for LED based on blue chip. YAG:Ce is a commercial phosphor which is widely used for obtaining white LED. However, there are several drawbacks associated with YAG:Ce [4–7]. Several other garnet structured hosts were explored, to preserve the large crystal field splitting and centroid shift, but improved thermal quenching behaviour. $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$ is a green emitting phosphor with high quantum efficiency and thermal stability much better than that of YAG:Ce [2]. For obtaining white LED with a single phosphor, yellow emission is desired which could be achieved by Mg co-doping [8,9]. Mg served a dual purpose. Though Ce^{3+} is trivalent, it occupies Ca^{2+} site as these ions are of nearly same size. The substitution, however, necessitates charge compensation which is achieved by placing Mg^{2+} on Sc^{3+}. Hence, red shift and charge compensation, both are achieved by Mg co-doping. Various other codopants were explored for improving the properties of $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$ phosphor. Charge compensation can also be achieved by Na^+ doping at Ca^{2+} site. However, emission colour of $Ca_3Sc_2Si_3O_{12}:Ce^{3+}$ with Na^+ as a charge compensator is green. Doping Al^{3+} at Sc^{3+} site induces red shift of the emission maximum. Al^{3+} doping results into lattice contraction, lower cell volume and increased crystal field strength. The inclusion of Al^{3+} was also found to prevent the undesired phases of ingredient oxides. As a result crystallinity is improved, which in turn, enhances the luminescence efficiency and intensity. Mn^{2+} could be incorporated at both Ca^{2+} and Sc^{3+} sites. It acts as a charge compensator at the Sc^{3+} site and also exhibit deep red emission (680 nm). On the other hand, at Ca^{2+} substitutional site the emission is in the yellow-orange region (574 nm) [10]. Partial substitution of oxygen ion by N^{3-} produced huge shift resulting in a red emitting phosphor [11,12]. Apart from Ce^{3+}, lanthanide activators like Pr^{3+} [13–15], Eu^{3+} [16,17], Tb^{3+} [18,19], Dy^{3+} [20,21], Er^{3+} [22], Yb^{3+} [23] have also been investigated in subsequent years. Divalent Eu^{2+} also exhibits characteristic emission in $Ca_3Sc_2Si_3O_{12}$ host. Eu^{2+} emission is at unusually long wavelengths [24].

Energy transfer studies involving pair of dopants have also been carried out. Interesting results involving energy transfer have been reported for pairs Ce^{3+}-Er^{3+} [25], Ce^{3+}-Pr^{3+} [26], Tb^{3+}-Ce^{3+} [27], Ce^{3+}-Eu^{2+} [28], Eu^{2+}-Yb^{3+} [29], Ce^{3+}-Mn^{2+} [30–32].

$Ca_3Sc_2Si_3O_{12}:Ce^{3+}$ phosphor was initially studied for the application in solid state lighting. Later, cathodoluminescence in this phosphor was studied and found to be useful for the field-emission display applications [33]. Phosphors incorporating other activators were suggested for various other applications. $Ca_3Sc_2Si_3O_{12}:Pr^{3+}$ was found suitable as a scintillator [15]. Broad excitation covering entire visible region and emission around 873 nm makes $Ca_3Sc_2Si_3O_{12}:Ce^{3+},Eu^{3+}$ phosphor useful as spectral converter for c-Si solar cell [28].

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Study of highly viscous polyacryile measurements of viscosity and ultrasonic velocity

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In order to perform the polymerization process, it is necessary to measure viscosity. In case of highly viscous fluid, viscosity starts to be dependent of the vibration and rotation frequency of the sensing element.The ultrasonic technique provides an effective and reliable tool to investigate properties of polymer solutions in the light of phase separation studies. The propagation of ultrasonic waves and the measurement of their viscosity in solution form an important tool for the evaluation of various acoustical and thermo-dynamical parameters which give an insight into the nature of miscibility/compatibility and molecular interactions in polymer solution. The phenomenon polymer-solvent miscibility may arises due to any specific molecular interactions such as hydrogen bonding, dipole- dipole interactions and charge transfer complexes for homogeneous polymer- solvent mixture. Miscibility is an important phenomenon in polymer solution to achieve mechanical integrity, better adhesion and better processing. In present research work we have chosen polyacrylamide solution as a highly viscous fluid.

Keywords: Viscosity, miscibility, polyacrylamide solution,pulse echo technique.

Introduction

Propagation of ultrasonic waves in polymer solution forms the basis of qualitative characterization. Acoustical studies in polymer solutions and in solid polymers have been the subject of research in recent years[1]. Ultrasonic is the universally accepted nondestructive technique to study the physical & chemical properties of the liquids, liquid mixtures, electrolytic solutions and polymeric solutions[2]. The different acoustical parameters interpret the nature and strength of molecular interaction that exist in the system. Being fast, nondestructive and versatile, ultrasonic technique is useful for testing structure-property relationship of macromolecules. Recently, studies in organic polymer have attracted the attention of large number of workers[3-5].

Exhaustive literature survey was carried out and it was found that not much work has been reported in the field of ultrasonic studies in polyacrylamide polymers. This has motivated us to carry out the ultrasonic measurements in such polymers.

In present research work we have chosen polyacrylamide solution as a highly viscous fluid. Polyacrylamide is a carbon- carbon chain water-soluble polymer and is used as a thickening agent and a flocculent. Polyacrylamide (PAA) solutions of different concentrations have been prepared with water and their miscibility investigated with ultrasonic pulse echo technique. Thermo acoustic parameters ultrasonic velocity *(u)*, density (ρ), viscosity (η) for polyacrylamide solutions is measured at different concentrations (Wt %) *i.e.* 0.05 Wt % 0.3 Wt %. The measurements were carried out at 288 K to 308 K and at frequencies 2 MHz and 5 MHz. The results are reported. Variation in viscosity (η) is found to be linear. These linear variation confirms the miscibility of polyacrylamide in water solution at that concentration range.

REVIEW OF RESEARCH
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REVIEW ON USE OF CALCIUM CARBIDE IN FRUIT GROWTH, ITS HARMFUL EFFECTS AND METHODS OF DETECTION

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ABSTRACT

Fruit ripening has been an integral part of the agricultural process. A variety of ripening chemicals try to mimic the action of a natural plant hormone Ethylene, to create the same effects on the edibility and economic value of fruit. Farmers try to maximize their profit margins and, in this quest, have started using a multitude of such chemicals. Most popular of them all is calcium carbide. Calcium carbide hugely accelerates the ripening process, but this comes at the cost of nutritional value of the fruit. Often the excessive use of CaC2 has been proven to introduce toxic elements and compounds into the peel or the pulp of the fruit. In this review, we try to evaluate the various studies conducted on the toxicity of Calcium carbide induced toxicity and methods of Detection of calcium carbide in artificially ripened fruits.

KEY WORDS: - *Fruit ripening , natural plant hormone.*

INTRODUCTION

Fruits are widely distributed in nature, commercially essential and nutritionally imperative part of a balanced diet. Fruits play a vital role by supplying the essential elements required for normal health[1].

The commercial value of a fruit is gauged by its short ripening period and longer post-harvest shelf life. Fruit ripening depends on genetics as well as epigenetic factors such as surrounding chemical and physical environment. The process of ripening involves a sequence of biochemical changes that finally result in a ripe edible fruit with qualities which are considered to have economic value.

In recent years, there has been research towards the action of different chemicals on the ripening processes of fruits.

The natural process of ripening takes place when the plant roduces Ethylene gas (C_2H_4). Ethylene is a flammable colourless gas with a sweet odour. Ethylene was the first identified naturally occurring plant hormone known to regulate numerous plant process such as growth, development and response to biotic and abiotic stresses[2].

The ripening process is seen when the concentration of ethylene increases from 0.1 ppm to that close to 1 ppm[3].

The best alternative to natural ripening is externally applying Ethylene gas. However, owing to its highly flammable nature and profit margin, this is not a viable option for the farmers.

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Diverstity of Odonates (Insecta: Odonata) around Sonegaon Lake, Nagpur, Maharashtra, India

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ABSTRACT

Sonegaon Lake is situated in Nagpur City, Maharashtra. To study the diversity of odonates in and around Sonegaon Lake, faunal surveys were conducted during the months of September 2018 to August 2019. This study has revealed a total of 25 species of odonates inhabiting the study area. These odonates include 17 species of dragonflies and 8 species of damselflies. Among the Anisoptera, family Libellulidae dominates with 15 species of dragonflies, while family Gomphidae and family Aeshnidae are represented by 1 species each. Among the 8 species of Zygoptera recorded from the study area, 7 species of damselflies belong to family Coenagrionidae, while family Lestidae is represented by 1 species.

Key words: Dragonfly, Maharashtra, Nagpur, Odonata, Sonegaon Lake.

INTRODUCTION

Order Odonata is a conspicuous order of insects. It comprises two types of flying insects, namely, dragonflies and damselflies. The odonates are closely associated with freshwater bodies, as their larval stage is aquatic. Many odonates have striking colouration which includes metallic colours. The odonates, especially the dragonflies are swift fliers. They are carnivorous insects. They feed upon other flying insects which may include odonates as well. Both the juvenile and the adult stages of odonates are predatory. Hence, they play the role of biological control agents in nature. Being closely associated with freshwater bodies like ponds, lakes, and rivers, they can be used as bio-indicators of the health of aquatic habitats (Andrew *et al*, 2008).

According to Subramanian (2014), 474 species of odonates in 142 genera of 18 families are known from India. Andrew *et al* (2008) have reported 45 species of odonates from Central India. Andrew (2013) has recorded 34 species of odonates from Zilpi Lake, Nagpur. Shende & Patil (2013) and Patil *et al* (2014) have reported 34 species of dragonflies and 21 species of damselflies, respectively from Gorewada Bio-Park, Nagpur.

Sonegaon Lake provides good habitat for odonates in the middle of a highly populated city like Nagpur. Hence, the present study has been carried out to ascertain the diversity of odonates found in and around this Lake.

MATERIALS AND METHODS

Nagpur City (*c.* 21.06°N 79.03°E) is located in the North-Eastern region of Maharashtra. Sonegaon Lake is one of the biggest lakes in Nagpur city. It is a man-made lake spread over an area of twelve and half hectares. There is a small garden at the southern end of the Lake. The boundary of the Lake is also dotted with lush vegetation, which provides suitable perching locations for odonates.

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Diverstity of Butterflies (Lepidoptera) found around Sonegaon Lake, Nagpur, Maharashtra, India

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ABSTRACT

Sonegaon Lake is located in Nagpur City of Maharashtra. To ascertain the diversity of butterflies found around Sonegaon Lake, faunistic studies were conducted during the months of September 2018 to August 2019. This study has revealed a total of 36 species of butterflies in 26 genera of 5 families inhabiting the study area. Among the five families of butterflies recorded, Family Papilionidae is represented by 6 species, Pieridae by 7 species, Nymphalidae by 16 species, Lycaenidae by 5 species and Hesperiidae is represented by 2 species of butterflies.

Key words: Butterfly, Lepidoptera, Maharashtra, Nagpur, Sonegaon Lake.

INTRODUCTION

Butterflies are a conspicuous group of insects belonging to order Lepidoptera. Owing to their large size and beautiful colouration, they are one of the most admired and studied animal groups in the world. They are mostly diurnal insects and are found in most types of terrestrial ecosystems. Butterflies are used by conservation biologists as indicator species to identify habitats that are critical and need to be protected (Kehimkar, 2008). The highest numbers of butterfly species are found in the tropical countries. India is no exception to this and has rich diversity of butterflies.

The diversity of butterflies of Nagpur which lies in the Vidarbha region of Maharashtra is well documented. Tiple and Khurad (2009) have reported 145 butterfly species from Nagpur city. Tiple (2011) has reported 166 species of butterflies from the Vidarbha region of Maharashtra.

The area around Sonegaon Lake is surrounded by greenery. It provides good habitat for various species of butterflies in a highly populated city like Nagpur. Hence, the present study has been carried out to ascertain the diversity of butterflies around Sonegaon Lake.

MATERIALS AND METHODS

Nagpur City (*c.* 21.06°N 79.03°E) is located in the North-Eastern region of Maharashtra. Sonegaon Lake is one of the biggest lakes in Nagpur city. It is a man-made lake spread over an area of twelve and half hectares. There is a garden at the southern end of the Lake. The boundary of the Lake is also dotted with good amount of vegetation, which includes food plants of many butterfly species. The diversity of butterflies was studied through weekly surveys around Sonegaon Lake during the period of September 2018 to August 2019. The butterflies that were sighted during the study were identified with the help of the field guide by Kehimkar (2008). Wherever possible, the butterfly species were photographed for authentication.

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STUDY OF ANTENNAL SENSILLA IN MEXICAN BEETLE ZYGOGRAMMA BICOLORATA (COLEOPTERA: CHRYSOMELIDAE) BY SCANNING ELECTRON MICROSCOPIC (SEM)

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INTRODUCTION

The mexican beetle Zygogramma bicolorata Pallister (Coleoptera: Chrysomelidae) is a biocontrol agent of weed, Parthenium hysterophorus (Asteraceae: Helianthеae) (Withers, 1998). Both adults and larvae of Z. bicolorata are capable of feeding on leaves, terminal buds and leaf blades of Parthenium. It has proved highly effective in managing this weed, significantly decreasing weed density and flower production (Dhileepan et al., 2000).

Antennae in insects are organs of taste, smell and stimulation (Wigglesworth, 1972). The antennae also play kinetic roles and normally keep the nervous system in a state of tone in which it responds to stimuli of all kinds. Antennae of insects vary greatly in length, overall size, size of the individual segment, segmentation, setation and other aspects with the structures being closely related to their functions (Srivastava and Omkar, 2003).

Despite the importance of sense organs on the antennae of mexican beetle (for oviposition, feeding and mating) there is little information about it. Therefore, the objective of current study is to describe the ultrastructure of antennae in Z. bicolorata using scanning electron microscopy.

MATERIALS AND METHODS

The antennae of newly emerged Mexican beetle *Zygogramma bicolorata* (Coleoptera: Chrysomelidae) were carefully excised from the antennal sockets and washed thoroughly in distilled water. After washing, antennae were fixed in 70 % alcohol for a period of 12 hours. After which the antennae were dehydrated sequentially in ascending grades of alcohol followed by cleared in acetone. The antennae were observed under stereomicroscope to reveal the general morphology and the length of individual segments using an ocular micrometer. The air dried antennae were mounted on metallic stub which was precoated with carbon strip. The metallic stub with antennae was proceeded for the gold coating and scanned under the Jeol (JSM 6380 A) Scanning Electron Microscope (SEM) at Visvesvaraya National Institute of Technology (VNIT), Nagpur.

OBSERVATIONS AND RESULTS

A pair of antennae of adult Mexican beetle *Z. bicolorata* is located on the head capsule. The antenna consists of an elongated scape, followed by a pedicel and a flagellum of 9 segments. Each segment is called as flagellomere. The length of complete antenna from base to apex is measuring about 2502.25±66.65 µm (fig. 1, A). Surface of the antenna is covered with placoid scales and contain various types of sensillae on it. A pore like pit gland of 1.37±0.03 µm diameter is present throughout the surface of antenna (fig. 4, G and H). The terminal five segments are densely covered with sensilla.

A single segment scape is measuring about 240.65±14.29 µm in length and 172.05±9.25 µm in width (Table 2). Small numbers of sensilla trichodea type I and sensilla trichodea type II as well as curved sensilla trichodea type I and curved sensilla trichodea type II are found on the surface of scape (Table 1 and Fig. 1, B).

Pedicel is continued after the scape and composed of a single segment and fits in a comparatively large cavity at the distal end of the scape (Fig. 1, B). Pedicel is measuring about 163.85±20.82 µm in length and 122.85±13.08 µm in width. On the surface of pedicel sensilla trichodea type I and sensilla trichodea type II as well as curved sensilla trichodea are found (Table 1 and 2).

Flagellum is composed of a nine segments, first four segments are collectively called as funicle and last five segments are collectively called as club (Fig. 2, C and D). Flagellum is measuring about 2137.56±66.21 µm in length. The last flagellomere being the longest (324.28±6.04 µm) while the fourth flagellomere is shortest (167.75±10.01µm) (Table 2). On the surface of funicle a small numbers of sensilla trichodea type I and curved sensilla trichodea type I are found. A very dense sensilla trichodea type I, sensilla trichodea type II, sensilla trichodea type III and sensilla trichodea type IV as well as curved sensilla trichodea type I and curved sensilla trichodea type II are found on the surface of club (Table 1). On the tip of distal segment of flagellomere a uniporous cones and multiporous pegs are observed.

Trichodea sensillae type I, II and III were found on all segments of the antenna of *Z. bicolorata*. This sensilla is innervated by a single sensory neuron, attached to the base of the hair shaft. The average length of sensilla trichoidea type I, II and II was found to be 89.13±3.36, 55.53±4.40 and 26.46±1.63 respectively and average

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width of sensilla trichoidea type I, II and II was found to be 2.53±0.05, 2.30±0.08 and 2.05±0.05 respectively (Table 3).

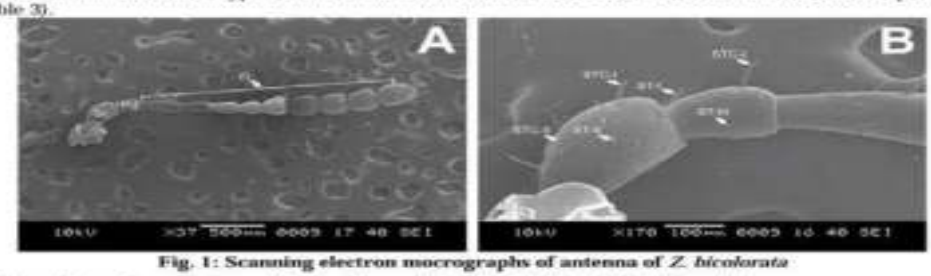
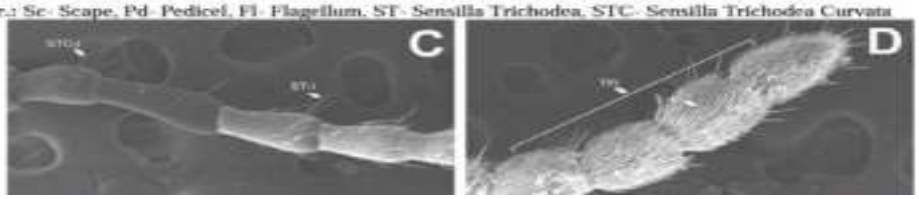


Fig. 1: Scanning electron mocrographs of antenna of *Z. bicolorata*

A. General overview of antenna showing Scape (Sc), Pedicel (Pd) and Flagellum (Fl)

B. Magnified view of Scape (Sc) and Pedicel (Pd) showing ST-I, ST-II, ST-III, STC-I and STC-II

Abbr.: Sc- Scape, Pd- Pedicel, Fl- Flagellum, ST- Sensilla Trichodea, STC- Sensilla Trichodea Curvata



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Acid catalyzed Knoevenagel condensation of thiobarbituric acid and aldehyde at room temperature

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ABSTRACT

Knoevenagel reactions have been performed by the action of various unsymmetrical thiobarbituric acids containing activated methylene carbon and electron deficient center of aromatic aldehydes using small amount of acetic acid as initiator in ethanolic medium. The present protocol proceeded smoothly on room temperature stirring using ethyl alcohol as solvent with the help of initiator. The work-up procedure is very simple and products have been purified by simple recrystallization. Thus rendering the methodology is good and all synthesized molecules were characterized by ^{1}H, ^{13}C NMR, and MS spectra.

GRAPHICAL ABSTRACT

ARTICLE HISTORY
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KEYWORDS
Acetic acid catalyst; aldehydes; Knoevenagel products; TBAs

Introduction

The Knoevenagel reaction is a condensation between activated methylene carbon and carbonyl compounds in acidic or basic medium. The condensation is catalyzed by a weak base such as an amine and have powerful tool for carbon–carbon double bond formation strategy.[1] In the past few decades, several Knoevenagel condensation reactions have been promoted under distinct catalysts.[2,3] However few reports are most prominent on activated methylene carbon in water medium,[4] or with organocatalyst,[5] and In(III) catalyzed using acetic anhydride as promoter.[6] In fact, to increased electrophilicity or leaving-group ability of aldehydes in the presence of the acid additive could accelerate the Knoevenagel condensation which is further increased polar character due to carbon–carbon double bond network.

The Knoevenagel reaction is the most common synthetic strategy to produce electron deficient carbon–carbon double bond center. It has been widely employed in the preparation of benzylidene derivatives and important intermediates which is used in varied organic transformations. Therefore, alkylated and benzylidene derivatives of thiobarbituric acid have attracted attention of researchers toward medicinal chemistry,[7–11]

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Supplemental data for this article can be accessed on the publisher's website.

Fabrication of white LED by coating LuAG:Ce phosphor on blue LED

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Abstract— **White LEDs, based on blue LED chips coated with a yellow emitting phosphor (YAG:Ce), were first reported in 1997. The blue chip/YAG:Ce system has many advantages, but the lamps fabricated in this manner give a poor colour rendering and there are several other disadvantages which are well-documented.**

LEDs using YAG:Ce phosphor on blue chip have high color temperature, and only "cool white" emission can be obtained. When the conversion phosphor is situated in close proximity of the LED chip, given the small chip area and the limited phosphor area, temperatures of 400 to 450 K are reached. Efficiency of YAG:Ce phosphor coated LEDs decreases at these temperatures. The reduction is related to the concentration quenching at higher temperatures.

Instead of the conventional solution combustion synthesis, we used the modified procedure which led to the formation of the desired compounds in a single step. Stoichiometric amounts of hydrated nitrates of yttrium, aluminium and cerium were thoroughly mixed with urea/glycine. A china dish containing the paste was inserted in a furnace preheated to 500 °C. The phosphor (3 wt %) was dispersed in a transparent silicone resin and LED was then fabricated by coating the blue LED chip (CREE 458 nm, 300 micron) with the epoxy resin. The electroluminescence (EL) spectra, colour temperature, CIE chromaticity coordinates, CRI and lumen output at room temperature were measured using a 300 mm integrating sphere and lumen meter (Hangzhou Zhongwei Photoelectricity Company ZVision ZW 3900). The measurements were carried out at 3.2 V, 20 mA.

In this paper we have reported a replacement as LuAG:Ce yellow phosphor for YAG:Ce phosphor.

Keywords— **phosphors; chemical synthesis; luminescence; Ce^{3+}; YAG ; LuAG**

I. Introduction

Solid state lighting based on high-brightness LEDs has emerged as a new potentially revolutionary technology that could save up to half of energy used for lighting applications. Compared with the traditional lighting, white LED has the following advantages; small (use of many kinds of associations and flexible array device), not easy to damage (bear shaking), long lifetime (more than 100,000 hours), low power consumption and low pollution. Thus, White LED would be the most important light source in the 21st century [1].

White LEDs, based on blue LED chips coated with a yellow emitting phosphor (YAG:Ce), were first reported in 1997 [2]. The blue chip/YAG:Ce system has many advantages. But the lamps fabricated in this manner give a poor colour rendering because the resulting light is typically deficient in the green and red colours. There are two approaches which are being followed to overcome this problem. In the first approach, white LEDs are made by coating near ultraviolet (n-UV) emitting LED with a mixture of high efficiency red, green and blue emitting phosphors [3], analogous to the fluorescent lamp. This method yields lamps with better colour rendition. Addition of a yellow emitting phosphor improves colour rendition index (CRI) further. Recently, much progress has been made for the emission efficiency of LED chips in the near UV-to-deep blue range [4], [5], [6], [7]. However, cost and light output wise, near UV chips are much inferior to blue chips. Thus, the second approach[8] comprising of coating blue excitable, green and red phosphors on blue chip, is considered to be more practicable for the time being. At present, LED lamps with YAG:Ce phosphor coated on the blue chip are dominating the market. Apart from poor colour rendering, there are several other disadvantages of YAG:Ce phosphor which are known and well-documented[9].

https://ijrbat.in/upload_papers/0407202004341726.%20A%20Fulzele.pdf

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STUDY OF MEMBERS OF DIFFERENT TRIBES OF FAMILY ASTERACEAE WITH REFERENCE TO STEM ANATOMY

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ABSTRACT:

Asteraceae is one of the widest family in Angiosperms having significant economic values, such as production of oil, ornamental plant, secondary metabolites, etc. In family Asteraceae about 1,535 genera distributed in 13 tribes. The current work aims at studying the differences in stem anatomy and floral characters of these tribes. In the present study sixteen species belonging to ten tribes were documented, The Heliantheae, one of the tribes' in this family is more dominant in Nagpur region, and in the present study six genera were recorded. This was followed by two genera in Cichoriese, and one genus each in the tribes Anthemideae, Astereae, Echinopeae, Eupatoriese, Gnaphalieae, Inuleae, Mutisieae and Vernonieae. Detailed study of the arrangement of vascular bundles and type of trichomes found on the stem was studied using free hand-sections. For the floral characters, ray floret, disk floret, shape of receptacle and the type of capitulum inflorescence was studied. An attempt was made for the development of a taxonomical key based on stem anatomical features highlighting the differences in the tribes. Microphotography of the floral components and anatomical study of the stem of these plants, revealed characters which are uutilized for creating a key for various tribes based on morphology as well as anatomical characters.

Key words: - *Asteraceae, tribes, Heliantheae, stem anatomy, capitulum, key*

INTRODUCTION:

The family Asteraceae also called the Compositae has been considered to be a unified evolutionary by all botanists. This family is one of the largest of the eudicots with over 32,000 species and at least 1,900 genera in 13 subfamilies (The Plant List, 2013). Members of the family Asteraceae can be found all over the world. These plants have evolved many adaptations to withstand harsh environment as well as more moderate climates. Many plants in the family Asteraceae are economically important as weed, ornamentals, medicinal and green vegetables are poisonous plants. Commercially the flowers of this family are very famous of their colorful florets. A wide range of horticultural species are grown in home garden or national garden plots. The Asteraceae feature extensively in gardens distributed throughout the world as ornamental. A wide range of horticultural species is grown both under grass, and as herbaceous garden plants throughout the world. About half the species of Asteraceae are native to the Old World and half to the New World.

TRIBE is a taxonomic group that is a subdivision of a subfamily

The Asteraceae consist of 1528 genera and 22,750 species. The Asteraceae has recently been classified into at least ten subfamilies and members of the family have a worldwide distributed. (Ngu Wah Win, 2018)

This family includes tribes - *Vernonieae, Eupatorieae, Asteroideae, Inuloideae, Helianthoideae, Antemideae, Senecioideae, Calendulaceae, Cynaroideae, Mutisiaceae, and Cichoriaceae.* (Hooker, 1881) As per Crono[illegible] (1981), in Asteraceae 13 tribes found. I[illegible] known family of flowering plants, the A[illegible] may be organized into 3 subfamilie[illegible]

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Checklist of Odonate Fauna (Insecta : Odonata) of Nagpur, Maharashtra, India

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ABSTRACT

Odonates constitute a very primitive and important group of insects. Nagpur, Maharashtra is home to many important wildlife conservation areas. A checklist of the odonates of Nagpur has been prepared. According to this checklist, the odonate fauna of Nagpur consists of 99 species in 53 genera of 10 families. It includes 60 species of dragonflies (Anisoptera) in 37 genera of 5 families and 39 species of damselflies (Zygoptera) in 16 genera of 5 families.

Key words: Checklist, damselfly, dragonfly, Maharashtra, Nagpur, Odonata.

INTRODUCTION

Dragonflies and damselflies are very familiar insects which are classified in order Odonata. They are well admired for their beautiful colours and spectacular flying abilities. Being closely associated with freshwater bodies like ponds, lakes, streams and rivers, odonates are used as bio-indicators of environment health. As odonates are exclusively carnivorous and prey on other insects, they have an important role in controlling the populations of their prey base.

Nagpur (*C.* 21.1458° N, 79.0882° E) is located in the north-eastern part of Maharashtra. Nagpur is a very important region in Central India regarding wildlife conservation, since many conservation areas are either located in Nagpur district or close to it. These conservation habitats include Bor Wildlife Sanctuary, Pench Tiger Reserve, Umred-Karhandla Wildlife Sanctuary, Tadoba-Andhari Tiger Reserve, Melghat Tiger Reserve, Nagzira Wildlife Sanctuary and Navegaon Tiger Reserve. The weather of Nagpur is generally warm with mildly cool winters and very hot summers. In the summer season, maximum temperature may rise up to 47°C. The average annual precipitation is approximately 1100 mm. Nagpur has abundant green cover and is considered one of the greenest cities in India. Nagpur district has many lakes, ponds, reservoirs and rivers, which provide abundant habitat for odonate fauna.

MATERIALS AND METHODS

First of all, literature available on the odonate fauna of Nagpur was collected. This literature included printed books and research papers, as well as literature searched for and collected from online websites and archives. The collected literature was arranged from the earliest to the latest years. After carefully reviewing the literature, a checklist of odonates reported from Nagpur was prepared.

https://www.gondwanags.org.in/journal-of-geosciences-research-jgsr/contents/jgsr-2020-vol-5-no-1/morphometric-study-of-pg-1watershed-of-chandrapur-district-maharashtra/

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Morphometric Study of PG-1Watershed of Chandrapur District, Maharashtra

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Abstract

Morphometric analyses for 13 mini-watersheds of PG-1 watershed have been carried out during present work. The linear parameters reveals that the mini-watersheds 1,2,3,4,5,7 and 8 has well developed stream network up to III and IV order with dendritic drainage pattern. The hard and compact nature of basaltic rock exposed over these mini-watersheds is related to dendritic drainage pattern and responsible for less infiltration and well developed stream network. The rock types of the study area are homogeneous with undulations in southern part of watershed, while northern part covering many mini-watersheds is a flat region. The areal parameters suggest moderate surface runoff and mostly elongated shape for all mini-watersheds (Ff: 0.09-0.84) with late maturity stage of topography. The basin relief is higher on southern side and it decreases towards northern part of watershed. The relief aspects as well as the visual interpretation of DEM of study area reflects high to moderate relief, higher runoff and low infiltration from southern central portion, which is related to lithology of either Deccan basalts or the shale-limestones of Penganga Group.

Keywords: Morphometric analysis, PG-1 watershed, Chandrapur District, Maharashtra.

Introduction

A watershed is an area of land that feeds all the water running over it and draining off into a body of water by way of single outlet. It is a hydrological unit of physiographic characteristics where land and water interact in a discernible way. Based on morphometric techniques, Horton (1945) laid the foundation of quantitative and systematic approach in geomorphology. Morphometric analysis represents the quantitative evaluation of geometrical characteristics of watershed that also enhances the quantitative data to the descriptive sets of information. The morphometric analysis is common technique in the basin investigations, as it forms an ideal areal unit for the interpretation and analysis of fluvially originated landforms. Integrated study of the geology and landform characteristics is useful for understanding the occurrence of porous as well as permeable zones in the rock formations (Karanth, 1999). Hence, morphomeric study has direct control on groundwater occurrences and GIS is a convenient tool for analysis of morphometric parameters (Sanjeevi and Bhaskar, 2008; Shah and Patel, 2009). The drainage characteristics of PG-1 watershed with its 13 mini-watersheds of Chandrapur district, Maharashtra have been investigated through the GIS environment based morphometric analysis and the data have been presented in this paper.

Study Area

The study area is located in south-western part of Chandrapur District, Maharashtra State. It is covered under Survey of India Topographic Sheet Nos. 56M/1, 56M/2 between Latitude 19°38'30":19°50'30"N and Longitudes 79°04'00":79°11'00"E with an areal extent of ~314.94Km^2 (Fig.1). The study area is 201Km away from Nagpur and it is approachable by Rajura - Korpana Road.

The Penganga Limestones as well as Penganga Shale-Limestones of Penganga Group, rest unconformably over the metamorphic rocks in the central portion of the watershed. The rocks belonging to Lower Gondwana Supergroup, which unconformably overlie the Penganga Limstone, have been disposed at northern eastern extremity of the watershed. The Deccan basalts have been exposed on southern part of watershed (Fig.1). The Groundwater Surveys and Development Agency has denoted this watershed as PG-1, which is further subdivided into 13 mini-watersheds. The

3.3.1 - Number of research papers per teachers in the Journals notified on UGC website during the year -2020-21

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Study of pollen production and pollen: Ovule ratio in some common members of *Malvaceae* in Nagpur city

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Abstract
The family *Malvaceae* is one of the largest flowering plant families with 4465 species recorded worldwide belonging to 245 genera. 35 species are reported from Nagpur district. Plants have ornamental, economical and medicinal value. Though morphological pollen studies in these plants are published, very meagre quantitative data is available about pollen production and pollen:ovule ratio, which provides insight into breeding system of the plants. This project was, therefore, undertaken to evaluate the same in some common members of *Malvaceae* found in Nagpur city. 14 species belonging to 8 genera of *Malvaceae* were evaluated. With limitations of less sample size and smaller geographical area, this preliminary study has presented quantitative data on pollen production and pollen:ovule ratio. In our future studies, pollen production and P:O ratios would be studied in different regions of wider geographical area in different seasons and with larger sample size so that relationship of all these factors on breeding system can be better understood.

Keywords: *Malvaceae*, pollen production, Pollen: Ovule ratio

Introduction
The family *Malvaceae* commonly known as 'Mallow family', is one of the largest flowering plant families. Plants belonging to *Malvaceae* family are used as food to produce beverages, for fibre, for their ornamental value and also for their medicinal value. Some of the economically important species have been introduced and cultivated in different parts of the World. 4465 accepted species names belonging to 245 genera are reported in this family worldwide in *The Plant List*, 2013 [1]. Around 93 species belonging to 22 genera of the family are reported from India [2]. 35 species are reported from Nagpur district by Ugemuge, N.R. in Flora of Nagpur district [3].

Palynological studies can provide more accurate basis for the identification of plant species. The study of pollen biology has direct relevance in agriculture, horticulture, forestry, plant breeding, forensic sciences and biotechnology. For a taxonomist, the data about fertility of pollens is an important means to differentiate the potential hybrid and parental plant [4].

A plant during its entire flowering period produces large amount of pollen grains most of which are not involved in fertilization. This large amount of pollen released may float in air or water and finally get deposited in earth's surface. The knowledge of quantitative production gives some idea about the frequency of presence of particular plant pollen grains in the atmosphere [5].

The pollen-ovule ratio (P/O) provides the best insight into the breeding system of a species [6]. Pollen-ovule ratios reflect the pollination efficiency, i.e., the likelihood of a pollen grain reaching the stigma [7, 8]. There is a substantial decrease in P/O ration from xenogamy to facultative xenogamy to autogamy. P/O ratios are also affected by the sexual system, the pollen vectors, pollination mechanisms, and ecological factors.

Though morphological pollen studies in these plants are published, very meagre data is available about number of pollen production per flower and pollen:ovule ratio. Keeping in mind the immense importance of pollen study, this project was undertaken to evaluate the pollen production and pollen:ovule ratio in some common members of *Malvaceae*.

Materials and Methods
Pollen production in 14 species belonging to 8 genera was evaluated in this project (Table 1). These plants are used as vegetables, medicinal plants and are of economic importance. The study was conducted from September 2018 to March 2019.

Pollen production
The plants selected for this study were collected from road side and open spaces in residential areas of Nagpur city. Mature and undehisced anthers from the flower buds were collected in the morning hours and pollen productivity (number of pollens per anther) was determined as per the method of Nair and Rastogi [9].

Pollen ovule ratio
To calculate pollen ovule (p/o) ratios, the number of grains per anther was averaged for three anthers from a flower. The mean number of grains per anther was then multiplied by the total number of anthers in the flower examined, and this was divided by the number of ovules in that flower. For each species, ten such flowers belonging to different individual plants were studied and finally average of number of anthers per flower, pollen production per flower and Pollen/ovule ratios along with standard deviation was calculated. Pollen/ovule ratios were log transformed to generate similar data as done by Cruden [7] in their extensive breeding system data and data published by Erbar and Langlotz [10].

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Ethnobotanical study of medicinal plants used by tribal people Wadegaon and Ghot villages of Gadchiroli district of Maharashtra state

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ABSTRACT

Gadchiroli district is located at the north-eastern side of the state of Maharashtra and has moderate tribal concentration i.e. between 25-50% of district's total population, the main tribes being Gond and Kawar. These people are highly dependent on medicinal plants as remedy for their medical illnesses. Identification of medicinal plants used by indigenous inhabitants for various ailments is a key to understand their properties. Most of the useful information in this regard is available with traditional healers. Hence the current project was undertaken with an aim to preserve and protect the traditional knowledge and also to prepare a database of traditional medicine. Information regarding the medicinal uses of plants was collected through face-to-face interviews with the healers, called locally as "Baida". During the interviews, local names, utilized parts and information on the types of ailments treated using traditional medicinal plant species were recorded and are presented here. Forty-five different plants belonging to 29 families were reported to be used by tribal people of the studied area for different medicinal uses. Plants were used for different common ailments like gastro-intestinal problems, fever, cough, skin diseases, menstrual problems, insect bites, urinary problems, weakness, etc.

Keywords: Ethnobotany, Gadchiroli, Medicinal plants, tribal medicine

INTRODUCTION

Since ancient times, man has used various plants parts of his surrounding habitat in the treatment and prevention of many ailments. All medicinal preparations were derived from plants, in the simple form of plant parts or in the more complex form of crude extracts, mixtures, etc. Even today, plants are the source of substantial number of drugs which are active against number of diseases. With passage of time, active ingredients were found from medicinal plant parts. In developed countries, 25 percent of the medical drugs are based on plants and their derivatives. Even today, in most of the developing countries, traditional knowledge of medicinal use of plants discovered through trial and error is used by the indigenous people in tribal and rural areas where the plant biodiversity is rich and the healthcare system is not easily accessible (Ayyanar, 2009).

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Phytochemical analysis and antibacterial activity of galls of *Quercus infectoria* (Majuphala)

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Abstract
The study was undertaken to screen phytochemical activity and to study antibacterial activity of aqueous and ethanolic extracts of *Quercus infectoria* against bacteria namely *Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa*. Phytochemical screening was done for different phytochemicals like tannins, alkaloids, phenolic compounds, glycosides, flavonoids, proteins and reducing sugar. Antibacterial activity was tested by Disc Diffusion technique. Tannins, alkaloids, phenolic compounds, glycosides and flavonoids were found to be present in both the extracts of *Q. infectoria*. Antibacterial activity of *Q. infectoria* was found to be comparable with the control antibiotics and even better for ethanolic extract against *P. aeruginosa* and *S. aureus*. The current study suggests potential of *Q. infectoria* as anti-bacterial agent with need of further studies on bioactive compounds in galls of *Q. infectoria* responsible for antibacterial activity.

Keywords: antibacterial activity, *Majuphala*, phytochemicals, *Quercus infectoria*

Introduction

Plant based drugs have been in use against various diseases since the time immemorial. The primitive man used plant as therapeutic agent and medicament, which they were able to procure easily. The nature has provided abundant plant wealth for all living creatures, which possess medicinal virtues [1].

Plants produce a diverse range of bioactive molecules, called phytochemicals. They are considered secondary metabolites because the plants that produce them may not need them. These secondary metabolites such as flavonoids, steroids, alkaloids, resins, fatty acids, tannins and phenolic compounds, etc are synthesized naturally in all parts of the body of the plant; bark, leaves, stem, root, flower, fruit, seeds, etc., that is, any part of the body of the plant may contain active components, making them rich sources of different types of phytochemicals. Today the herbal or natural products have become more popular due to their high antimicrobial activity, biocompatibility, anti-inflammatory and anti-oxidant properties. As the incidence of increased resistance by pathogenic bacteria to currently used antibiotics and chemotherapeutics agents is more, the researchers are developing interest towards alternative treatment options and products for diseases. Hence, the natural phytochemicals isolated from plants used in traditional medicine are considered as good alternatives to synthetic chemicals. [2]

The *Quercus infectoria* (Family-Fagaceae) is a small tree or shrub found in Greece, Asia, and Iran. The galls arise on branches of this tree, resulting from the deposition of eggs by gall wasp [3]. In Indian traditional medicine, the galls have been used to treat diarrhoea, dysentery, internal haemorrhages, gonorrhoea, impetigo, tonsillitis, and menorrhagia. The drug Mazu (Gall of Quercus infectoria) is described in detail in ethnobotanical and classical Unani literature and various actions of the drug have been reported such as analgesic, antidote, anti-inflammatory, antipyretic, antiseptic, deodorant, desiccant, expectorant, germicidal, hypnotic, hypoglycaemic, powerful astringent, sedative, styptic, tonic, tonic to teeth and gum, and wound healing. [4] Galls have also been shown to have high antibacterial activity, particularly against resistant bacteria. [5]

Incidence, and the emergence of multidrug resistant and disinfectant resistant bacteria—such as *Staphylococcus aureus* (*S. aureus*), *Escherichia coli* (*E. coli*) and *Pseudomonas aeruginosa* (*P. aeruginosa*)—has increased rapidly, causing the increase of morbidity and mortality. [6]

The present study was, therefore, undertaken to screen phytochemical activity and to study antibacterial activity of aqueous and ethanolic extracts of *Q. infectoria* against bacteria namely *S. aureus, E. coli*, and *P. aeruginosa*.

Material and Methods

Seed collection and extraction process

The galls of *Q. infectoria* were purchased from traditional vendors of medicinal plants in local market of Nagpur. The galls were washed thoroughly with tap water followed with sterilized distilled water and shade dried for few days and then were grinded separately in mechanical grinder to get fine powder.

Each of 0.5 gm of the fine powder of seeds were dissolved in 5 ml of sterile distilled water to make aqueous extract and in 80 % ethanol for ethanolic extract, centrifuged and then were filtered by Whatman filter paper no. 1 till clear filtrates were obtained. The extracts were then stored in screw capped bottles in refrigerator for further use. Extraction procedure adapted was as described by Gowdhami et al. [7]

Phytochemical tests

Phytochemical analysis was carried out for identification of different phytochemicals like tannins, Alkaloids, Phenolic compounds, Glycosides, flavonoids, proteins and reducing sugar according to standard methods [8, 9, 10].

Antibacterial Activity

The antibacterial activity was investigated against pure cultures of pathogenic strains of *Escherichia coli* (Gram-negative), *Staphylococcus aureus* (Gram- positive), and

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Airborne Culturable Fungi from Outdoor Environment of College Premises

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Abstract

Exposure to mould significantly increased risks of respiratory symptoms such as rhinitis, sore throat, cough and common cold in adults. There is no doubt that fungi produce allergens, mycotoxins, neurotoxins and also cause a number of human diseases and adversely affect human health. Present study was carried out to find out the airborne culturable fungi from the outdoor environment of college premises. The study was conducted from November- 2013 to February-2014 at fortnight intervals by using Hi-Air sampler (LA-002). Altogether 17 fungal species were isolated and identified from the college premises by using two different media strips viz. RBS-640 and PS-290 one sampling after the next simultaneously. The dominant fungi isolated from the campus includes *Aspergillus*, *Penicillium*, *Cladosporium*, *Alternaria*, *Curvularia*, *Trichoderma*, *Mucor*, *Rhizopus*, *Fusarium*, *Nigrospora*, *Drechslera*, *Trichoderma* and non-sporulated fungi. The fungal isolates varied from 625 to 2181 CFU/m^3 on the RBS-640 and PS-290 media strips respectively. The highest colony forming units was recorded in the month of January-2014 which is 2181 CFU/m^3 on RBS-640 media strips and lowest 625 CFU/m^3 recorded in the month of December-2013 on PS-290 media strips. On an average of total CFU counts of four months, the maximum 5,144 CFU/m^3 was recorded on RBS-640 media strips, while lowest was recorded 3,731 CFU/m^3 on PS-290 media strips. This difference of colony forming units was recorded might be due to culture medium which favors the growth of fungi i.e. RBS-640 is Rose Bengal Agar for Yeasts and Moulds and PS-290 is TSA- Agar for total count. The results of this study provide basic information about the prevalence of airborne culturable fungi which are highly allergenic, toxigenic and producing many different types of health complaints.

Key words: Airborne, Culturable fungi, Outdoor Environment, College Premises, *Aspergillus*.

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PREVALENCE OF AIR-BORNE FUNGI IN INDOOR ENVIRONMENT OF DENTAL CLINIC

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ABSTRACT

The present study was aim to find out the prevalence of airborne fungi in indoor air of dental clinic at Nagpur city. Air sampling was conducted during October, 2013 to March, 2014 by using Hi-Air sampler (Hi-Media-LA002 with RBS-290 and RBS-640 media strips) at monthly intervals. In the past few decades the public health has given more attention to the quality of air and their health impact issue associated with exposure to fungi. There is no uniformity in the suggested guidelines for acceptable levels of fungi in indoor ambient air. Thus, health professionals have no way to determine what levels of fungi may pose a threat to human health. The indoor air concentration of fungal spores was found higher than currently suggested guidance value. The average indoor air concentration was found in dental clinic 952 CFUs/^{3} (colony forming units per cubic meter), whereas in control air (outdoor) levels was averaged 614 CFUs/m^3. Total indoor colony counts ranged from 6 to 133 CFU/m^3, whereas in outdoor air it is ranged from 1 to 92 CFU/m^3 in studied environment. Without intentionally developing a sterile environment, a mold free, indoor environment is not possible to maintain. The most common fungal genera/species isolated from indoor as well as in outdoor environment of dental clinic includes *Aspergillus, Cladosporium, Curvularia, Alternaria, Penicillium, Rhizopus, Mucor, Trichoderma, Nigrospora* and *Candida*. Beside these yeasts and non-sporulated fungi are also isolated. Many health professionals suggest that if the indoor ambient air concentration is more than concentrations observed in outdoor air and if the fungi detected in both are similar, then there is high health risk to patients.

Keywords: Airborne, fungi, indoor, environment, dental clinic.

I. INTRODUCTION

Airborne fungal spores are present in outdoor air all year round, usually in high numbers. These spores can enter indoor environments via natural ventilation (open windows and doors). They are also brought indoors on people's clothing, shoes and pets. Therefore, indoor fungi can be a mixture of fungi from outdoors and fungi from indoor sources. All fungi are eukaryotes and exist in different growth forms such as rusts, mushrooms, mould and yeasts. Filamentous fungi (moulds) consist of long, branching filaments called hyphae and reproduce via formation of spores from sexual or asexual processes. Some fungi can exhibit both growth forms and are known as dimorphic fungi. They are ubiquitous in all environments like indoors and outdoors. Fungi in indoor environments are a problem for a number of reasons like they deteriorate or damage the surfaces, cause unpleasant odors, can cause an allergic response and also be responsible for infections, and other health problems.[15,21].

Moulds produce millions of spores, which are loosely attached and even slight air currents will disturb the spores making them airborne. Due to their small size (large spores are 10-20mm, average 1-5mm) spores easily stay airborne and may be respirable and breathed deep into the airways. Spores are very tolerant to dryness, changes in temperature, UV light and some chemicals. The spores may carry allergens and toxins, which are stable and may stay active even after the spore has lost its viability. Some fungi do not produce infections but can cause allergic reactions. Fungal spores are generally recognized as important causes of respiratory allergies, in both the lower and upper respiratory tracts[1,8]. Allergic reactions usually occur at the site of allergen deposition. When larger fungal spores are inhaled, they are deposited in the naso-pharynx and are associated with nasal and/or ocular symptoms usually referred to

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Monitoring of Airborne Fungi in Indoor Environments of Reading and Stock Sections of College Library

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Abstract: *Mold constituents, particularly to Alternaria alternata, Cladosporium herbarum, Aspergillus fumigatus and other fungi including Candida, Penicillium and Curvularia species are mainly cause allergic bronchopulmonary mycosis and severe asthma.The study was conducted from December-2013 to April-2015By using Hi-Air sampler (Hi-Media Ltd. LA-002), with the help of two different media strips PS-640 and PS-290 simultaneously. In both the sections of library, total 34fungal species excluding yeasts and non-sporulated fungi were isolated and identified (Reading & Stock section). The dominant fungal species isolated were Curvularia lunata recorded 706 CFU/m³, followed by Curvularia geniculata 612.5CFU/m³,Curvularia tetramera 537.5CFU/m³, Aspergillus niger 468.75 CFU/m³, Aspergillus flavus432.25CFU/m³, Aspergillus fumigatus475CFU/m³,Alternaria alternata 350CFU/m³,Cladosporium herbarum 287.5CFU/m³, Alternaria solani 281.25CFU/m³, Alternaria tenuissima262.5CFU/m³, Cladosporium spp. 243.75CFU/m³, Penicillium chrysogenum 450CFU/m³, P. citrinum 456.25CFU/m³, P. glaucus 556.25CFU/m³, Penicillium spp. 331.25 CFU/m³, and Non-sporulating fungi 737.5 CFU/m³ in reading and stock sections of library. The total mean concentrations of airborne fungi in reading section of library was 7618.75 CFU/m³, which is minimum as compare to the stock section of library 10306.25 CFU/m³. Fungi are ubiquitous in the atmosphere, and often constitute the main biological component of the air. They are closely related with indoor and outdoor air pollution and human health. The prevalence of airborne fungi in the environments of library of college was marginly studied. The present study was conducted to monitor the airborne fungi and their concentrations in two sections of library environments, to find out the fungi which are mainly responsible for the adverse health effects and deteriorating the book materials.*

Keywords: Monitoring, Airborne Fungi, Indoor Environments, College Library, *Curvularia* spp.

1. Introduction

Molds in indoor niches are largely linked with the aetiology of asthma and respiratory allergy. Asthma is common in the developed and developing countries and increasing in frequency, despite better living conditions. *Aspergillus fumigatus, Alternaria alternata, Cladosporium cladosporioides, Curvularia tetramera, Mucor, Rhizopus, Penicillium citrinum, Penicillium chrysogenum, Aspergillus flavus, Aspergillus niger* and *Candida spp.* are the major respiratory allergens, which causes most known cases of allergic bronchopulmonary mycosis [10]. The deterioration of the library material by microorganism has attracted the attention of many in recent years. The efforts are directed towards reduction of these losses by finding out the conditions, the causes and the environmental factors which contribute in the biodeterioration of books and the binding material like leather, resins and cloth.The role of biological agents and the deterioration with reference to libraries and museums had been reviewed by [5].For recording the progress of mankind books have been in use for centuries and will probably continue as a medium for recording and exchanging information in future also. Depending upon the nature and the environmental conditions, paper is subjected to the attack from several sources which can be broadly classified as physical, chemical and biological. Heat, sunlight, moisture, dust and dirt are physical sources, which are known to damage paper and cause deterioration. Similarly, acidic and other gases present in the atmosphere and deleterious chemicals added during manufacture of paper are responsible for affecting storage life of paper.

Estimation of allergenic bioparticles in the indoor environment is of great significance. The role of fungi as a causative agent of allergenic rhinitis and bronchial asthma from library dust and book collection is well documented [1]. Fungi on papers and books belong to the species of *Alternaria, Monilia, Fusarium, Chaetomium, Myrothecium, Torula, Stachybotrys, Cladosporium, Sporodesmium, Rhizopus, Epicoccum* and *Paecilomyces*. Most of these are active cellulose decomposing, many are also pigment forming and stain paper usually with yellow, brown and black spots. Some however form colorless colonies. But the action of fungi is very slow, requiring several months for damage to be detected by ordinary means [25]. The airborne fungi in library environment was the species of *Cladosporium, Curvularia, Alternaria, Penicillium, Aspergillus, Mucor, Rhizopus, Trichoderma, Fusarium* and numerous non-sporulated fungiat Bhopal [17].The study of aeromycoflora of libraries are few and sketchy [16, 20, 24].However, problems of students' health in schools, colleges and in universities were not concerned enough in Nagpur city. Aeromycological studies in intramural environmentsof Hospital ward and Library of Nagpur city were previously studied [21]. The aim of the present study was to monitor the airborne allergenic and book deteriorating fungi in indoor environments of reading and stock sections of college library.

2. Materials and Methods

Sampling site& Method of Sampling

Library of Shri Mathuradas Mohota College of Science, Nagpurwas selected for the study of airborne fungi (Plate 1). The indoor area of college library is measure about 1300

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Airborne Viable and Settled Dust-Bound Micro-Fungi in Residential Homes

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Abstract: ***Recent reviews of the effects of home dampness and fungi have shown several positive associations between fungal exposure and increased risk of adverse respiratory symptoms in children's and adults. Present study was conducted to study the airborne viable and settled dust bound micro-fungi in residential homes of two different localities namely Ayodhya Nagar and Raghuji Nagar area of Nagpur city. Air and dust sampling were carried out simultaneously at monthly intervals from July, 2017 to December, 2017 (6 months) by using Hi-Media Air sampler (Hi-Media-LA002); and Eureka Forbes Mini vacuum cleaner (Eureka Forbes Co. ltd. India) were used for dust collection from various sources.***

Total 23 fungal species were isolated and counted their CFUs/m3 from the indoor air of residential homes. Nine species of Aspergillus were recorded and it was dominant throughout the study period followed by the species of the genera Curvularia (2 spp.), Cladosporium (2 spp.), Alternaria (2 spp.), Trichoderma, Mucor, Rhizopus and Yeasts. While 19 species were isolated from the settled dust samples collected from the various sources, these are Ceiling fan/table fan dust isolated 4 species of Aspergillus, out of which Aspergillus niger and Aspergillus flavus are the dominant.

Sofa dust isolated 6 species of Aspergillus of which Aspergillus niger is the dominant followed by Aspergillus flavus, Aspergillus fumigatus, A. ocharceous, A. terrus and A. zonatus. Carpet dust also isolated Aspergillus species dominantly followed by Cladosporium, Penicillium, Curvularia, Rhizopus, Alternaria, Trichoderma and Yeasts. Seven species were reported from the bed dust collected from two different localities. Bed dust isolated 5 species of which 3 were Aspergillus niger, A. flavus and A. fumigatus and one each of Penicillium chrysogenum and Curvularia tetramera. Indoor airborne mould exposure causes neurologic dysfunction and cognitive deficits including memory loss, irritability, anxiety, depression, numbness, tingling and tremor.

Keywords: Airborne, Viable, Settled dust bound Micro-fungi, Residential homes, and Aspergillus.

I. INTRODUCTION

The inhalation of fungal spores and also house dust of dwelling homes cause acute symptoms in allergenic individuals. The risk of respiratory symptoms, such as cough and wheeze or asthma as well as respiratory infections and general symptoms like headache and tiredness, is higher for occupants in residential buildings Peat et. al., [12], Borneheg et al., [2]. Many fungal genera were observed in homes and it is well described correctly as the "weeds of home" which are also responsible for dust allergy.

Allergic reactions to fungi (single or clusters of conidia, hyphae elements, spores, crystals) in air include rhinitis, asthma and extrinsic allergic alveolitis or hypersensitivity pneumonitis Hedayati et.al., [8]. Although it has not always been possible to find a high degree of correlation between the concentration of fungal spores and the incidence of asthmatic symptoms, the role of spores has been clearly identified in specific atopic individuals. Traditionally, allergists have assumed that mold-induced asthma was entirely due to an allergic reaction. It is clear, however, that some species such as *Aspergillus fumigatus* have particular properties that can result in more severe symptoms caused by direct lung infection allergic bronchopulmonary aspergillosis (ABPA) Dales [3] and Hedayati et al. [8].

Dwelling homes are one of the most important indoor environments. It may serve as a reservoir and source of allergens. The fungal spores in dwelling houses may come from many sources within the building. They may come from fungi growing in condensation on walls, paint works, and on foods or spores may come from outside and accumulate in house dust and grow, if the humidity is high enough.

They may then become dispersed by human activity such as sweeping, bed making, and building repairing work etc. Verboeff & Burge [15]. Indoor airborne mould exposure causes neurologic dysfunction and cognitive deficits including memory loss, irritability, anxiety, depression, numbness, tingling and tremor etc. Luke Curtis et al., [11]. The purpose of this study was to assess quantitatively and qualitatively the occurrence of airborne viable and settled dust bound micro-fungi in indoor environment of residential homes which are mainly responsible for various human health hazards.

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Indoor Air Quality in College Laboratories: Exposure to Airborne Fungi

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***Abstract*-** The present study was undertaken to identify and find out the airborne viable fungi and their concentrations in indoor environment of college laboratories. Air sampling was conducted in Chemistry, Zoology, Botany, and Geology laboratories by using Hi-Air Sampler (Hi-media LA-002); two media strips were used for isolation of airborne fungi (PS-290 & PS-640). The average counts of total fungi isolated on two media strips were recorded maximum in chemistry laboratory (4088 CFU/m^3), followed by Botany (2681 CFU/m^3), Zoology laboratory (2300 CFU/m^3), and the lowest recorded in geology laboratory (1622 CFU/m^3). While comparing the total CFU counts of isolated fungi on two media strips, the maximum counts were recorded on PS-640 media strips (13618.75 CFU/m^3), and (9,637.50 CFU/m^3) recorded on PS-290 media strips. In chemistry laboratory total 31 species isolated along with Yeast and Non-sporulating fungi, followed by 29 species from Botany laboratory, 26 from Zoology and only 17 species from Geology laboratory. The total fungal counts of all the fungal species isolated from the studied laboratories were considered and found maximum CFU counts of *Curvularia clavata*, which is most predominant species followed by the species of *Cladosporium herbarum*, *Curvularia geniculata*, *Alternaria alternata*, *Aspergillus niger*, *Alternaria solani*, *Curvularia lunata*, *Yeasts*, *Aspergillus flavus*, *Penicillium lutem*, *Penicillium purpurogenum*, *Aspergillus fumigatus*, *Penicillium glabrum*, *Alternaria brassicicola*, *Alternaria tenuissima*, *Curvularia brachyspora*, *Rhizopus*, *Mucor*, and *Cladosporium oxysporum*.

Keywords – Indoor, Air-quality, Laboratories, Airborne, Fungi, *Curvularia spp.*

I. INTRODUCTION

Air contaminants, which includes fungus, mold, bacteria, inorganic and organic matter, cause many health-related problems. Many small size fungal spores are respirable into the alveoli of lung, and release soluble toxins contained in the spores enter the blood stream. Fungi are well known to colonized and caused diseases in skin, nails, sinuses or airways [1]. *Aspergillus flavus* and *A. fumigatus* are the second most important species causing human infections particularly fungal sinusitis, aspergillosis and lower proportion of pulmonary infections [2]. Occupational allergy is nothing but the any kind of clinical or physio-pathological event due to hypersensitivity prompted by allergens found in working indoor environments. The dust, dirt, moisture level, minimum and maximum temperature normally provide sufficient nutrients to support extensive fungal growth on various substrates. The Non-Infectious Fungal Indoor Exposure syndrome (NIFIES) has been proposed to described the illness typically first called SBS. Symptoms include eye, nose and throat irritation/inflammation, respiratory symptoms such as cough and chest tightness, fatigue, popular rash, and neurocognitive symptoms such as short-term memory loss and concentration problems [3]. The presence of Aspergillus species in the air is a major risk factor for both invasive and allergic aspergillosis [4]. Most students, faculties and laboratory staffs spend their maximum time in laboratories while performing practical's in college hours. However, poor indoor air quality has adversely affected not only known allergy sufferers, but also others who experience more frequent aggressive symptoms. The present study specifically monitors college laboratories to evaluate the indoor air quality in reference to presence of airborne viable fungi.

II. MATERIAL AND METHODS

SAMPLING SITE AND SAMPLING OF AIR:

The study was carried out in various laboratories of Shri Mathuradas Mohota College of Science, Nagpur city. Air sampling was conducted randomly in Chemistry, Botany, Zoology and Geology laboratories from December, 2013 to April, 2015. Air sampling was conducted by using Hi-Air sampler (Hi-Media Ltd. LA-002). Two media strips were used to sample the indoor air of laboratories (PS-640 and PS-290) for total CFU counts. Air sampler was run 4 minutes during working hours of college (11.30 am to 2.30 pm). The minimum and maximum temperatures, relative humidity was recorded during sampling hours by temperature-hygrometer (Figure 1).

COLONY FORMING UNITS (CFUs) AND SPECIES IDENTIFICATION:

The exposed media strips were brought back and incubated in an inverted position in laboratory. After 4 to 7 days of

AFTERGLOW LUMINESCENCE IN TbAG:Ce GARNET PHOSPHOR

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ABSTRACT:

$Tb_3Al_5O_{12}$ (TAG) terbium–aluminum garnet is used in optical filters based on the Faraday effect [1] and in luminescence converters of blue LED radiation to obtain light sources with a white emission spectrum [2]. An intense 5d–4f photoluminescence of Ce^{3+} on the Tb^{3+} site in $Tb_3Al_5O_{12}$ (TAG) powder has been reported by Kummer et al. [3], $Tb_3Al_5O_{12}$ activated with Ce phosphors were prepared by combustion synthesis. Reagent grade rare earth oxides/carbonates were converted to the corresponding nitrates by dissolving in nitric acid. The nitrates were dried by prolonged, gentle warming. A china dish containing the paste was inserted in a furnace preheated to 500^{0}C. Within minutes the paste foamed and a flame was produced which lasted for several seconds.

Green LL is observed in Ce doped $Tb_3Al_5O_{12}$ s$_y$:Ce garnet phosphors. LL is well correlated with Ce^{3+} emission and a peak around 140°C in the TL glow curve. This can be well explained by referring figures above. In comparison with the commercial phosphor YAG, the $Tb_3Al_5O_{12}$:Ce (TAG) is more stable and shows more intense TL properties, this phosphor can be used for dosimetric detections and measurements. Luminescence that persists after the removal of the excitation is called afterglow or persistent phosphorescence or Long-lasting phosphorescence. It is a phenomenon due to the thermal stimulated recombination of holes and electrons at traps which leave holes or electrons in a long-lived excited state at room temperature [1]. The first record of persistent phosphorescent material is in the Song dynasty of China (11th century A.D.). In the miscellaneous notes by a Song monk, entitled Xiang-Shan Ye-Lu, there is a story about a long lasting phosphorescent painting. A cow on the painting appears eating grass outside the pen during the daytime, and resting in it at night. The ink used for the painting contains long lasting phosphorescent material [2,3]. The long afterglow phosphors are finding more and more applications such as traffic signs, emergency signage, watches and clocks, textile printing etc. Lanthanide activated alkaline earth silicates or aluminates yield desirable characteristics, such as longer duration time of the phosphorescence, high intensity and improved chemical stability, than the conventional sulfide materials used earlier [4].

$Tb_3Al_5O_{12}$ (TAG) terbium–aluminum garnet is used in optical filters based on the Faraday effect [5] and in luminescence converters of blue LED radiation to obtain light sources with a white emission spectrum [6]. An intense 5d–4f photoluminescence of Ce^{3+} on the Tb^{3+} site in $Tb_3Al_5O_{12}$ (TAG) powder has been reported by Kummer et al. [7] Effective processes of the energy transfer from TAG host to Ce^{3+} ions and simultaneously from Ce^{3+} to Eu^{3+} ions via the Tb^{3+} cation sublattice are realized [8]. Mn^{2+} doping also helps in shifting the emission to longer wavelengths. Mn^{2+} emission is at 595 nm. Due to the existence of the Mn^{2+} emission, TAG:Mn,Ce phosphor demonstrates the relatively higher contribution to the luminescence in the orange-red spectral range as compared with the YAG:Ce and TAG:Ce phosphors [9]. TAG single crystal is an excellent magneto-optical material [10] with good transmittance in the 500-

RADIATION DOSIMETER NANOPHOSPHORS USED IN PERSONAL MONITORING

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ABSTRACT:

The programmable OSL (Optically stimulated Luminescence) reader systems are in great demand in all the research and academic institutions for their applications in advanced radiation dosimeters research Dosimeters for personnel monitoring are required in radiation department. The YAG:Ce phosphor developed in 1967 by Blasse and Brill has been practically used as cathode ray tube phosphors (P 46 and P 48) [1]. Blasse and Brill [2] also showed that this phosphor emitted in yellow region when excited by blue light. Modifications brought in the PL characterstics by substitutions continue to interest researcher to date [3]. The OSL graph of YAG:Ce,Yb phosphor shows intense optically stimulated luminescence, as the Yb concentration increases OSL also increases. Hence this phosphor can be used for detection in radiation dosimeters.

In the recent past, optically stimulated luminescence (OSL) technique has emerged as an alternative to the TLD and it has gained popularity in radiation dosimetry applications due to its significant advantages over the TL technique [1,2] The physical principles of OSL are closely related to those of TL technique. In contrast to TL OSL readout does not involve heating of the sample. Thus the problems due to thermal quenching of luminescence efficiency of the phosphor are eliminated and thus a significant increase in sensitivity is achieved due to better signal-to-noise (S/N) ratio, particularly at low doses.

In OSL the defects are stimulated by the light in the visible/IR region and as a result, release of either the electron or hole and subsequent capture at the recombination centre leads to emission of radiation which is generally at shorter wavelength compared to the wavelength of the stimulating radiation. The general requirement for material to be a good OSL phosphor is that the emission should be in between 350 and 425 nm and the defects should have high photo-ionization cross-section in blue-green region (450-550 nm) or IR region (650-800 nm). This limit on wavelength is due to availability of suitable filters, stimulation sources as well as sensitive PM tubes in this range, and most importantly the requirement of separation of stimulating wavelength from the emission wavelength which ensures better signal to noise ratio. Both the stimulation and emission spectra are characteristic of the phosphor. Blue excitation is needed for phosphors like Al_2O_3:C [3], BeO [4] and $LiMgPO_4$:Tb [5] green excitation for MgO:Tb [6], Y_2SiO_5 [7], Porcelain [8] red for KBr:Eu [9] and IR excitation for feldspar [10]. Even for Al_2O_3:C some workers prefer green excitation over blue [11]. Hence, a versatile OSL reader should incorporate a variety of excitation sources.

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Article

First record of some jumping spiders (Arachnida: Araneae: Salticidae) from Pench National Park, Maharashtra State, India

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Abstract
Spiders are one of the most familiar and studied groups of arthropods. They are ubiquitous in most terrestrial ecosystems preying on other arthropods as well as their own type. Jumping spiders belong to family Salticidae and constitute the largest family of spiders. While studying animal diversity in Pench National Park, Maharashtra State, India, five species of jumping spiders were identified, which have not been previously described from the study area. These five species of jumping spiders, namely, *Hasarius adansoni*, *Menemerus bivittatus*, *Plexippus paykulli*, *Plexippus petersi*, and *Telamonia dimidiata* are new records for Pench National Park, Maharashtra.

Keywords Arachnida; Araneae; jumping spiders; Pench; Salticidae.

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1 Introduction

Family Salticidae is the largest family of spiders with over 6000 species. These spiders are commonly known as jumping spiders and possess some of the best vision among arthropods. Jumping spiders of the family Salticidae have well-developed eyes, which mediate their highly stereotyped predatory and communicative behaviour (Clark and Uetz, 1990). While moving, most species are capable of jumping very well, which gives them their common name. The largest numbers of species are found in tropical region, however, they are also found in temperate region and desert. They are generally diurnal and active hunters.

In India, not much work has been done on recording the diversity of jumping spiders and most of the Indian jumping spider species remain unknown. Pench National Park is a prominent conservation area in Central India spanning two states, Madhya Pradesh and Maharashtra. Previously, 15 species of spiders have been reported from Pench National Park, Madhya Pradesh (Gajbe, 2004) and 31 species of spiders have been recorded from Pench National Park, Maharashtra (Bastawade, 2004). None of these two studies have reported any spiders from family Salticidae. Hence, the present study is the first record of jumping spiders from Pench National Park, Maharashtra.

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Synthesis and Characterization of Conducting Polymer

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ABSTRACT

In recent technology, considerable attention was given to the fabrication of light weight rechargeable batteries, electro chromic display devices, microelectronics, sensor and molecule design etc. As one of the most important conducting polymers, polyaniline because of its chemical stability and relatively high conductivity and its derivatives have been extensively studied in different fields of science, because of the demand for high performance materials in advanced technologies. However, the common uses of polyaniline are restricted, due to its poor process ability and low solubility. Various techniques were given for synthesis of conducting polymer. In the current studies, polyaniline (PANI) and its composites with semiconductor was prepared chemical oxidation method in the presence of different bronsted acids from aqueous solutions. The effect of thermal treatment on electrical conductivity (DC), of the pure PANI, PANI+10%, 15% and 20% $MnSO_4$ conducting polymers were investigated. It is found that conductivity of PANI enhancing due to stretching polymeric chain cause due to interaction with $MnSO_4$.

Keywords : Conducting polymer, DC Conductivity

I. INTRODUCTION

In the last two decades the field of conducting polymers has shown tremendous growth and it is now an important field of research, the conducting polymer when functionalized with other conjugate system can be very useful; in many applications. As seen in the literature survey the functionalization with macrocyclic molecules has been mainly used in electrode preparation for reduction of oxygen, the detailed study on functionalization of conducting polymers such as polyaniline with $MnSO_4$ is now reported so far. In order to have better understanding of physics of this material the present work was undertaken. The investigation are mainly clamed at looking at the structural changes taking place due to incorporation of $MnSO_4$and the effect of $MnSO_4$ on properties such as electrical conductivity, frequency response, and dielectric constant of the resulting polymer composite. In the present investigation, one

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A comparative study of muscular power and muscular strength among kabaddi and wrestling players.

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Abstract

The purpose of the study was to find out and Comparison of muscular power and muscular strength among wrestling and Kabaddi players. The study was delimited to 50 inter school male players of different schools of Nagpur city and their age group were 14-16 years. Players were selected by using simple random sampling method. Muscular power was measured by standing broad jump and horizontal distance recorded in centimeters and Muscular strength was measured by flexed arm hang, maximum time were recorded as scores of the test. After analysis of data results were drawn by using statistical tools.

Key words:- Muscular power, Muscular strength, Kabaddi, wrestling.

Introduction

Muscle is a soft tissue found in most animals. Muscle cells contain protein filaments of actin and myosin that slide past one another, producing a contraction that changes both the length and the shape of the cell. Muscles function to produce force and motion. They are primarily responsible for maintaining and changing posture, locomotion, as well as movement of internal organs, such as the contraction of the heart and the movement of food through the digestive system via peristalsis.

Muscular Power Muscular power refers to a great force production over a short period of time, such as in fast leg kicks and explosive jumping.

Muscular strength Muscular strength is the ability to exert maximal force in one single contraction, such as lifting a weight that you could lift only once before needing a short break.

Table no. 1

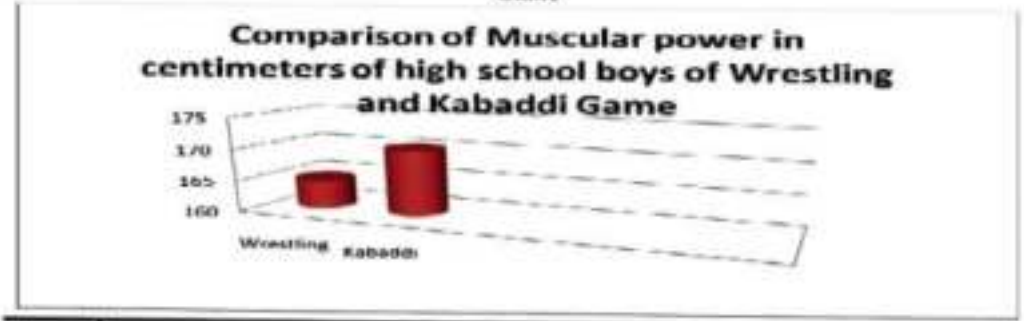
Comparison of Muscular power in centimeters of high school boys of Wrestling and Kabaddi Game

Game	N	Mean	MD	"T Ratio"
Wrestling	100	164.61	5.8	0.08
Kabaddi	100	170.41		

Level of significance 0.05

Graph no. 1

Comparison of Muscular power in centimeters of high school boys of Wrestling and Kabaddi Game



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Colour tuning of garnet phosphor through codoping

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ABSTRACT

$Ca_3Sc_2Si_3O_{12}:Ce^{3+}$ is a well known green emitting phosphor for two phosphor converted LED lamp. It is shown that the emission colour can be tuned with the help of various co-dopents. For obtaining safer cyan emitting phosphor, partial substitution of Si by Ge found to be effective. Pr codoping is responsible for the addition of red component. The partial substitution of Y at Ca site and Mg at Sc site is the novel step into the work. This substitution converts the cyan emitting phosphor into yellow one. The colour changes are illustrated by calculating colour coordinates. Na codoping facilitates incorporation of the trivalent activator at Ce^{3+} site, as well as the grain growth, and enhances the PL intensity without changing emission colour. Addition of Cyan emitting phosphor in the blend can be useful for achieving super Colour Rendition Index (CRI > 95). Extended excitation in the violet region will result in removal of the harmful wavelengths from the LED lamp.

1. Introduction

Invention of blue LED based on nitride semi-conductors by Shuji Nakamura in 1994 provided great impetus to research in luminescence [1]. This was made possible by vital developments in growth of p-type doped GaN on sapphire substrates by Isamu Akasaki and H. Amano in Nagoya [2]. Initial efforts were directed towards obtaining phosphors which can be excited by blue light and generate white light when coated on blue LED [3,4]. Solid state lighting was the theme of many investigations in the field [5–10]. This aspect was highlighted even by the Nobel committee considering its widespread applications [11]. In the first LED lamp, yellow emitting YAG:Ce phosphor was used to generate white light. For improving colour rendition index (CRI) and correlated colour temperature (CCT), combination of red and green phosphors is envisagrd.

Though solid state lighting is the most highlighted application of blue LED, its use is not limited to production of white light alone. Several other applications such as green house lighting [12,13], backlight for LCD displays [14], optical disc memories [15], signage [16], projector lamps [17], vehicle headlamp [18], fishing [19], solar simulator [20], radiation dosimetry using optical stimulation [21], hyperbilirubinemia treatment [22] make use of blue LED. Earlier studies were related to finding red, green, blue, yellow emitting phosphors for constructing white LED lamp. These lamps make use of the fact that human vision is tricolor and hence the need for phosphors emitting in primary or complimentary colors. Phosphors with different requirements are needed in applications other than household lighting. In applications like solar simulator and spectrophotometer lamps sources with "true" white emission are needed. Thus, phosphors with different colour coordinates and excitation in the blue region need to be developed.

Ce^{3+} activated $Ca_3Sc_2Si_3O_{12}$ introduced by Shimomura et al. [23], is a green emitting phosphor which can replace phosphors like $SrGa_2S_4:Eu^{2+}$ [24], $BaSrSiO_4:Eu^{2+}$ [25], $LuAG:Ce^{3+}$ [26]. Various substitutions at Ca and Sc sites can shift the emission to yellow region [27–29]. We have further studied colour tunability of this phosphor by using various codopents. Partial replacement of Si by Ge resulted in blue shift leading to cyan emitting phosphor which can be attributed to lattice expansion and in turn reduction in the crystal field. On the other hand, further substitutions by Y at Ca site and Mg and Sc site resulted in red shift, which in turn gives yellow emitting phosphor indicating strengthening of the crystal field. For getting red component, $Ce^{3+} \rightarrow Pr^{3+}$ energy transfer was successfully studied. Doping by Na did not change emission colour, but increased intensity by facilitating Ce^{3+} incorporation.

2. Experimental

Details of the experimental procedure can be found elsewhere [30]. $Ca_3Sc_2Si_{3-x}Ge_xO_{12}:Ce^{3+}$ was synthesized by the conventional solid

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Urban Rooftop Farming – Model for Sustainable Vegetable Production and Environmental Well-being

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ABSTRACT

Background: Urban rooftop farming is a form of urban agriculture. Due to the scarcity of agricultural land in urban areas, rooftop farming is becoming popular in many countries. An experiment was conducted to grow herbs and vegetables in a small and sustainable urban rooftop farm in Nagpur City, India and the various ecological benefits of this form of urban agriculture were studied.

Methods: The experiment was conducted on a 230 sq ft rooftop area from July 2019 to March 2020. Environment friendly cultivation methods employed in the study include pest management by cultural means to produce pesticide-free vegetables, conversion of household green waste into compost for augmentation of soil nutrients and the use of harvested rain water and greywater for irrigation.

Result: The experiment resulted in the production of 61.7 kg of pesticide-free vegetables from an area of 230 sq ft using sustainable farming methods. Apart from this, the various ecological benefits obtained from the experiment point to the fact that sustainable urban rooftop farming can be an innovative means to promote urban agriculture without harming the environment.

Key words: Rooftop farming, Sustainable agriculture, Urban agriculture.

INTRODUCTION

In an uncertain future of climate change and constrained resources, urban agriculture is widely viewed as a sustainable and scalable approach to improving food security (Pollard *et al*., 2017). Urban rooftop farming is a form of urban agriculture. It is primarily concerned with the cultivation of plants on the rooftops of buildings in urban surroundings. Urban rooftop farming favours local food production (Sanyé-Mengual *et al*., 2015a). It is a practice that is well-suited to enhancing food security in cities and reducing the environmental impact that results from long transportation distances that are common in conventional agriculture (Buehler and Junge, 2016).

The population of India is growing at a fast pace. This is a thing of great concern, as agricultural land resources are limited and conventional agricultural production can be increased only to a certain extent. Hence, there is a need for new and innovative strategies for increasing the production of food crops without any harmful effects on the environment. It could be a good option for local authorities to promote rooftop farming (Grard *et al*., 2015). If urban rooftops are judicially used for cultivating edible plants, several tonnes of produce could be harvested through rooftop farming in the cities. Urban and peri-urban agriculture could play an important role in safeguarding livelihoods and urban food security (Maconachie *et al*., 2012).

Regarding the management of urban rooftop farms, crop planning may focus on selecting the vegetables with higher crop yield and establishing crop periods to produce year-round, while reducing the environmental impacts and economic costs of crops (Sanyé-Mengual *et al*., 2015a). There are economic, social and environmental opportunities of local and efficient food production through innovative urban rooftop farming (Sanyé-Mengual *et al*., 2015b).

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MATERIALS AND METHODS

Study area

Nagpur City (Coordinates: 21°9' N 79°5' E) is located in Maharashtra State in Central India. The rooftop farming experiment was carried out on the concrete rooftop of the author's house in Nagpur from July 2019 to March 2020 (Fig 1). Out of the total rooftop area of 900 sq ft available, approximately 230 sq ft area was used for cultivating edible plants.

Materials used

Sixteen types of edible plants were cultivated as depicted in (Table 1). The plants were grown in clay pots and grow bags of suitable sizes depending on the type of plant. Common garden soil was used for cultivation. The soil depth was maintained at 8-25 inches depending on plant size. Pots/ containers of diameters 9, 12 and 15 inches were used for cultivation and were filled with about 4.5 kg, 7 kg and 10 kg mixture of soil and compost, respectively.

Cultivation method

Plants were cultivated directly from seeds except onion, garlic, lemongrass and mint. Plants of the same type were

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Orb-Web spiders (Arachnida: Araneae) of Maharashtra State, India

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Abstract

Orb web spiders, a familiar feature of terrestrial ecosystems, are much admired for their intricate spiral wheel-shaped webs. Maharashtra is a State occupying the Central and Western regions of India. A checklist of the orb web spiders of Maharashtra has been prepared, which consists of 73 species in 24 genera of two families, Araneidae and Tetragnathidae. Of these, 61 species in 19 genera belong to family Araneidae and 12 species in 5 genera belong to family Tetragnathidae.

Keywords: Araneidae, Tetragnathidae, orb weaver, biodiversity, fauna, India.

Introduction

Spiders are an integral part of terrestrial ecosystems. Research into spider biology, particularly the diversity of silk, webs, and venoms, together with the associated ecology and behaviours, has greatly increased in recent decades (Gillespie & Spagna, 2009). Web-building spiders are forming an important model system to address questions in a variety of biological fields. They are attractive because of their intriguing biology and because they can be fairly easily collected and maintained in the laboratory (Zschokke & Herberstein, 2005). Orb web spiders are ubiquitous predators in terrestrial ecosystems. They are classified in two families of Araneae, namely Araneidae Clerck, 1757 and Tetragnathidae Menge, 1866. The common orb weavers belong to Araneidae, whereas, orb weavers belonging to Tetragnathidae are commonly known as long-jawed orb weavers on account of their long chelicerae. Orb webs are composite structures built from multiple types of silk, each with its own unique molecular structure and mechanical

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Article

Impact of a small artificial water source on the diversity of odonates (Insecta : Odonata) in an urban landscape

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Abstract
Rapid urbanisation is mainly responsible for the degradation and fragmentation of natural ecosystems in urban areas. Dragonflies and damselflies (Odonata) constitute an important part of urban biodiversity. The odonate larval stage is aquatic and being dependent on freshwater ecosystems, odonates are often used as ecological indicators for such ecosystems. Both larval and adult odonates are carnivorous and prey on other insects including mosquitoes. Hence, they perform an important role as predators in the ecosystems where they are found. In this study, the impact of a small artificial water source on the diversity of odonates in an urban landscape has been evaluated. The impact of the water source was found to be positive as its availability resulted in an increase in odonate diversity.

Keywords damselfly; dragonfly; Odonate; urban biodiversity.

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1 Introduction

The Odonata, that is dragonflies and damselflies are very familiar insects, as they are colourful, relatively larger than other insects, diurnal, and can be easily observed flying around freshwater bodies and nearby land areas (Thorp and Rogers, 2011). Odonates have large eyes with many ommatidia, which is an adaptation for the detection of movement. Odonates use their keen eye sight to catch living prey (Tennessen, 2009).

Odonates are aquatic as larvae and terrestrial as adults, and hence can be used as bioindicators in both aquatic and terrestrial habitats (Oertli, 2008). Odonates are ideal for studying movement through the landscape, as their adult stage exhibits high dispersal ability and is very conspicuous (Conrad et al., 1999). Being exclusively carnivorous and mostly preying on other insects, odonates play an important role as predators in the natural food web. Odonate larvae are known to prey on mosquito larvae, and this is a good example of biological control in nature (Saha et al., 2012). When foraging, dragonflies can be categorized as "perchers" or "fliers." Perchers spend much of their time stationary, making short flights from perches to capture prey and

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IndiGenomes: a comprehensive resource of genetic variants from over 1000 Indian genomes

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ABSTRACT

With the advent of next-generation sequencing, large-scale initiatives for mining whole genomes and exomes have been employed to better understand global or population-level genetic architecture. India encompasses more than 17% of the world population with extensive genetic diversity, but is underrepresented in the global sequencing datasets. This gave us the impetus to perform and analyze the whole genome sequencing of 1029 healthy Indian individuals under the pilot phase of the 'IndiGen' program. We generated a compendium of 55,898,122 single allelic genetic variants from geographically distinct Indian genomes and calculated the allele frequency, allele count, allele number, along with the number of heterozygous or homozygous individuals. In the present study, these variants were sys-

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Seasonal Histomorphological Changes In The Testes Of *Channa Striata*

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Abstract

Striped snakehead, *Channa striata* is commonly known as mural (murrel). Due to its air breathing habit and hardy nature,it is found quite frequently in shallow or deep parts of rivers, lakes etc., with or without aquatic vegetation throughout India. Striped snakehead*C. striata* breeds annually in the natural water bodies. The sequence of spermatogenesis in *C. striata* is morphogically and histologically divided into 5 stages viz. resting, preparatory, pre-spawning, spawning and post-spawning. The testicular cycle of *C. striata* from Nagpur region are workout. The fish spawn only once in a year in this region. *C. striata* the testes are paired which are elongated flattened structures, situated on either side, ventral to the kidneys in the posterior region of the abdominal cavity. The testes remain attached to the body wall by means of mesorchia. They are equal in size. Sperm duct join posteriorly to open into the urinogenital papilla. Each testis contains numerous spermatozoa of different stages of development and degeneration. The wall of the testes is fairly thick during non-breeding season but become thin and highly vascular during spawning period. The testes were processed by standard histological technique. Histological characteristics of testes show well differentiated stages (i-iv) of maturation.

Keywords: - testes, histology, *Channa striata*

Introduction

Snakehead, *Channastriata* (Bloch, 1793)is hardy fish because of its air breathing habit. The biological process, especially the reproductive biology is the most important factor concerning the successful management of fisheries and mobilization of seed resources. Teleost are annual breeder, biannual breeder or multiple breeder depending upon the occurrence of egg laying. According the reproductive cyclical changes ensued in the gonads of fish. Depending upon the gonado-somatic index different phases were reported in reproductive cycle of teleosts. These phases described differently in several teleosts by different names. Thus reproductive cycle could be divided into resting phase,preparatory phase,prespawing phase,spawning phase and postspawning phase in *Labeo rohita* (Sonarghare,2010),*Heteropneustes fossilis* (Sonparote,2010) and in *Channa punctate punctate* (Salame and Masram,2019) . Teleosts exhibit variations in testicular structure and spermatogenic patterns.(Grier ,1998).

Material and Methods

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INHIBITORY EFFECT OF STATIN PRODUCED BY ENDOPHYTE *FUSARIUM SPECIES* ISOLATED FROM *AZADIRACHTA INDICA*

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ABSTRACT:
Endophytes are organisms associated with plant tissues that are less explored ecological niche of novel fungi and bacteria. Such organisms are rich sources capable of producing bioactive metabolites, having immense pharmaceutical significance. *Azadirachta indica* is an evergreen tree with ethno-medicinal properties. In this investigation, an attempt has been made to isolate endophytes from different tissues of *A.indica* such as stem, leaf and bark. An endophyte identified as *Fusarium decemcellulare* isolated from leaf tissues, this endophytic fungus showed capacity of lovastatin production when subjected to solid state fermentation. The inhibitory effect of lovastatin extract from this endophytic *Fusarium* sp. on the growth of *Saccharomyces cerevisiae* was studied.

Key words: - *Azadirachta indica*, *Fusarium*, lovastatin, inhibitory, secondary metabolites.

INTRODUCTION:

Statins:

Statins are the group of compounds which are produced by fungi as secondary metabolites by Polyketide pathway. The basic structure of natural statins consists of hexahydronapthalene part and a polyketide part. Though statins are naturally produced compounds by certain microorganisms, it can be produced synthetically or semi synthetically (Hfuse *et al* 1998). Statins are significant for their bioactivities and pharmaceutical value. It has been highlighted that among top best selling drugs in 1995, six out of them are from fungal origin (Bhilabutra *et al* 2007). Statins are capable of producing benefits like inhibitory action on different pathogenic fungi (Macreadie2000).

Few investigations reports the ability of statins to reduce mortality due to cardiac disease and to some extent reduce cancer incidences on their combined application and differences Blais *et al* (2000).Statins have been also studied for their combined application and different antimycotics.

Endophytes that reside in the plant are found to be rich source of secondary metabolitea, Kumar (2015). Present investigation is an attempt to study inhibitory activity of one such metabolite lovastatin from endophyte of *Azadirachta indica*.

MATERIAL & METHODS:

For isolation of endophytic fungus from Neem tree, leaves were surface sterilized and placed aseptically on sterilized potato dextrose agar plates and incubated for five days at 25° C.

For lovastatin production, solid state fermentation was carried out by using wheat bran as substrate with 70% moisture content and inoculating spore suspension of isolated fungi. The experimental set in triplicate along with control was incubated for 10 days at 25°C.

After completion of fermentation, lovastatin was extracted by ethyl acetate extraction

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STRAIN IMPROVENT AND EFFECT OF NATURAL INDUCER ON LIPASE PRODUCTION BY *RHIZOMUCOR PUSILLUS*

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ABSTRACT:
Lipases are widely used enzyme, known for its application in various industries. The fungal strains are preferred for lipase production since their enzymes are secreted extracellular and the extraction technique is simple. Thermophilic fungal enzymes are more important because of their stability at high temperature. During present investigation a thermophilic fungi *Rhizomucour pusillus* was isolated from decomposing leaves collected from forest of Nagpur district. Strain improvement of *R. pusillus* was carried out the increase Lipase production by using chemical mutagen EMS. Mutant strains derived were evaluated for yield of lipases production. Lipase activity of mutants was assayed by evaluation of quantity of fatty acid released in unit time during enzyme reaction and its measured by the quantity of NaOH required to maintain pH neutral. Present work also includes the effect of natural inducer such as wheat bran and olive oil on lipase production. It was concluded that the wheat bran is good inducer for lipase production as compare to olive oil during the process of submerged fermentation.

Keywords: *Strain improvement lipase activity, inducer, fungi, Rhizomucour pusillus*

INTRODUCTION:

Lipases are widely used enzyme, known for its applications in various industries. The fungal strains are preferred for lipase production since their enzymes are secreted extracellular and the extraction technique is simple. Thermophilic fungal enzymes are more important because of their stability at high temperature. Present investigation on a thermophilic fungus Rhizomucor pusillus (Lindt) Schipper was isolated from decomposing leaves collected from forest of Nagpur district. Mutant was developed earlier in same laboratory by using EMS. Quantitative estimation of lipase was carried out to understand effect of natural inducer during fermentation on lipase production.

Lipases are widely used enzyme, known for its applications in various industries. The fungal strains are preferred for lipase production since their enzymes are secreted extracellular and the extraction technique is simple. Thermophilic fungal enzymes are more important because of their stability at high temperature. Present investigation on a thermophilic fungus *Rhizomucor pusillus* (Lindt) Schipper was isolated from decomposing leaves collected from forest of Nagpur district. Mutant was developed earlier in same laboratory by using EMS. Quantitative estimation of lipase was carried out to understand effect of natural inducer during fermentation on lipase production.

Rhizomucor pusillus – It is a thermophilic fungus that lives in hot environments such as decomposing leaf litter. Its growth optimum at 45° C and a maximum temperature 50° C or above and a minimum of 20 °C or above (Cooney Emerson, 1964, Maheshwari *et al.*, 2000). *Rhizomucor pusillus* structure shows rhizoids and branched sporangiophores. It is grey mycelium fungi grows naturally on dead and decaying

3.3.1 - Number of research papers per teachers in the Journals notified on UGC website during the year -2021-22

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BIOCHEMICAL AND HISTOPATHOLOGICAL STUDIES ON INDIAN MAJOR CARP *LABEO ROHITA* (HAM.)

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ABSTRACT

Studies were undertaken to isolate and identify different bacterial species from *Labeo rohita* collected from in and around Nagpur region. During this study, *Pseudomonas sp.*, *Staphylococcus sp.* and *Escherichia coli* were isolated from fishes, which frequently infect liver and muscles of the fishes.

Key words: *L. rohita*, Bacteria, *Pseudomonas*, *Staphylococcus*.

Introduction:

Bacterial pathogens cause heavy losses and severe mortality in wild and cultured fishes (Anderson *et al.*, 1988; Nash, 1990). During present investigation attempts were made to find out bacterial species from adult carp, *Labeo rohita*, collected from and around Nagpur region.

Material and Methods

Adults of *L. rohita* were collected and those having pathological symptoms were brought to the laboratory. Fishes with pale, raised lesions were selected for isolation of pathogenic bacteria. For this purpose, samples of the tissues were collected from different organs and transferred in a sterile container with nutrient broth. Nutrient broth medium contained 3 g of beef extract and 5 g of peptone in 1,000 ml of water and nutrient agar was prepared by adding 3 g beef extract, 5 g peptone and 15 g agar in 1, 000 ml of water (Pelczar et al., 1986) which was incubated at 37°C for 24 hrs.

Nutrient broths with turbidity were streaked on nutrient agar plates and incubated at 37°C for 24 hrs. The isolated colonies were picked up for further studies and maintained as stock cultures on nutrient agar slants.

For differentiation of bacteria, various selective media such as Mac Conkey agar, Pseudomonas isolation agar, Blood agar etc. were purchased from Hi-Media laboratories, Mumbai and used, the bacterial micro-flora was identified on the basis of morphological, biochemical and cultural characteristics following (Noga, 1995; Carter, 1990).

Samples of the used for tissues were used for the estimation of protein, as described by Lowry *et al.*, (1951). Histological studies of the tissues were also undertaken as described by Tembhare, (2010).

Results and Discussion:

Fishes suffer from various types of diseases, with symptoms like ulceration and cloudiness of skin, necrosis, pale colouration, excess mucus on gills, haemorrhages on the body and fins, reddening of the body, erosion of scales, and tail or fin rot.

The bacterial pathogens isolated from un-healthy fishes were *Pseudomonas sp.*, *Escherichia coli* and *Staphylococcus sp.* Out of these *Pseudomonas sp.* was dominant. *Pseudomonas sp. and E. coli. were found in infected liver and muscles, while Staphylococcus sp. was found in infected muscle.* Bacterial infections resulted into *significant* decreases in protein content of muscles and liver (Table 1).

https://bbrc.in/analysis-on-the-diversity-of-jumping-spiders-of-maharashtra-india/

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Ecological Communication

On the Diversity of Jumping Spiders of Maharashtra, India

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ABSTRACT

Family Salticidae (jumping spiders) is the largest family of spiders under order Araneae. Jumping spiders are ubiquitous in terrestrial ecosystems and are familiar to humans as they are also found in human dwellings and home gardens. They are well known for their complex vision-based behaviour, which include elaborate mating behaviours, stalking and capturing of prey species, araneophagy and mimicry. Jumping spiders are generally diurnal in habit and being predators exclusively, they have an important role in the terrestrial food webs. Being well-represented in agro ecosystems, they have a significant role in the biological control of pest species. Despite being a major arthropod group, not much is known regarding the diversity, distribution, taxonomy and behaviour of jumping spiders found in the various regions of India. Maharashtra is one of the largest states in India, however only a few records exist of the salticid fauna of Maharashtra. Hence, there was a need to ascertain the diversity of jumping spiders found in Maharashtra. The methodology which has been used to this purpose includes collection and identification of jumping spiders from different areas of Maharashtra and also the review of previously published reports. The jumping spiders of Maharashtra are represented by 29 species in 18 genera. This appears to be just a small portion of the salticid fauna actually found in Maharashtra and further work is required to thoroughly understand the diversity and biology of this group. This work highlights a neglected group of Arachnids, provides an up-to-date number of salticid species known from Maharashtra, and shall be of help to future researchers.

KEY WORDS: ANT-LIKE SPIDER, ARACHNIDA, BIOCONTROL, BIODIVERSITY, FAUNA, MYRMARACHNE.

INTRODUCTION

Currently 49,159 species of spiders in 4,207 genera of 128 families are known from the world. Taking into account the number of species, family Salticidae (jumping spiders) is the largest family with 6334 species in 659 genera (World Spider Catalog 2021). Indian jumping spider fauna consists of 181 species in 62 genera (Siliwal et al., 2005). It is difficult to estimate the actual number of jumping spider species found in India as this group is very diverse but has not been thoroughly studied in India. Jumping spiders are unique in the animal kingdom as they are known for their intricate vision-based behaviour during encounters with prey and conspecific individuals. This is achieved using eyes specialized for discerning fine detail (Cerveira et al., 2019).

Jumping spiders have a pair of large forward facing anterior-median eyes, which are the principal eyes (Fig. 1). They also have three pairs of smaller eyes called secondary eyes, which include one pair each of anterior-lateral, posterior-median and posterior-lateral eyes. The secondary eyes are highly proficient motion detectors. The salticid eyes provide a near 360° field of view and forward-looking spatial resolution surpassing that of all insects and even some mammals (Menda et al., 2014).

Among arachnids, jumping spiders are agile and dexterous jumpers and have a semi hydraulic system of locomotion (Brandt et al., 2021). Diverse predatory strategies have evolved in jumping spiders, including araneophagy, aggressive mimicry, myrmecophagy, and prey-specific prey catching behaviour (Jackson and Pollard 1996; Brandt et al., 2021).

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RESEARCH Open Access

Genetic epidemiology of autoinflammatory disease variants in Indian population from 1029 whole genomes

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Abstract

Background: Autoinflammatory disorders are the group of inherited inflammatory disorders caused due to the genetic defect in the genes that regulates innate immune systems. These have been clinically characterized based on the duration and occurrence of unprovoked fever, skin rash, and patient's ancestry. There are several autoinflammatory disorders that are found to be prevalent in a specific population and whose disease genetic epidemiology within the population has been well understood. However, India has a limited number of genetic studies reported for autoinflammatory disorders till date. The whole genome sequencing and analysis of 1029 Indian individuals performed under the IndiGen project persuaded us to perform the genetic epidemiology of the autoinflammatory disorders in India.

Results: We have systematically annotated the genetic variants of 56 genes implicated in autoinflammatory disorder. These genetic variants were reclassified into five categories (i.e., pathogenic, likely pathogenic, benign, likely benign, and variant of uncertain significance (VUS)) according to the American College of Medical Genetics and Association of Molecular pathology (ACMG-AMP) guidelines. Our analysis revealed 20 pathogenic and likely pathogenic variants with significant differences in the allele frequency compared with the global population. We also found six causal founder variants in the IndiGen dataset belonging to different ancestry. We have performed haplotype prediction analysis for founder mutations haplotype that reveals the admixture of the South Asian population with other populations. The cumulative carrier frequency of the autoinflammatory disorder in India was found to be 3.5% which is much higher than reported.

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Research Article

Pharmacogenomics

Pharmacogenomic landscape of COVID-19 therapies from Indian population genomes

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Aim: Numerous drugs are being widely prescribed for COVID-19 treatment without any direct evidence for the drug safety/efficacy in patients across diverse ethnic populations. **Materials & methods:** We analyzed whole genomes of 1029 Indian individuals (IndiGen) to understand the extent of drug–gene (pharmacogenetic), drug–drug and drug–drug–gene interactions associated with COVID-19 therapy in the Indian population. **Results:** We identified 30 clinically significant pharmacogenetic variants and 73 predicted deleterious pharmacogenetic variants. COVID-19-associated pharmacogenes were substantially overlapped with those of metabolic disorder therapeutics. *CYP3A4*, *ABCB1* and *ALB* are the most shared pharmacogenes. Fifteen COVID-19 therapeutics were predicted as likely drug–drug interaction candidates when used with four *CYP* inhibitor drugs. **Conclusion:** Our findings provide actionable insights for future validation studies and improved clinical decisions for COVID-19 therapy in Indians.

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Keywords: COVID-19 therapies • drug–drug–gene interactions • drug–drug interactions • Indian population • pharmacogenomics

It has been well established that genetic variants among several other factors significantly explain inter-individual differences in therapeutic response [1,2]. Several examples of large-scale ethnic differences in treatment response have

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THE STUDY OF ANCIENT SWIMMING AND THE CHANGING NATURE OF MODERN SWIMMING

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ABSTRACT

Sports have a very important place in human life. Sports help to end enmity and establish friendships. Social commitment increases. Sports are very useful in breaking the barriers of caste, religion, country, and language. It helps to create a different image of oneself in society and introduces a true sense of tolerance and humanity. In health science, it is said that not only the organs and organs of the body should be in good condition and the body should not have any disease, but the organs must be maximally functional. So, the mind remains happy, energetic, and efficient. All this can be easily realized through regular sports participation. 'A good mind resides in a good body', the trick comes from sports. There are many types of sports. Among them, the name of one such water sport is swimming. To move freely in the water without any support is swimming. It is a very popular and exercising sport. Ancient swimming and the changing nature of modern swimming have been studied in this research paper.

KEYWORDS: *Sports, Swimming, Health, Fitness, Swimming Competition, Freestyle Swimming, Backstroke Swimming, Butterfly Swimming.*

Data Collection Method Used for Research:

Data for the research paper has been collected from books, websites and newspapers.

OBJECTIVE OF RESEARCH:

1) To study ancient swimming and the changing nature of modern swimming
2) To know the history of swimming
3) To study the modern rules and opportunities for swimming

INTRODUCTION:

Almost all quadrupeds, toed birds, and fishes have a natural gift for swimming. But man has to take training in swimming. Swimming exercises more muscles in the body than any other exercise. It helps in the proper growth of the whole body. Swimming has health, fitness, and other benefits for a person. The use of swimming in terms of conservation is very important. A person who swims after falling into deep water can save his own life and, on occasion, the life of another. At the same time,

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Article

Dynamics of Anthracene Excimer Formation within a Water-Soluble Nanocavity at Room Temperature

Aritra Das, Ashwini Danao, Shubhojit Banerjee, A. Mohan Raj, Gaurav Sharma, Rajeev Prabhakar, Varadharajan Srinivasan,* V. Ramamurthy,* and Pratik Sen*

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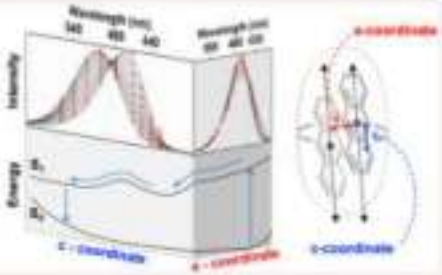
ABSTRACT: Excited anthracene is well-known to photodimerize and not to exhibit excimer emission in isotropic organic solvents. Anthracene (AN) forms two types of supramolecular host−guest complexes (2:1 and 2:2, H:G) with the synthetic host octa acid in aqueous medium. Excitation of the 2:2 complex results in intense excimer emission, as reported previously, while the 2:1 complex, as expected, yields only monomer emission. This study includes confirming of host−guest complexation by NMR, probing the host−guest structure by molecular dynamics simulation, following the dynamics AN molecules in the excited state by ultrafast time-resolved experiments, and mapping of the excited surface through quantum chemical calculations (QM/MM-TDDFT method). Importantly, time-resolved emission experiments revealed the excimer emission maximum to be time dependent. This observation is unique and is not in line with the textbook examples of time-independent monomer−excimer emission maxima of aromatics in solution. The presence of at least one intermediate between the monomer and the excimer is inferred from time-resolved area normalized emission spectra. Potential energy curves calculated for the ground and excited states of two adjacent anthracene molecules via the QM/MM-TDDFT method support the model proposed on the basis of time-resolved experiments. The results presented here on the excited-state behavior of a well-investigated aromatic molecule, namely the parent anthracene, establish that the behavior of a molecule drastically changes under confinement. The results presented here have implications on the behavior of molecules in biological systems.



INTRODUCTION

Anthracene (AN) and pyrene (PY) occupy a special place in the history of the photochemistry[1,2] and photophysics of aromatic molecules.[3,4] The concepts that currently prevail concerning the excited-state chemistry of aromatic molecules could be traced back to these two molecules serving as exemplars in the development of concepts related to excimers and photodimerizations.[1,2,5−7] A century ago AN was established to photodimerize with a limiting quantum yield of 1 in solution at room temperature.[1,2] On the other hand, PY is known not to photodimerize under any conditions. However, it shows a concentration- and temperature-dependent emission, in addition to fluorescence and phosphorescence, in solution at room temperature even at 10^{-4} M.[3] The intense structureless broad emission with a lifetime of 90 ns initially recorded by Forster and Kasper[8,9] was established to originate from an excited dimer (excimer). In contrast, AN, which photodimerizes from the excited singlet state mainly fluoresces and phosphoresces in isotropic solution.[3] Recognizing the anomaly between AN and PY, Chandross devised an ingenious method by which excimer emission from anthracene could be recorded at 77 K in an organic glass.[10−12] He generated "sandwich" dimers (two AN molecules placed side by side with the long and short axes parallel to each other) via photolytic decomposition of dianthracene (covalent dimer of AN; Scheme 1), which upon excitation gave an intense broad emission red-shifted with respect to fluorescence. This was attributed to an excimer and found to have a long lifetime (~185−225 ns).[13−16] Following this, Ferguson showed that excimer emission could be recorded in the crystalline state as well as in a KBr matrix by following the above procedure.[17−20] As expected, the excitation spectrum corresponded to the absorption spectrum of the AN monomer. While the "sandwich" dimer showed intense excimer emission at 77 K, when warming the matrix was warmed, the excimer emission disappeared and dianthracene was formed with a near-unit quantum yield at room temperature.[21] The above observations

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Fungi Isolated from Different Fruits Obtained from Fruit Vendors of Nagpur City

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Abstract: ***Fruits make important diet for human beings. However, the high concentration of various sugars, minerals, vitamins and amino acids also provide a good platform for the successful growth and survival of various parasitic and saprophytic forms of fungi. Considering the importance of fungi in deterioration of fruits and in causing huge losses, the present study was undertaken to understand different fungi isolated from common fruits available in markets of Nagpur city namely Citrus limon, Citrus sinensis, Pyrus communis, Carissa carandas, Averrhoa carambola, Prunus domestica, Malus domestica and Punica granatum. Fungi were isolated on sterile potato Dextrose Agar and identified on the basis of published literature. Aspergillus niger was having highest frequency of occurrence followed by Fusarium spp. for most of the fruits. Maximum diversity of fungi was seen forCarissa carandas with 8 fungal species followed by Pyrus communis and Prunus domestica with 5 species each. The known potential of isolated species for the mycotoxin production carries significance as contaminated fruits are often consumed in developing countries. Results of the study will help to spread awareness amongst the farmers and those involved in the storage, transport and marketing of the fruits about the need for prevention of storage fungi growth.***

Keywords: fruits, fungi, mycotoxins, storage

1. Introduction

Fruits make important diet for human beings. However, the high concentration of various sugars, minerals, vitamins and amino acids also provide a good platform for the successful growth and survival of various parasitic and saprophytic forms of fungi. Fruits are highly perishable and maintain an active metabolism during the storage phase. During post-harvest period diseases can affect the quality of fruits. Post-harvest losses. The emphasis had always been on crop production and the breeding of better varieties. In tropical countries, deterioration tends to be especially rapid because of prevailing high temperature and in many places, high humidity. Physical damage is a very important aspect of post-harvest deterioration and is the primary cause of many losses. Various types of injury can be sustained before, during or after harvest. Causal agents include the weather, insects, birds, rodents and farm implements. Most types of damage cause an increase in respiratory rate and hence a greater heat output. Other adverse effects include increased moisture loss and enhanced production of ethylene. Physical damage very often facilitates invasion by micro-organisms resulting in a progressive decay which may affect the entire organ. Many fruits are resistant to fungal attack when unripe; the infection process is halted almost as soon as it has begun but the fungus remains alive, entering a 'quiescent' or 'latent' phase. The process of ripening is accompanied by a weakening of cell walls and a decline in ability to synthesise antifungal substances, until eventually the fruit is no longer able to resist the advance of the fungus [2].

The internal tissues of fruits are nutrient rich. Their structure is comprised mainly of the polysaccharides cellulose, hemicellulose, and pectin. The principal storage polymer is starch. Spoilage microorganisms exploit the host using extracellular lytic enzymes that degrade these polymers to release water and the plant's other intracellular constituents for use as nutrients for their growth. Fungi in particular produce an abundance of extracellular pectinases and hemi-cellulases that are important factors for fungal spoilage. The

The post-harvest losses of horticultural crops in developing countries have been reported to vary between 15 to 50 percent, with an estimated minimum of 20 percent. Horticultural crops not only provide nutritional and healthy foods, but also generate cash income to growers. Besides their economic importance, fruits play a pivotal role in human diet. In developing countries, inadequate arrangements for post-harvest management like storage, processing, preservation and marketing facilities lead to problem of postharvest losses. After harvesting, most of the farmers transport the fruits to the markets in lorries and tractors. Sometimes while loading in trucks the fruits are directly dumped into lorry without any packing. At the time of unloading the fruits in the wholesale market, the damaged, over ripened, immature and unmarketable size fruits are separated out, resulting into further physical damage [4]

Considering the importance of fungi in deterioration of fruits and in causing huge losses, the present study was undertaken to understand different fungi isolated from common fruits available in markets of Nagpur city.

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Research Article

New aluminate-germanate hosts with garnet structure for solid state lighting applications

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ARTICLE INFO

Keywords:
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Luminescence

ABSTRACT

In this paper, two newly developed garnet phosphors, $BaY_2Al_4GeO_{12}:Ce^{3+}$ and $SrY_2Al_4GeO_{12}:Ce^{3+}$ are reported. The materials were prepared by simple, facile combustion synthesis. The emission for these phosphors is in yellow region when excited by blue light. Decay for $BaY_2Al_4GeO_{12}:Ce^{3+}$ is nearly exponential with average lifetime of 70 ns. In case of $SrY_2Al_4GeO_{12}:Ce^{3+}$, decay curve could be fitted to second order exponential with fast component $\tau_1 = 24.5$ ns and slow component $\tau_2 = 57$ ns. Capability of excitation by blue LED, yellow emission, simple preparation make these phosphors suitable for white LED lamp fabrication. These could be suitable replacements for YAG:Ce.

1. Introduction

YAG:Ce is the phosphor used in the first commercial LED lamp [1]. Even today, it is the most widely used phosphor for producing white LED lamps. The phosphor is suitable for coating on blue LED chips as it has strong absorption in the blue region and emission in the yellow. Such properties can be observed for Ce^{3+} activator when placed in a strong crystal field leading to large centroid shift [2]. Garnet structure is suitable to provide the same as Yttrium ions have eight oxygen neighbours in a distorted dodecahedral arrangement. Several drawbacks of YAG:Ce have been pointed out from time-to-time [3]. These include narrow excitation band, concentration quenching at rather low activator concentration, thermal quenching, etc. A number of efforts have been made to obtain a substitute. Most obvious way of finding a better phosphor would be to make substitutions in the host lattice without changing the garnet structure, and look for improvement. After exhausting possible substitutions at single Yttrium or Aluminium sites, substitution pairs were explored. These pairs may be represented as AE- M(IV), where AE is one of the alkaline earths Mg, Ca, Sr or Ba and M(IV) is a tetravalent element like Si, Ge or Zr [4]. Several phosphors claimed to be better than YAG:Ce have been reported based on this strategy. For example, $CaY_2Al_4SiO_{12}:Ce^{3+}$ [5], $CaLu_2Al_4SiO_{12}:Ce^{3+}$ [6], $MgY_2Al_4SiO_{12}:Ce^{3+}$ [7], $BaY_2Al_4SiO_{12}:Ce^{3+}$ [8], $Y_3Mg_2AlSi_2O_{12}:Ce^{3+}$ [9], $Lu_3(Al,Mg)_2(Al,Si)_2O_{12}:Ce^{3+}$ [10], $Y_3MgSiAl_2O_{12}:Ce^{3+}$ [11,12], $Lu_3MgAl_2SiO_{12}$ [13], $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ [14], $Lu_2SrAl_4SiO_{12}:Ce^{3+}$ [15]. Though Si had been a common choice for tetravalent element in recent years, Ge also has been used to substitute at Al site [16]. Tratsiaka et al. studied Ce-doped $Y_2CaAl_4GeO_{12}$ and $Y_3MgAl_4GeO_{12}$ as scintillators [17]. Yellow emission was observed in these phosphors also. The studies have not covered Sr or Ba analogues. Recently, we have synthesized $AEY_2Al_4SiO_{12}:Ce$ (AE = Ba, Sr, Mg, Ca) phosphors using facile combustion synthesis [18]. Following this success, we have prepared new phosphors $SrY_2Al_4GeO_{12}:Ce^{3+}$, $BaY_2Al_4GeO_{12}:Ce^{3+}$ by this method. Anticipated yellow emission with blue excitation useful for white LED lamp was observed.

In this paper, we have reported two new phosphors as described above. The phosphors were studied for various parameters like crystal structure, PL and PLE spectra, Lifetime, colour coordinates.

2. Experimental

Details of the experimental procedure can be found elsewhere [18]. Salient points are reproduced here. "Aluminium nitrate has exothermic reaction with urea. However, there is no such reaction between yttrium nitrate and urea. Yttrium nitrate shows exothermic reaction with glycine. Hence, urea + glycine mixed fuel was used. Reagent grade

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THERMODYNAMIC STUDIES ON MOLECULAR INTERACTIONS IN AQUEOUS SOLUTIONS OF BARBITURIC ACID, 1,3-DIMETHYL BARBITURIC ACID AND THIOBARBITURIC ACID

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Abstract

The densities, ultrasonic velocities and refractive indices of barbituric acid, 1,3-dimethyl barbituric acid and thiobarbituric acid in aqueous solutions have been measured at 37 °C. The volumetric and acoustical properties were calculated from densities and ultrasonic velocities in order to understand the interactions between barbituric acid-water, 1,3-dimethyl barbituric acid-water and thiobarbituric acid-water. The quantum chemical calculations of barbituric acid, 1,3-dimethyl barbituric acid and thiobarbituric acid in gas phase and in water performed employing GAUSSIAN 09 programme. Energies, bond lengths, IR frequencies of selected interacting groups are reported for studying the solute-solvent interactions.

Keywords:- Thermodynamic properties, Molecular interaction, Compressibility, Barbiturate, DFT

I. INTRODUCTION

Drug-macromolecular interactions are an important phenomenon in physiological media such as blood, membranes, intra and extracellular fluids. The processes of drug transport, protein-binding and anaesthesia are few examples where drug and bio macromolecules appear to interact in an important and vitally significant manner. Thermodynamic properties are generally convenient parameters for interpreting solute-solvent and solute-solute interactions in the solution phase [1-6]. Fundamental properties such as enthalpy, entropy and Gibbs energy represent the macroscopic state of the system and interpretation of these macroscopic properties in terms of molecular phenomena is generally difficult. Sometimes, higher derivatives of these properties can be interpreted more effectively in terms of molecular interactions.

However, some drug effects are non-receptor mediated and are caused by the particular physical or chemical properties of the drug molecule. To firmly grasp the concepts of how desired and deleterious effects are induced in the body by a drug molecule requires an understanding of where and how these molecules interact.

The study of volumetric, acoustical and optical properties of biomolecules in aqueous and aqueous-cosolute solutions provide significant information regarding molecular interactions and hydration behaviour of these molecules. The organic salt like disodium tartarate can change the binding trends and hydration behaviour of biomolecules in solution. The changes in molecular environment and molecular interactions involved are reflected in thermodynamic properties. Interactions between drug and macromolecule are important in biophysical chemistry [7-8]. Drug-electrolyte or drug-active organic molecule interactions are significant for pharmacokinetics and pharmacodynamics. The thermodynamic properties and molecular interactions in aqueous solutions of drug in presence

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ARTICLE

Preliminary Archaeoacoustic Study of Kanheri Caves in Mumbai (Maharashtra, India)

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ABSTRACT

Here we report first ever study on acoustical evaluation of Kanheri Caves located in Sanjay Gandhi National Park, Mumbai (Maharashtra, India). These caves are dated to a period between 2nd century BCE to 7th century CE. In this study we used an ambisonic recorder to capture Impulse Response, which carries acoustic signature of the place. Out of total 109 caves 41 were surveyed in available time. Out of those reverberant environment was noted in 12 caves. Measurements were made only in 3 caves (Cave Nos. 1, 3, 11) which are important. In the beginning we carried out an FFT analysis. We then studied room acoustic parameters like Reverberation Time, Early Decay Time, Clarity, Definition, etc., based on the measurement of Impulse response. Cave No. 3 have high value of reverberation time, compared to other. Therefore it also have lower clarity compared to others. It is properties needs to be compared with similar structures (chaityas) in Maharashtra (at Ajanta, Ellora, Nashik, Junnar, etc.) and elsewhere in India. It is worthwhile to carry out further research in Cave No. 3 with more sophisticated instruments as well as 3D modeling. Since the experiment was performed with receiver at only one position, we also suggest to carry out experiment with receiver at multiple positions and then comparing them.

KEYWORDS

Archaeoacoustics; reverberation time; room acoustics; kanheri caves

1 Introduction

Archaeoacoustic is relatively a new area in scientific studies which combines the principles & technique of Acoustics and the knowledge from archaeology/history about a place under consideration [1]. In Archaeoacoustic studies, we need to generate an Impulse Response (IR) and recording it with the help of a proper instrument. IR represents acoustic signature of that place useful for analysis.

Archaeoacoustical investigation in India started some 30 years ago in 1990s. Many sites like Hulimavu Cave Temple (Bengaluru, Karnataka), Udayagiri Cave (Odisha), Koothabalam of Vadakkunathan Temple (Thrissur, Kerala); Rivona Caves, Tambdi Surla Mahadev Temple (all in Goa) and of many other sites have been studied by some researchers [2]. Last decade has witnessed increasing studies in this field worldwide. Such investigations in India were carried out with normal recording microphones or handheld recorders of Sony, Zoom, etc. Umashankar Manthrawadi developed his own First Order Ambisonic recorder named *"Brahma"*, with the help of this he carried out his work at many sites like Anupu

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Institutional Repositories is the Key Role for Online Submission of SSR

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Abstract:

Library is an avenue for knowledge management can effectively become a physical or virtual place for open access and scholarly communication only if librarians' step outside traditional roles. An Institutional Repository that is (IRs) means the scientifically organized and managed collections of digital content generated by institutional faculty members, other staff members, Research Scholars, students and other stalk holder of the institution. It's the collective intellectual digitalized outcome of the institution. This is the result of the vision of the librarian to collect, store and disseminate by access to scholarly published digitized material in a various way, mostly librarians of the institution can initiated for the work. Institutional repositories are useful for scholarly work. In the context of academia or even for NAAC online submission the Institutional Repository helps to increase the institution prestige and nourishing the ideas of the Institutional stack holders. "Institutional Repository" is well managed and preserved relevant information by experts. Otherwise this information would remain scattered, unattended, untagged, unclassified and inaccessible.

Keywords: *Institutional Repository, Digital-Preservation, scholarly-communication, Libraries-IRs, NAAC, Digital – Archive, e-resources.*

Introduction:

Institutional Repositories means the collection of scholarly published work of faculties, research scholars, other staff members, students and other stalk holders of the institute, which is digitalized, classified, tagged and accessible for users. A repository, is a centralized website where digital information, usually databases or computer files are stored and maintained. They can be of public access, or may be protected and need a pre-authentication. As per the New World Encyclopedia, an Institutional Repository is an online locus for collecting, preserving, and disseminating, in digital form, the intellectual output of an institution, particularly a research institution.

Definitions of Institutional Repositories:

According to Lynch (2003) "a university based Institutional Repository is a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members". Foster and Gibbons (2004) defined Institutional Repository as, "an electronic system that captures preserves and provides access to the digital work products of a community".

Raym Crow (2004) defined as Institutional Repository as a "Digital Archive of intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside the institution, with few, if any barrier to access. The content is institutionally defined, scholarly, cumulative and perpetual, open and interoperable."

Chang (2003) defines an Institutional Repository as a new method for capturing, collecting, managing, disseminating and preserving scholarly works created in digital form by the constituent members of an institution. For the present study, the term 'digital libraries and repositories' include digital collection, digital archives developed using digital library and Institutional Repository software packages.

libguide.com defined 'An institutional repository is an archive for collecting, preserving, and disseminating digital copies of the intellectual output of an institution, particularly a research institution".

Objectives:

The institutions having mostly four major objectives for IRs

1) It is to create global self renowned visibility for a scholarly research work of the intuition.
2) To collect content on a single location.
3) To provide open access to institutional stalk holders by self archiving.
4) To collect, store, protect and preserve the institutional digital material may be published or unpublished.

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THE STUDY OF SPORTS OF MAHARASHTRA AND THEIR PRESENT STATUS

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ABSTRACT:

Maharashtra has had a long tradition of sports, exercise, and recreation since ancient times, and it has been consistently beneficial to the overall life of the people and social health. Atyapatya, Hututu, Gotya etc. in ancient Santwangmaya. From the allegorical mentions of games that are found, it seems that those games must have been a norm in the social life of that time. Mentions of many other games and forms of entertainment are found in the folk songs and folk dances of the time. Although cricket is considered to be the most popular sport in Maharashtra today, Kabaddi, field hockey, kho kho, badminton, and table tennis are also widely played. Hind Kesari and Maharashtra Kesari wrestling tournaments are held regularly in rural areas of the state. Sports/sports is not only an effective tool for the personal development of the individual but also for social transformation. In this paper, an attempt has been made to know the information about the traditional games such as Mallakhamba, Kusti, Atyapatya, Kho-Kho, Kabaddi as well as Lathi, Jambia, Farigadka, which started and are played in every corner of Maharashtra. The study of sports in Maharashtra and their current status has been done in the present research paper.

KEY WORDS: *Sports, Mallakhamba, Kusti, Atyapatya, Health, Fitness, Kho-Kho, Kabaddi, physical education, Sports of Maharashtra.*

OBJECTIVE OF RESEARCH:

1) To study history of sports of Maharashtra.
2) To know the current status of sports of Maharashtra.

INTRODUCTION:

Sports play an important role in human life. Various games can help to relax the mind and refresh the body and mind by making people forget the pains and worries of life. The body gets a lot of exercise in physically demanding games and it makes the body fit and strong. Sports develop morale, perseverance, sportsmanship, etc. Marks also increase. Team sports give scope for cooperative attitude, team spirit, and leadership qualities and these qualities are useful on various occasions in life. Competition in sports also increases the quality of sports. International harmony also increases due to sports competitions among nations.

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Antibacterial and Antifungal Activities of new unsymmetrical thiobarbituric acids and their Knoevenagel Products

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Abstract

The synthesized thiobarbituric acids and Knoevenagel products were evaluated for their antimicrobial activities against various pathogens *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans* using cup plate agar diffusion method.

Introduction

Microbes are unique creatures that adapt to varying lifestyles and environment resistance in extreme or adverse conditions. Continuous change in genetic architecture of microbes it becomes a challenge for the society to find new chemical entities which can treat microbial infections.[1] The alarming rates of the growing emergence of antimicrobial resistance are major concern to the public health and scientific communities worldwide, especially in the field of multi drug resistant bacteria and fungi.[2,3] These trends have emphasized the urgent needs for new, more effective, less toxic and safe antimicrobial agents and the development of structurally new classes of antimicrobials with novel mechanisms of action as well as structural modifications to improve both their binding affinity and their spectrum of activity.[4]

Structural modification of antimicrobial drugs to which resistance are developed and has been proven to be an effective means of extending the lifespan of antifungal agents such as the azoles,[5] antiviral agents such as the non-nucleoside reverse transcriptase inhibitors[6] and various antibacterial agents including β-lactams and quinolones.[7] It is not surprising in response to antimicrobial resistance, major pharmaceutical companies have tended to concentrate their efforts on improving antimicrobial agents in established classes.[8,9,10]

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KI-H_2O_2 promoted intramolecular oxidative C—H Functionalization: Synthesis of Benzo[*d*]thiazol-2-amines

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ARTICLE INFO

Keywords:
Thiocarbamide
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ABSTRACT

This work reported a novel, efficient and green technique for the synthesis of *N*-substituted benzothiazoles using KI-H_2O_2 in DCM via intramolecular oxidative C—H functionalization was carried out. The simple isolation, mild reaction conditions, easy purification without column with good yields, rendering the methodology accessible herein highly eco-friendly compare to existing method.

Introduction

N-substituted benzo[*d*]thiazol-2-amines are heterocyclic compounds with diverse range of biological activity and are considered as good building blocks for organic transformation. It shows numerous activities like antibacterial, antidiabetic, anticancer, anti-infective, herbicidal [1–3], diabetics [4], epilepsy [5], and tuberculosis [6]. 2-aminobenzothiozoles are terribly active in the field of biological facet and have significant & unique scaffolds used for the drug delivery which includes riluzole **I**, glutamate antagonist agent [7], R116010 **II** acts as anti-tumour [8], rambazole **III** for the treatment of skin disorder and cutaneous inflammation [9], CYP26 **IV** which acts as potent inhibitors and enhancers of all-trans retinoic acid activity in malignant neoplasm cells [10], **V** acts as antibacterial [11], HM139 **VI** which shows anticancer and anti-HIV [12] and frentizole **VII** used as anti-viral and immunological disorder [13] respectively (Fig. 1).

Because of their wide range of biological significance, these compounds have received a incredible attraction and developing the new methodology is huge challenge for organic chemists. The various classical methodologies for synthesis of most likely active 2-amino benzothiazoles using diverse catalytic systems are reported. Among these ways some common technique for synthesis of 2-amino benzothiazole includes transition of metals catalysed like Fe [14,15], Cu [16], $FeCl_3$ [17], nano copper oxide [18] by the addition reactions of o-haloaniline with isothiocyanates followed by intramolecular cyclization (Scheme 1, eq (I)). The oxidative cyclisation of thiobenzanilides including Jacobson's and Hugerschoff's methods have described [19–23]. However, C—S coupling reaction associated with an elevated temperature lead to the synthesis of 2-aminobenzothiazole was obtained using CuI [24], and Cu(II) [25] (Scheme 1, eq (II)). In addition to those, variety of the common methods are used for the synthesis of 2-amino benzothiazoles such as liquid bromine, solid crystalline $C_6H_5CH_2NMe_3$ [26], Cu (cat) [27], ligand free Cu-Pd [28], CuO nanoparticle [29] Cu(OTf) [30], Fe (cat) [31] and $C_6H_5I(OAc)_2$ and $NiBr_2$/Pyridine [32] as a wellspring of C—S coupling reaction (Scheme 1, eq (III)). Within the framework of research interest, our cluster has synthesized C—S coupling products by the reaction of 5-Bromo barbituric acid with thiocarbamides [33] and aryl ammonium dithiocarbamates [34].

The above reported methods for the synthesis of *N*-substituted benzothiazoles via oxidative C—H functionalization have certain drawbacks such as inadequate substrate scope due to less availability of isothiocyanates, contamination of metal catalysts, harsh reaction conditions, and additive required for the completion of reaction. To the best of our knowledge, it seems worthwhile to point out that KI/H_2O_2 in DCM was not functionalized with the intramolecular C—S coupling product of *N*-substituted benzothiazoles in any previous studies (Scheme 1 eq. (IV)).

Result and discussion

We examined the interaction of phenyl thiocarbamide **1a** with KI/H_2O_2 in DCM on stirring at room temperature, via in-situ generated 2-Iodo phenyl thiocarbamide as an intermediate followed by oxidative cyclization (C—S coupling) had occurred. The structure of product **2a** was confirmed by spectral analysis. Noteworthy, the oxidative

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Fabrication of W-LEDs by Coating Tri-Color Inorganic Phosphors on UV-Diode

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Abstract. YAG:Ce phosphor coated on blue-chip gives many advantages, except the color rendering of the LEDs fabricated by this method is poor due to the lack of red and green colors. This problem can be sorted out by choosing different methods out of the available two different methods. For the first method, the n-UV (near-ultraviolet) LED is coated with a mixture of intense blue, green, and red phosphors to make a white light-emitting diode. Also, if the yellow color phosphor is added, lamps can give better CRI values. So many papers are reported on this type of white LED fabrication technique. In this paper, we have reported the fabrication of white LED lamps by coating three different phosphors i.e. blue, green, and red in the appropriate amount to be mixed and coated on the near UV LED chips. This approach is different from the existing reports because we are using near UV (405-407 nm LEDs) not the UV LED chips in the fabrication of white LEDs in this paper.

Introduction

The ultra-high brightness LEDs have proved to be better for lighting applications nowadays. With the advances in solid-state lighting applications, the light consumption amount is reduced to nearly half of the total energy consumption. The LED lightings have so many advantages like they are small in size, they have a longer lifetime, they have less pollution and lower consumption properties which can make w-LED as the most suitable and important source of light for the upcoming centuries [1].

The YAG: Ce coated on blue LED chips to make white LEDs were first time reported in 1997 [2]. The blue-chip coated with YAG: Ce system has shown very good characteristics, except the color rendering of the LEDs fabricated by this method is poor due to the lack of red and green colors. This problem can be sorted out by choosing different methods out of the available two different methods. For the first method, the n-UV LED is coated with a blend of intense blue, green and red phosphors to make a white light-emitting diode [3]. Also, if the yellow color phosphor is added, lamps can give better CRI values. So many papers are reported on this type of white LED fabrication technique [4-7].

But the cost of UV LED chips is very high than blue LED chips. Hence the second way of fabricating white LEDs by coating the blend of red and green phosphors on the blue-chip is gaining many reviews nowadays [8].

Experimental

Blue phosphors for UV diodes: BAM: Eu and SAM: Eu phosphors

The BAM phosphor is also known as barium magnesium aluminate, is widely used in Plasma display panels and also is a blue-emitting phosphor, or $BaMgAl_{10}O_{17}:Eu^{2+}$ (BAM) is a good candidate for use as a blue emitter for making white LED [6]. This blue emission in the BAM phosphor can be correlated with the 5d to 4f transition of Eu^{2+} and the crystal-field strength of host lattice. $SrMgAl_{10}O_{17}:Eu^{2+}$ (SAM) and BAM are the two phosphors having emission and excitation on the same frequency bands. SAM is also a blue-emitting phosphor having the same excitation bands as the BAM. But SAM is more widely used in SSL (solid-state lighting) applications due of its wider