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Experimental Investigation on Green Synthesis of FeNPs using *Azadirachta indica* Leaves

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Abstract

In nanotechnology, developing an environmentally friendly method for synthesizing iron nanoparticles (FeNPs) is an important aspect. According to recent studies, the use of secondary metabolites from plant leaf extract has recently emerged as a novel technology for synthesizing various nanoparticles. The leaf extract of *Azadirachta indica* was used to synthesize iron nanoparticles in this research. The effects of reactant concentrations, reaction temperature, and pH of the solution on the synthesis process of iron nanoparticles were studied. A UV-Visible Spectrophotometer that analyzed absorbance spectra was used to monitor the formation of iron nanoparticles in dispersion. Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) characterized the morphology of iron nanoparticles, and results reveal the particles are spherical with an average size of 48 nm. The optimum conditions for synthesis are as follows: 15 % leaf extract, $[FeCl_3]$ = 1.0 mM, pH 6.0, and temperature 60°C. The FTIR technique confirms that plant biomolecules induce the reduction of Fe^{3+} ions to FeNPs and act as a capping and stabilizing agent. Therefore, they have good stability for various applications.

Keywords: Green synthesis; *Azadirachta indica*; Iron nanoparticles; Experimental investigation.

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1. Introduction

Iron nanoparticles (FeNPs) are among the most promising metallic nanoparticles for various applications due to their reactivity and high surface area to volume ratio [1]. Several physical and chemical methods are used to synthesize iron nanoparticles, such as co-precipitation [2], sol-gel [3], hydrothermal [4], micro-emulsion [5], and sonochemical method [6]. The physical technique includes high energy, pressure, and temperature intake, while the chemical technique requires dangerous and harmful chemicals that lead to environmental contamination [7]. Research is focused tirelessly on achieving a green nanoparticle synthesis process that is easy, efficient, and accurate. Several species serve as safe, environmentally friendly, and green precursors to develop stable and well-defined functionalized nanoparticles. [8]. Biosynthesis of nanoparticles using microorganisms and

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Eco- Friendly Applications in Presence of Biosynthesized Metal Nanoparticles

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Abstract: *Green chemistry has proven to be an effective way to synthesize metal nanoparticles. Nanoparticles are very important for the development of sustainable technology for the future, for humans and the environment. The synthesis of nanoparticles from plants is a green chemical approach that combines nanotechnology and plant biotechnology. The plant extract is used for the bio-reduction of metal ion to produce nanoparticles. Plant metabolites have been shown to play an important role in reducing metal ions to nanoparticles and aiding their subsequent stability. Conventional methods for synthesis of nanoparticles uses harmful chemicals, generate serious attention to the development of ecological processes. Therefore, green synthesis uses extracts from biological sources from plant sources, which are superior to conventional methods. Over the past decade, it has been shown that many biological systems, including plant extract such as Steams, leaves, latex, flower, seeds can convert inorganic metal ion into metal nanoparticles. The many plants and plant parts have been used successfully in the synthesis of several green Metal nanoparticles such as Ag, Cu, Fe, Au, Pd Nanoparticles have been confirmed by various instrumental techniques. NPs are widely used in areas such as magnetic devices, photocatalysts, microelectronic devices, anti-corrosion coatings, biomedical and electrocatalysts. Here we report the biosynthesis of FeNPs and their catalytic activity was tested for degradation kinetics for Malachite green dye (MG).*

Keywords: Nanotechnology, Biosynthesis, Metal Nanoparticles, Characterization, Catalytic applications

I. INTRODUCTION

The environmental impact of colorants is a concern over the last few decades. Industries such as textile, leather, paper, plastic and pharmaceutical produce a great amount of waste water contaminated with dyes in the world [1][2]. Among all synthetic dyes, azo dyes are the largest and most important class of dye for industrial application [3]. The presence of dyes not only highly colors the effluent even at low concentration; it also causes environmental problems due to their toxic and carcinogenic characteristics [4].

Azo dyes are difficultly degraded by conventional treatment methods because of their complex structure and stability. The different treatment methods such as adsorption and flocculation are not efficient because they generate solid waste; this creating another environmental problem requires further treatment [5]. Among various treatment methods, advance oxidation processes (AOR) are considered as one of the most effective methods to degrade azo dyes, which involves the generation of powerful oxidizing species such as sulfate radicals ($SO_4^{\cdot}$) that attack the dye molecule [6], and degrade into harmless products. The advanced oxidation process (AOP) is the name given to several oxidation methods that are based on the generation of strong free radicals for destroying organic pollutants present in anthropogenic sources. In the past years, persulfate such as peroxomonosulphate (PMS, HSO_5^{-}) and peroxodisulfate (PDS, $S_2O_8^{2-}$) have attracted increasing attention because they show more stability than hydrogen peroxide. Furthermore, persulfate and their product (SO_4^{-2}) have the least effect on natural organisms[7]. Additionally, the sulfate radical (E^0 =2.5-3.1v) generated in activated persulfate systems is more selective than the hydroxyl radical (E^0= 1.8-2.7 v) for the degradation of organic compounds with carbon-carbon double bond and aromatic rings[8].Thermal radiation[9]. U.V. light[10] and transition metal[11] are the main technologies for persulfate activation. Moreover, the higher energy needs for thermal, U.V. light radiation and the risk of secondary pollutants compel further application of these methods. Therefore, it is a

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Degradation of Organic Pollutants using Green Synthesized Bimetallic Nanoparticles: A Kinetic Study

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Abstract: *Nanotechnology is an interdisciplinary field that encompasses various disciplines of engineering, biology, physics and chemistry, which deals with nanoscale materials. It is a multiple areas field which covers diverse domains from the synthesis of nanoparticles (NPs) from plants is a green chemical approach that combines nanotechnology and plant biotechnology. Plant metabolites such as sugars, terpenoids, polyphenols and others play an important role in reducing metal ions to nanoparticles. So to complete the goal; a biological approach to filling in the gaps is imminent; For example, green synthesis uses extracts from biological sources from plant sources, which are superior to chemical and biological methods. Water pollution is defined as the existence of toxic bio- logical agents and chemicals that exceed the normal level of water and may pose a detrimental effect to human health and the environment. In the current report, here we synthesized silver, copper bimetallic nanoparticles (BMNPs) via a novel, robust, and inexpensive method using leaf extract of Azadirachta Indica as reducing as well as capping agent. The synthesized Ag-CuNPs was tested for degradation and degradation kinetics using Methyl Orange dye (MO) through an advanced oxidation process (AOP). The obtained kinetic result indicates the rate of degradation of MO induces significantly in presence of small concentration of BMNPs (1×10^{-8} s^{-1}) and UV-Visible spectrum changes are used to analyze the structure of intermediate and end products during the degraded process. This work promises good environmental safetyagainst dye contamination in water based systems.*

Keywords: Nanotechnology, Green Synthesis, Bimetallic Nanoparticles, Degradation.

I. INTRODUCTION

The issue of emissions of harmful organic pollutants being released into the aquatic environment has received a lot of attention in recent years and is now considered one of the most important problems facing scientists. Even Industries that handle pollutants rigorously dealing with harmful materials such as dyes, smelters, tanneries and paper mills release highly waste water into ecosystem, causing pollution. Intense colour that the dyes impart to the aquatic ecosystem is an aesthetic and serious ecological concern [1].Because most dyes are resistant to light, water and oxidizing chemicals, making them difficult to degrade if once they are discharged into the environment. Azo dyes that include one or more azo linkages (-N=N-) are known to be extremely hazardous and carcinogenic [2]. Advanced oxidation techniques have garnered a lot of attention in recent decades as a cutting-edge wastewater treatment technology for removing organic contaminants into less dangerous compounds[3, 4, 5,6].Several reactive oxidative species such as $^{\bullet}OH$,$O_2^{\bullet-}$/$HO_2^{\bullet}$ can be made in AOP and are usually very effective for bleaching colour and even mineralization. Recently, AOPs based on sulphate radicals ($SO_4^{\bullet-}$) have attracted great scientific and technological interest in their environmental applications [7].By activating sulfate-based oxidants (PMS, PDS) with thermal, ultraviolet, microwave, and ultrasonic radiation and/or transition metal ions, sulphate radicals (SR) with a reduction potential of +2.6 V relative to NHE can be generated. As a result, it is envisaged that $SO_4^{\bullet-}$will be an excellent oxidising agent in contaminated water for decomposition of refractory organic molecules [8]. Plant extracts have been established in a number of recent studies to be safe precursors for the production of nanomaterials. Both technologically and scientifically, bimetallic nanoparticles (BMNPs) have gained more interest than monometallic nanoparticles, as BMNPs have better properties in many applications, especially in dye degradation, due to their synergistic

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Research Article

Single-Step Green Synthesis of Iron Nanoparticles in the Aqueous Phase for Catalytic Application in Degradation of Malachite Green

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Abstract: The goal of the research was to devise a simple and environment-friendly approach to synthesize iron nanoparticles (FeNPs) and evaluate the catalytic activity of biosynthesized FeNPs for the degradation of the cationic dye Malachite Green (MG) in the presence of Peroxomonosulphate (PMS). Different instrumental approaches were used to characterize green produced FeNPs, and the results show that the NPs are spherical and 48 nm in size. Increasing the concentrations of nanoparticles ($0.5 \times 10^{-8} - 2.0 \times 10^{-8}$ mol/dm^3), Peroxomonosulphate ($1.0 \times 10^{-4} - 5.0 \times 10^{-4}$ mol/dm^3), dye ($1.0 \times 10^{-5} - 5.0 \times 10^{-5}$ mol/dm^3), pH (5), and high temperature (25-35 °C) enhanced the degradation kinetics of MG. Pseudo-first-order kinetics were used to describe the degradation of MG in the FeNPs/PMS system, and activation parameters were derived. The maximum MG degrading efficiency for the FeNPs/PMS system was 88% in 60 minutes under optimum reaction conditions. The structure of intermediates formed by MG degradation by FeNPs/PMS was determined using UV-vis spectrum analysis. The application of synthesized FeNPs to improve Peroxomonosulphate oxidation potential for MG degradation is a unique, efficient, promising, and eco-friendly technology because it does not require any expensive reagents.

Keywords: green synthesis, iron nanoparticles, Peroxomonosulphate, catalysis, Malachite Green

1. Introduction

FeNPs have recently attracted a lot of attention because of their versatile properties, such as high catalytic activities and higher intrinsic reactivity of their surface sites, which have applications in a variety of fields, including the food industry [1], medical science [2], biosensing [3], catalysis [4], magnetic field-assisted separations [5], and analyses [6]. Shape and size of nanoparticles are important properties in their fabrication, processing, and applications due to their large surface area, electron transport, and electrical conductivity that lead to their high catalytic reactivity [7-8].

For the production of iron-based nanoparticles and the modification of their surface properties, many chemical and physical approaches have been established [9]. In physical and chemical procedures, toxic chemicals are used as reducing agents, organic solvents, or non-biodegradable stabilizing agents, making them potentially harmful to the environment and biological systems. The use of microorganisms and plant extracts in the biosynthesis of FeNPs has been suggested as a viable environmentally benign alternative to chemical and physical approaches [10]. Plant extracts commonly contain flavonoids, proteins, terpenoids, polyphenols, and other biomolecules that act as metal ion reducers

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REVIEW | Egyptian Journal of Agricultural Research | Plant Science

Applications of Metal Nanoparticles in the Agri-Food sector

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ABSTRACT

The application of smart and active packaging, nano sensors, nano pesticides, and nano fertilizers, as well as the rapid development of nanotechnology, has expedited the transformations of traditional food and agriculture industries. Metal nanoparticles have been produced for a variety of applications, including food quality and safety, crop development, and environmental monitoring. The most challenging issues and potential opportunities in the food and agriculture sectors are discussed in this chapter, as well as the most recent trends in nanotechnology from research findings. We focused on the possibilities for biosynthesized and bio-inspired nanoparticles to be used in sustainable development. Nanotechnology is used in agriculture to provide agrochemicals and nutrition, as well as insecticides, nano-scale carriers, smart packing, nanosensors, and nutritional deficiency monitoring. Nanomaterials have a broad range of applications in the food industry, including production, storage, packaging, bioavailability, nutrient conductivity, and food safety. Nanomaterials are likely to become more widely used in agriculture in the future, increasing human and environmental exposure to these materials.

Keywords: Nanotechnology, Nanomaterials, Metal nanoparticles, Applications, Agri-food sector

INTRODUCTION

Nanotechnology is concerned with nanoparticles with at least one dimension of 1 to 100 nanometers. Nanotechnology has a wide range of applications, and synthesizing functional nanomaterials for Agri-food applications from biogenic resources is universally recognized as a sustainable, human- and animal-safe approach. (Sampathkumar and colleagues, 2020). With the advent of equipment to monitor and analyze nanomaterials, they have infiltrated every part of human existence, starting with fabrics (Rivero *et al.*, 2015) and progressing to more serious uses in the agri-food, vehicle, biomedical, and wastewater industries. Nanoparticle application and utilization provide superior qualities not seen at larger size scales, and with the emergence of nanotechnology, this is becoming more ubiquitous (Global Industry Analysts Inc., 2019). With a rapidly growing global population, it is projected that food demand will skyrocket, putting enormous strain on the agri-food business. (Adisa *et al.*, 2019) Nanotechnology has been employed in food processing and preservation, crop productivity, animal feeding, and environmental monitoring since 2003 when it was first introduced into the agricultural and food industries (He *et al.*, 2019).

Biosynthesized nanoparticles offer immense potential in green technology for enhancing the quality of life through applications in the Food and Agriculture fields such as improved food quality and safety, reduced agricultural inputs, and improved nanoscale nutrient absorption from the soil. Agriculture, a smart delivery system for agrochemicals such as fertilizers and pesticides, early detection of diseases in food materials, system integration for food processing, packaging, monitoring, and natural reservoir management all have growth potential. (Ali *et al.*, 2021; Rawat *et al.*, 2018). All of these factors have an impact on the production of food and agricultural-based products, which are key driving factors. This nanomaterial is expected to become an important agenda item in the not-too-distant future, with significant benefits for consumers, producers, farmers, ecosystems, and society (Kaphle *et al.*, 2018; Baker *et al.*, 2017). Scientists and professionals are looking for alternate, environmentally safe, and intensive approaches to control plant diseases (Parthiban *et al.*, 2019). Metal nanoparticles as antimicrobial elements have grown increasingly popular as a substitute for chemical pesticides, thanks to technological advancements that have made their products more cost-effective (Malandrakis *et al.*, 2019; Sahadan *et al.*, 2019). Nanotechnology's new role as a precision agriculture technique should boost crop yields while lowering leaching and emissions (Duhan *et al.*, 2017). Nanoparticles for the controlled release of nutrients, insecticides, fertilizers, and other uses have been appraised as a positive influence of nanotechnology in the agri-food business (Yata *et al.*, 2018; Rawat *et al.*, 2018; Singh *et al.*, 2019).

Metal/Metal oxide nanoparticles offer unique features that make it easier to produce durable and multifunctional materials for a variety of applications. Because of their unique properties that improve adsorption by plants, disease management, and pathogen detection metal nanoparticles have the potential to transform the food and agriculture industries (Abd-Elsalam *et al.*, 2021). Nanoparticles have a unique surface and characteristics due to their unique design. Metal oxide nanoparticles, magnetic nanoparticles, gold nanoparticles, mesoporous silica nanoparticles, quantum dots, and carbon nanomaterials have all been made (Wang *et al.*, 2016 a). Metal oxide nanoparticles, such as copper, gold, silver, aluminum, zinc oxide, and titanium oxide, have gotten a lot of interest in recent studies as prospective alternatives to chemical antimicrobials. Different metal nanoparticles can inactivate a wide variety of Gram-negative and Gram-positive

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Review Article

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Experimental Investigation on Green Synthesis of Bimetallic Nanoparticles by Using Plant Extract: A Review

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Abstract

The use of viable cells in the green production of nanoparticles (NPs) is a promising and unique method in nanotechnology. The purpose of this work is to provide a comprehensive dissection on the use of various extracts of plant parts in the synthesis of bimetallic nanoparticles (BMNPs). In comparison to the physical and chemical methods, green nanotechnology based on biosynthesis has recently attracted a lot of attention. Biosynthesis has been discovered to be more energy-efficient and capable of avoiding the usage of toxic chemicals. Several strategies have recently been employed to boost the productivity of nanoparticles with varying sizes, shapes, and stability. The shape, size, surface charge, and surface area of NPs have all been associated with their mechanical, optical, magnetic, and chemical properties. The impact of various reaction conditions such as pH, plant extract concentration, reaction temperature, and ionic ratio on the synthesis of bimetallic nanoparticles is also discussed to provide a thorough knowledge of how these variables affect the development of bimetallic nanoparticles. Different techniques are used to detect and analyze biosynthesized NPs, such as UV–vis spectroscopy, FT-IR, TEM, SEM, AFM, DLS, XRD, zeta potential studies, and so on. The green method of NP synthesis can be used in a variety of biotechnological sectors.

Keywords

Green synthesis, Bimetallic nanoparticles, Experimental investigation, Characterization techniques

Introduction

Nanoscience is an interdisciplinary field of study that encompasses physics, chemistry, medicine, and materials science. Nanotechnology is sometimes referred to as a general-purpose technology since it will have a significant impact on practically every aspect of society and industry in its advanced form [1]. Norio Taniguchi of Tokyo University of Science coined the term "nanotechnology". The prefix 'Nano' derives from a Greek term that means "dwarf" and refers to objects that are one-billionth in size [2]. The study of structures and molecules in the nanometre range of 1-100 nm is known as nanotechnology [3]. Nanotechnology is a type of technology that is employed in practical applications such as devices. Nanoparticles are classified into many categories based on their size, shape, physical, and chemical characteristics. Metal nanoparticles, carbon nanoparticles, semiconductor nanoparticles, ceramic nanoparticles, polymeric nanoparticles, and lipid-based nanoparticles are just a few of them. Metal nanoparticles have unique properties compared to their bulk metal counterparts, which have a degraded density of energy state and a high surface-to-volume ratio, boosting their

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Biological Synthesis of Metal Nanoparticles: A Review

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Abstract

The utilization of biological cells in the biosynthesis of nanoparticles (NPs) is a promising and novel nanotechnology strategy. The goal of this research is to utilize different plant extracts in the manufacture of metallic nanoparticles (MNPs). Green nanotechnology based on biosynthesis has recently gained a lot of interest in compared to physical and chemical techniques. Biosynthesis has been found to be more energy efficient and capable of eliminating the need of harmful chemicals. Recently, several ways have been used to increase the productivity of nanoparticles of various sizes, shapes, and stability. The form, size, surface charge, and surface area of NPs have all been connected to their mechanical, optical, magnetic, and chemical capabilities. The effects of various reaction conditions on the synthesis of metallic nanoparticles, such as pH, plant extract concentration and, reaction temperature is also investigated in order to gain a thorough understanding of how these factors affect the formation of bimetallic nanoparticles. Biosynthesized NPs are detected and studied using UV–vis spectroscopy, FT-IR, TEM, SEM, AFM, DLS, XRD, zeta potential investigations, and other techniques. The environmentally friendly approach of NP synthesis can be used to a range of biotechnological fields.

Keywords: Biological synthesis, Nanotechnology, Metal nanoparticles, Experimental investigation

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Restoration of Forests: Human Concern

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ABSTRACT

Human depends upon the forest for their day-to-day need. The increasing population has caused the over-exploitation of natural forest resources. Initially, the rate of forest exploitation was balanced by the rate of natural restoration but in the last few centuries due to the population explosion and increased greed of humans, the rate of deforestation is far more than the rate of restoration, which results in the degradation of forests globally. Forest degradation is followed by many consequences including unavailability of forest goods and services, reduction in pollutant absorption by forests which in turn accelerate global warming, climate change, etc. There is an urgent need to conserve what we have left with and restore what we have lost otherwise the outcomes of human greed will be drastic.

Forest restoration is the process of improving the health, productivity, and array of life of a forest and re-establishes the integrity of the ecosystem. There are usually 4 strategies of restoration used according to the type of ecosystem and level of degradation, these are rehabilitation, reconstruction, reclamation, and replacement. Principles involved in restoration are ecological (benefit the environment), economical (economically support the community), and community-based (enhance the community values like integrity, etc.). Restoration varies from site to site, according to the environment and species present in the degraded ecosystem, it is a normal belief that species with larger seed sizes can withstand stress conditions, and tree legumes form the excellent primary introduction subjects in such areas due to their nitrogen-fixing ability. The process of restoration involves multiple steps and for a successful restoration project implementation of each step should be careful. As with any other project, restoration has its challenges like fund availability, exotic species, lack of support and awareness, etc.

Keywords- Restoration, degradation, reference species, monitoring.

I. INTRODUCTION

Human needs are served by forests for an indefinite time in form of food, timber, fibers, etc. and now the awareness of society's dependence on the forest is much stronger than before. Despite all this awareness, the unsustainable use of forest resources led us to the vast degradation of forests. It is estimated that more than 2 billion hectares of forest area are degraded worldwide and require restoration (Lindenmayer, et al., 2012). There are many social factors responsible for degradation including, economic, demographic, technical, and governance (Kanninen, et al., 2007). Although 12% of the total global forest is reserved and expected to be repositories of biodiversity there is no forest in the world left without human disturbance, even our so-called reserve forest is often degraded and threatened by encroachment. Degradation can occur in degrees; for example, land may be classed as marginal, fragile, or degraded (Hudson & Ayala, 2006); or ecosystems as degraded, damaged, or destroyed (Society of Ecological Restoration, 2004). The loss of forests leads us to the loss of ecological services like biodiversity, carbon sequestration, and protective and productive functions. Loss of forest cover also accelerates the process of climate change, global warming, and the greenhouse effect because forests or trees are known to absorb responsible pollutants. So, conservation of what have we left with and restoration of what we have lost should be our utmost priority in the current situation.

II. WHAT IS RESTORATION?

No forest in the world remains completely unaffected by humans, the effects imposed by humans are either direct like overexploitation, invasions, etc. or indirect like impacts of climate change, change in weather patterns, etc. In both scenarios, nature is the one that suffers. WWF defines forest restoration as "the process of improving the health, productivity, and array of life of a forest and is a complex undertaking that can never fully bring back the original forest" (WWF, n.d.). It can also be defined as "actions to re-instate ecological processes, which accelerate recovery of forest structure, ecological functioning and biodiversity levels towards those typical of climax forest" (Elliott, et al., 2014). Forest restoration can also be defined as accelerating the regeneration process by removing and overcoming the hurdles to natural forest regeneration (Lamb, 2011; Holl, 2012).

Generally, the term restoration is being confused with replantation but in reality, restoration is an umbrella covering replantation, conservation of remnant vegetation, biodiversity conservation, and economy; hence IUCN introduced a new concept of FLR i.e., Forest landscape restoration. IUCN defines FLR as an

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Effect of Physico-chemical Properties on Spore Density and Root Colonization of Mycorrhizal Fungi in Industrial Wastelands in Kota, Rajasthan

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Authors' contributions

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

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Original Research Article

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ABSTRACT

This study was conducted in selected industrial waste dump sites in the Kota district of Rajasthan, India to investigate the impact of various edaphic factors on spore density and root colonization of arbuscular mycorrhizal (AM) fungi. The current research shows that AMF root colonization rates were insignificantly negatively correlated with EC, soil temperature, P, K, Fe, Cu, Zn, and Mn but significantly positively correlated with soil pH, soil moisture, and insignificantly positively correlated with N and OC ($P < 0.05$). Spore density of mycorrhiza was insignificant and negatively correlated with soil moisture ($P < 0.05$), EC, soil temperature, P, K, Fe, Cu, Zn, and Mn but significantly positively correlated with soil pH and insignificantly positively correlated with N and OC.
Edaphic factors may influence the root colonization and spore density of mycorrhiza differentially. Except for pH and soil moisture, almost all other parameters have a very insignificant influence on mycorrhizal root colonization and spore density in industrial wastelands.

Keywords: Edaphic factors; root colonization; spore density; industrial wastelands.

1. INTRODUCTION

Mycorrhiza are obligate symbiotic soil fungi that colonize the roots of the majority of plants forming an intricate network in the root cortex, regulating community and ecosystem functioning. An Arbuscular Mycorrhizal Fungi (AMF) is a type of mycorrhiza in which the

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FLORISTIC ANALYSIS OF CERTAIN SELECTED AREAS OF FOREST REGION OF BHAINSRORGARH (RAWATBHATA), RAJASTHAN

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ABSTRACT

This Study is based on assessment of common and dominant species found in transect line survey, transect survey gives the idea about trees, shrubs, herbaceous species, grasses and weed species of that particular transect area where plotting has been done. Results are justifying the presence of 11 tree species, single grass species,5herbaceous species, one shrub species And 4 weed species in the study of given transect lines (I.T 21 and I.T12). Maximum canopy cover found in all the plots never exceeded from 0.5, while herbs and shrubs are not reported in some plots.*Diospyros melanoxylon* Roxb.,*Boswellia serrata* Roxb. Ex. Colebr., *Butea monosperma* (Lam.)Taub. and Anogeissus pendula Edgew., Anogeissus latifolia (Roxb. Ex DC.)Wall. Ex Guill. And perr.)are frequent tree species of the area studied.

Key words: transect line, plotting, abundance, locus map, ecological app etc

INTRODUCTION

Forest ecosystem is consist of its floral and faunal species composition and specifically floral composition contributes the most and prepare the base of food chain and food web. Floristic methods of vegetation description involve the identification of individual species and the assessment of abundance of species. Floristic analysis is important to measure changing pattern of flora, conservation status, and extinction rate of a particular species.

The geological and Ecological varieties zone of the world support various types of floristic composition. This composition of flora of a district distinguishes and ensures plants riches on the systematic way. (Masroor, 2011).The structure, composition, and vegetative functions are most significant ecological attributes of a particular ecosystem, which show variations in response to environmental as well as anthropogenic variables. (Shaheen et al.2012). For forest management decisions, appraisal of flora species and forest structure is crucial for any meaningful conservation work. (Adeyemi, A. A., Ibe, A. E. and Okedinma, F. C., 2015).The rapid loss in floristic diversity and changing pattern of vegetation due to various bioticand abiotic factors have necessitated the qualitative and quantitative assessment of vegetation.(Sharma et.al. 2014). Study of flora contributes in making direct conservation plans for that particular flora and also leads to indirect conservation of relatable fauna which relies on that flora. Knowledge of different aspects like density, abundance, dominance, frequency, canopy cover etc.gives idea about conservation status, extinction rate, habitat and growth requirements along with factors affecting species composition so that we can distinguish the flora on which we needs to put more efforts to conserve.

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Ecomorphological Studies Of Algal Floristics Of Chambal River At Selected Sites Of Rawatbhata Region(Rajasthan)

Dr.Pratima Shrivastava

Associate Professor Botany,J.D.B.Govt.Girls College Kota

ABSTRACT

Wetlands areas that are wet during part or year round because of their location in the landscape. About 93 Indian wetlands are included in Asian wetland directory (Scott,1995)

A study was undertaken to analyze the physico-chemical characteristics of water and its effect on algal floristics of the Chambal Riverine wetland including the effects of the human interference in the vicinity of these water bodies. The present work is a piece of research understanding to know the algal diversity in the area of study and its seasonal and monthly variation in correlation with the physico-chemical parameters.

INTRODUCTION

Phytoplankton like algae are one of the key constituents of aquatic ecosystem thus play an important role in sustainability by their ecological interactions with biotic and abiotic factors which is beneficial to aquatic life in many ways. Along with ecological and economical benefits algal species are also counted as bioindicators, used in bioremediation and production of biofuels and biomass, despite these uses algal potential is still continue to explore. A direct correlation has been found between phytoplankton diversity and the physiochemical properties of water body. Qualitative and quantitative studies about phytoplanktons are used to assess the quality of water. The algal flora represents a critical link in the food chain and its productivity depends on water quality at a given time (Meshram, and Dhande,2000 , Santhanam and Perumal,2003).

Species composition differs with the variations in factors like topography, pollution status of water body, disturbance, variation in biotic and abiotic factors and so on. Current study is undertaken to assess the species richness and evenness in contrast to algal floristics of Chambal river at Rawatbhata.

STUDY AREA

Rawatbhata map with two main sites- jawa and Bhainsrorgarh

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Harmful Algal blooms (HABs) and Its Effects on Aquatic Life in Shakambhari Conservation Reserve of Sikar and Jhunjhunu District, Rajasthan

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INTRODUCTION

2 may 2022, after some time there are formed algal blooms that is known as Harmful algal blooms on a pond surface in shakambari conservation Reserve of Rajasthan. Harmful Algal blooms (HABs) also known as Red Tides. Some algae can toxic that cause algal bloom and can leads to collapse entire aquatic Ecosystem typically as a result of the transfer of toxins through the food web. Sometimes the direct release of toxic compounds can be lethal to marine animals. These phenomena are caused by blooms of microscopic algae. Non-toxic HABs cause damage to ecosystems, fisheries resources, and recreational facilities, often due to the sheer biomass of the accumulated algae. The term "HABs" also applies to non-toxic blooms of algae which can cause major ecological impacts such as the displacement of aquatic life HABoxia alteration and oxygen depletion in bottom waters. The nature of HABS problem has changed over the last some decades. The resulting economic losses, resources affected, and the number of toxins and toxic species are all increased dominant. Human activities are also affected from Harmful algal blooms because Humans have contributed by transporting toxic species by water and by adding large quantities of industrial, agricultural and sewage effluents to waters bodies. In many urbanized coastal regions these inputs have altered the size and composition of the nutrient elements which has created more favorable nutrient environment for HABS species in shakambhari conservation reserve . The study explain the use of fertilizers for agricultural production represents a large source of nutrients in pond waters that promote some HABs. The diversity in HABS species and their impacts presents a significant challenge to those responsible for the management of coastal resources. Furthermore, HABs are complex oceanographic phenomena that require multidisciplinary study.

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Dear Authors

Ankit Kumar Jangid[1*] and Pratima Shrivastava[2]

[1]Research Scholar, [2]Head of Department

Department of Botany, J.D.B. Govt. Girls College, Kota (Raj.)

University of Kota, Kota (Raj.)

You will glad to know that your research work entitled **"Basic Aspects of Hibiscus Plant Tissu Culture and its Commercial" (Manuscript No: IJRB-2022-1308)** is highly appreciated by the concerning reviewe and recommended your article for publication in the forthcoming issue.

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EFFECT OF CADMIUM CHLORIDE ON HAEMATOPOIETIC ORGAN: THYMUS

Dr. Jaishree Daverey*

ABSTRACT

Since there is a constant release of trace elements in unnaturally higher concentrations and often in unusual physio-chemical state, the fear of them being hazardous to human health is now an indisputable truth. Once perpetuated in the environment, metals are not readily detoxified by metabolic activity. As a result, they get accumulated contributing to potential environmental hazard. In the present study, the effect of cadmium chloride on thymus of mice has been in investigated. For the experiment, adult healthy male Swiss albino mice were fed with aqueous solution of $CdCl_2$ prepared by dissolving 20mg of $CdCl_2$ in 1000ml of distilled water, thus giving a concentration of 20ppm and then administered orally in drinking water ad libitum continuously till the end of experiment. Animals were autopsied by cervical dislocation at each post-treatment interval of 1, 2, 4, 7, 10, 14 and 28 days. Thymus was taken out after autopsy, weighed and fixed in Bouin's fluid. Then the tissue was dehydrated and embedded in paraffin wax and transverse sections were cut at 5µ and stained in Harri'shaematoxylin-eosin stain for histopathological studies. After cadmium chloride treatment, thymus showed a significant decline in the organo-somatic index value continuously till day 10, and recovering thereafter. Pathological changes after $CdCl_2$ treatment include necrosis of thymocytes, fibrous tissue proliferation, Pyknosis, Karyolysis, and distortion of Hassal's corpuscles. Recovery started at a much later interval, and was probably due to the binding of intracellular cadmium to metallothionein which protects the tissue against the cadmium toxicity.

Keywords: *Karyolysis, Pyknosis, Metallothionein, Thymocytes, Cadmium Toxicity.*

Introduction

Heavy metals are the most toxic, non-biodegradable intrinsic component of earth's crust. With technological advancement and diversification of industries, combined with specialization in all fields, the volume and complexity of metals is also increasing day by day. Due to their toxicity, heavy metals are well known environmental pollutants persisting in the environment, contaminating the food chains and causing different health hazards[1].Most of the pollution problems which we face today stem from over exploitation of our natural resources and/or heedless disposal of waste material in the environment. Once perpetuated in the environment, metals are not readily detoxified by metabolic activity. As a result, they get accumulated contributing to potential environment hazard. Cadmium as an industrial pollutant has aroused a great concern due to is toxic effects on various body tissues. Cadmium enters animal tissues via inhalation, ingestion, cigarette smoking or occupational exposures. Tobacco smoking is one of the largest single source of cadmium exposure in humans[2]. An important route of exposure is the circulatory system and the blood vessels are considered to be the mainstream organ of cadmium toxicity[3]. In the tissues, concentration of cadmium increases with the increased period of exposure to cadmium[4]. However, their toxicity depends on several factors including the dose, route of exposure, age, gender and also nutritional status of exposed individuals. They disrupt cellular events including growth, proliferation, differentiation, damage-repairing process and apoptosis. Cadmium also causes genomic instability[5]. Therefore, an attempt has been made to assess the effect of cadmium chloride on the thymus of Swiss albino mice.

Material and Methods

In the present study, the effect of cadmium chloride on thymus of mice has been investigated. For the experiment, adult healthy male Swiss albino mice were fed with the aqueous solution of the cadmium chloride. For preparing this solution, 20 mg of cadmium chloride was dissolved in 1000 ml of distilled water. This 20ppm cadmium chloride concentration solution was fed orally *ad libitum* in drinking

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HISTOPATHOLOGICAL CHANGES IN SPLEEN OF MOUSE AFTER RADIATION EXPOSURE

Dr. Jaishree Daverey*

ABSTRACT

Small amount of radioactive material released in the environment from coal and nuclear power plants and also from nuclear explosions are also source of radiation exposure to man. Exposure to high doses of radiation can cause nausea and vomiting within few hours whereas low levels of radiation exposure doesn't cause immediate health effects but can increase cancer risks. Ionizing radiation can cause tissue damage by changing the chemical properties of molecules. It produces free radicals which are chemically very active and damage the genetic material of a living cell. The present study was therefore designed to investigate the histopathological changes in spleen of Swiss albino mice after radiation exposure. For the experiment, adult healthy male Swiss albino mice were irradiated at the dose rate ranging from 0.97 Gy/min. to 1.97 Gy/min. The dose was calculated at mid-point by multiplying dose rate and tissue air ratio. Animals were exposed to sublethal dose of gamma radiation from Co^{60} source. Five animals from each group were autopsied by cervical dislocation at each post-interval of 1, 2, 4, 7, 10, 14, and 28 days. Before autopsy the weight of the animals was also recorded. Five normal mice were also autopsied. After autopsy spleen was taken out, weighed on mono pan electric balance. After recording weight, tissue was fixed in Bouin's fluid for 24 hours for histological studies. Spleen is a radiosensitive tissue and shows reduction in body weight and organ weight ratio reaching minimum till day 10 after radiation exposure. Loss of splenic weight was mainly due to cellular damage, loss of lymphocytes, mitosis and circulatory and humoral disturbances. Most striking histopathological change in the spleen in the present study was the rapid death of lymphocytes. Decrease in the total cell population in the present study may be due to direct killing of small lymphocytes by radiation and due to death of cells in their attempt to divide. During later intervals, the new germinal centers were gradually repopulated and lymphocyte cap begins to surround them. At the end of the experiment, although spleen represented all the normal cell types however, recovery was not complete as far as cell population and cell arrangement was considered.

Keywords: *Radiation, Spleen, Lymphocytes.*

Introduction

Radiation is the natural part of our environment and every living being on the earth is exposed to this natural background ionizing radiation. Small amount of radioactive material released in the environment from coal and nuclear power plants and also from nuclear explosions are also source of radiation exposure to man. Increasing use of ionizing radiation for diagnostic as well as therapeutic purpose has drawn the attention of many radiobiologists towards undesired adverse effects of such exposures. Exposure to high doses of radiation can cause nausea and vomiting within few hours whereas low levels of radiation exposure doesn't cause immediate health effects but can increase cancer risks. The biological effect of these exposures varies with the type, energy and dose of radiation. Ionizing radiation has sufficient energy to liberate electrons from atoms and thereby ionizing them which further damage the genetic material of a living cell, however, our body cells are efficient enough to repair this damage up to certain levels. One of the well-known consequences of radiation exposure is the changes in blood cell counts. Due to the high sensitivity of blood and blood forming organs to ionizing radiation variations in blood cell count is still considered the most sensitive biological evidences of several disorders or diseases. Changes found in the circulating blood are primarily due to the effect on haematopoeitic tissues (1 & 2). Avery small dose of radiation to a blood forming organ causes an arrest of the haematopoeisis with changes in peripheral blood.

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Substrate Evolution to Microstructural and Optoelectrical Properties of Evaporated CdS Thin Films Correlated with Elemental Composition

Anuradha Purohit[1] · Himanshu[1] · S. L. Patel[1] · S. Chander[2,3] · M. S. Dhaka[1]

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Abstract
A typical high-efficiency solar cell device needs the best lattice matching between different constituent layers to mitigate the open-circuit voltage loss. In the present work, the physical properties of CdS thin films are investigated where films with 100 nm thickness were fabricated on the different types of substrates viz. soda–lime glass, indium-doped tin oxide (ITO)- and fluorine-doped tin oxide (FTO)-coated glass substrates, and silicon wafer using electron beam evaporation. The X-ray diffraction patterns confirmed that deposited thin films showed cubic phase and had (111) as predominant orientation where the structural parameters were observed to be varied with nature of substrates. The ohmic behaviour of the CdS films was disclosed by current–voltage characteristics, whereas the scanning electron microscopy micrograph revealed the uniform deposition of the CdS films with the presence of round-shaped grains. The elemental analysis confirmed the CdS films deposition where the Cd/S weight percentage ratio was changed with nature of substrates. The direct energy band gap was observed in the 1.63–2.50 eV range for the films grown on different substrates. The investigated properties of thin CdS layers demonstrated that the selection of substrate (in terms of nature) during device fabrication plays a crucial role.

Keywords CdS thin films · Substrate evolution · E-beam evaporation · Microstructural properties · Optoelectrical properties

1 Introduction

The increasing demand of energy in the era of cutting-edge technology and limited stock of fossil fuels have drawn kind attention for developing cost-effective and high-efficiency solar cell devices [1]. The silicon solar cell technology has been the champion ever since its invention while the thin film-based cost-effective technologies viz. CdTe, CIGS, organic, and perovskites have also come into existence with time which have their own merits and demerits. A solar cell device needs an optical window for ensuring the formation of an asymmetric junction with a corresponding absorber layer in order to derive the generated charge carriers towards the electrodes concerned [2]. For the CIGS and CdTe technologies, the CdS is a well-studied optical window material as it is having the best lattice matching with these absorber materials. Recently, the perovskite solar cell technology has come into existence and received extensive attention owing to low cost, high efficiency, and ease of fabrication procedure [3]. The high power conversion efficiency of the perovskite solar cells is achieved by using a mesoporous TiO_2 electron transport layer (ETL) since the transport layers (viz. electron and hole transport layers) play an important role in the device performance. In such high-efficiency devices, the high-temperature annealing (> 450 °C) condition is required to crystallize the TiO_2 films. However, it has been reported that the light-induced degradation of the solar cells is due to light-induced desorption of the oxygen and light-activated catalytic effect of TiO_2, thus, the perovskite-based devices are facing stability problem. To reduce the degradation and enhance the stability, new materials for ETL have been proposed including ZnO, CdSe, CdS, SnO_2, graphene, etc. [4–7].

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