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SHORT COMMUNICATION

Hepatoprotective and Cytotoxic Activities of Abietic Acid from *Isodon wightii* (Bentham) H. Hara

Madhusudhanan Gogul Ramnath, Ramaraj Thirugnanasampandan, Sadasivam Mathusalini[1], Palathurai Subramanium Mohan[1]

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ABSTRACT

Isodon (*Lamiaceae*) is a known source of bioactive terpenoids. Diterpenoids isolated from *Isodon wightii* (Bentham) H. Hara showed antibacterial, antiacetylcholinesterase, antioxidant, anticancer, and anticarcinogenic activities, etc., Hepatoprotective activity of ABA against lipopolysaccharide (LPS) induced liver injury in BALB/c mice was studied. Cytotoxic activity of ABA was tested against cervical cancer cells (HeLa) using MTT assay followed by propidium iodide (PI) staining to identify apoptosis. Histopathological analysis revealed that 1.5 µg/mL LPS induced liver damage was attenuated by ABA in a dose dependent manner. ABA showed cytotoxicity with IC_{50} value of 176.28 ± 0.02 µg/mL and PI staining of treated cells showed apoptosis. This study proves that ABA would be a promising natural compound for herbal drug preparation.

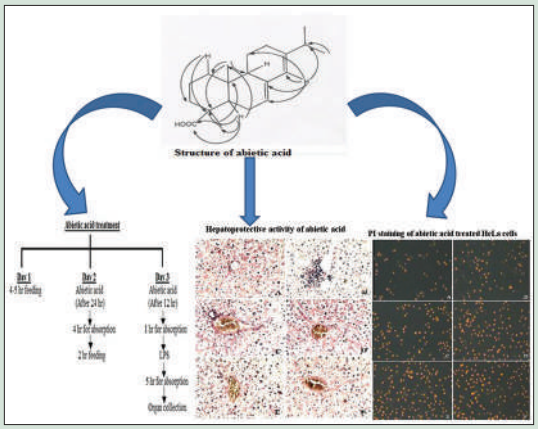
Key words: Abietic acid, apoptosis, BALB/c mice, HeLa, lipopolysaccharide

SUMMARY

- In the present study, abietic acid isolated from *I.wightii* had potent hepatoprotective effect on LPS induced liver damage in BALB/c mice. Abietic acid also showed cytotoxic activity on HeLa cells followed by apoptosis induction confirmed by PI staining.

Abbreviation Used:

ABA: Abietic acid; LPS: Lipopolysacharride; PBS: Phosphate buffer saline; PI: Propidium iodide; NMR: Nuclear magnetic resonance; COSY: Correlation spectroscopy; HSQC: Heteronuclear single quantum correlation; HMBC: Heteronuclear multi - bond correlation; MTT: 3-(4,5-dimethylthiazol-2yl)-2,5-diphenyltetrazolium bromide



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INTRODUCTION

Abietanes are known diterpenoids mostly isolated from terrestrial plants and it possess aromatic c-ring and different degree of oxygenation at several groups. The genus *Isodon* (*Plectranthus*) belongs to *Lamiaceae* reported to have a number of abietane diterpenoids with a wide range of biological activities.[1-4] In our previous work, we reported free radical scavenging, antibacterial and antiacetylcholinesterase activities of abietane diterpenoid, abietic acid (ABA) from *Isodon wightii*.[5] Therefore, the present study was aimed to test hepatoprotective and cytotoxic potentials of ABA.

MATERIALS AND METHODS

Plant material

The leaves of *I. wightii* (Bentham) H. Hara, a perennial herb, were collected from Coonoor, Tamil Nadu, India, during January 2014. An authentication sample was identified by Botanical Survey of India (BSI) and voucher specimen (BSI/SC/5/23/06–07-Tech. 881) has been deposited in the herbarium of BSI, Southern Circle, Coimbatore, Tamil Nadu, India.

Extraction and isolation

The dried and powdered leaves (715 g) were extracted with petroleum ether in Soxhlet apparatus at room temperature to yield crude extract (15 g). After solvent evaporation in vacuo at 45°C, the extract was subjected to silica gel column chromatography (60–120 mesh size) and eluted with petroleum ether (100%). Further, the fractions were collected, combined, and monitored by thin layer chromatography coated silica gel G-60. Yellowish amorphous powder (82 mg) was obtained at 70th h. Based on the spectral studies (IR, ^{1}H NMR, ^{13}C NMR, COSY, HSQC, and HMBC), the compound structure was predicted.[5]

Animals and experimental design

The animal care and handling were done according to the regulations of Council Directive CPCSEA no: 659/02/2 about Good Laboratory Practice on animal experimentation. Adult BALB/c mice were purchased from KMCH Hospital, maintained in micro isolators with autoclaved bedding and cages, fed with autoclaved food pellets and deionized water.

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GENOMICS, TRANSCRIPTOMICS, PROTEOMICS

Nonribosomal peptide synthetase with a unique iterative-alternative-optional mechanism catalyzes amonabactin synthesis in *Aeromonas*

Qassim Esmaeel[1] · **Mickael Chevalier**[1] · **Gabrielle Chataigné**[1] · **Rathinasamy Subashkumar**[1] · **Philippe Jacques**[1,2] · **Valérie Leclère**[1,3]

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Abstract Based on the exploration of data generated by genome sequencing, a bioinformatics approach has been chosen to identify the biosynthetic pathway of the siderophores produced by *Aeromonas* species. The amonabactins, considered as a virulence factor, represent a family of four variants of catechol peptidic siderophores containing Dhb, Lys, Gly, and an aromatic residue either Trp or Phe in a D-configuration. The synthesis operon is constituted of seven genes named *amoCEBFAGH* and is iron-regulated. The cluster includes genes encoding proteins involved in the synthesis and incorporation of the Dhb monomer, and genes encoding specific nonribosomal peptide synthetases, which are responsible for the building of the peptidic moiety. The amonabactin assembly line displays a still so far not described atypical mode of synthesis that is iterative, alternative, and optional. A disruption mutant in the adenylation domain of AmoG was unable to synthesize any amonabactin and to grow in iron stress conditions while a deletion of *amoH* resulted in the production of only two over the four forms. The *amo* cluster is widespread among most of the *Aeromonas* species, only few species produces the enterobactin siderophore.

Keywords *Aeromonas* · Amonabactin · Nonribosomal peptide synthetase · Siderophore · NRPS

Electronic supplementary material The online version of this article (doi:10.1007/s00253-016-7773-4) contains supplementary material, which is available to authorized users.

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Introduction

Aeromonas are Gram-negative, motile, facultative anaerobic, nonspore-forming bacteria. They are among the most common bacteria in aquatic environments through the world (Janda and Abbott 2010). *Aeromonas hydrophila* strains are known to cause disease in both fish and human beings (Janda and Abbott 2010), whereas *Aeromonas salmonicida* is a specific pathogen of salmonid fish (Austin and Austin 2007; Toranzo et al. 2005) and is capable of causing disease in a wide variety of nonsalmonid fish (Beaz-Hidalgo and Figueras 2013; Coscelli et al. 2014; Farto et al. 2011). Pathogenicity and virulence of *A. hydrophila* depend on the ability to produce factors such as toxins, invasion or adhesion compounds, S-layers, flagella, high-affinity iron chelators named siderophores, and indirectly ferric uptake regulator (Fur) as it regulates the production of some virulence factors (Daskalov 2006; Merino et al. 1995; Seshadri et al. 2006; Yu et al. 2005). Many bacterial siderophores are polypeptide derivatives that are nonribosomally synthesized by assembly lines constituted of nonribosomal peptides synthetases (NRPSs), while others that are not polypeptides are assembled by different enzymes designated as NRPS independent siderophores (NIS) (Challis 2005). NRPS and NIS genes are generally found in operons or clusters within the genome. NRPSs are themselves organized in sets of domains such as condensation, adenylation, thiolation, and thioesterase domains, sometimes accompanied by modifying domains as

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Synthesis, characterization and antibacterial activity of hybrid chitosan-cerium oxide nanoparticles: As a bionanomaterials

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ABSTRACT

The hybrid chitosan cerium oxide nanoparticles were prepared for the first time by green chemistry approach using plant leaf extract. The intense peak observed around 292 nm in the UV–vis spectrum indicate the formation of cerium oxide nanoparticles. The XRD pattern revealed that the hybrid chitosan-cerium oxide nanoparticles have a polycrystalline structure with cubic fluorite phase. The FTIR spectrum of prepared samples showed the formation of Ce-O bonds and chitosan main chains —C—O—C— and C—O. The FESEM image of hybrid chitosan cerium oxide nanoparticles revealed that the particles are spherical in shape with grains size varying from 23.12 nm to 89.91 nm. EDAX analysis confirmed the presence of Ce, O, C and N elements in the prepared sample. TEM images showed that the prepared hybrid chitosan-cerium oxide nanoparticles are predominantly uniform in size and most of the particles are spherical in shape with less agglomeration and the particles size varies from 3.61 nm to 24.40 nm. The prepared chitosan cerium oxide nanoparticles of 50 μL concentration showed good antibacterial properties against test pathogens, which was confirmed by the FESEM analysis. The prepared small particle size facilitate that these hybrid Chi—CO_2 NPs could effectively be used in biomedical applications.

1. Introduction

Nanoparticles and polymer coated nanoparticles are being increasingly used in applications like solar cells, optoelectronic devices, sensors, biological and environmental monitors, etc [1–4]. The main methods of nanoparticles preparation are physical [5,6] and chemical [7,8] approaches that are often costly and potentially harmful to the environment. Hence, an alternative green chemistry approach was used to synthesis nanoparticles [9,10]. This approach has been actively pursued in recent years due to inexpensive, efficient and environmentally safe method for preparation of nanoparticles with specified properties [11–13]. Recently, researchers are actively involved in the synthesis of cerium oxide nanoparticles through green chemistry approach, mainly because of its application in pharmacological treatment [14–16]. The increasing importance of polymer coated nanomaterials from biological polymer sources has put chitosan in the spotlight, particularly due to their biological properties, which has been utilized in many engineering and biological field [17,18]. Chitosan is a biopolymer found to have distinguished properties like biodegradability and biocompatibility [19]. A detail review on nanostructured chitosan and their applications was reported by Pavinatto et al. [20]. It is also reported that chitosan coated iron oxide nanoparticles has superior antibacterial property against *Pseudomonas aeruginosa* as compared to pure chitosan and iron oxide nanoparticles [20,21]. The newly developed silver ion coated and chitosan coated mesoporous silica nanoparticles are found to have good antibacterial properties. The shape and surface of nanoparticles contribute positively towards killing bacteria such as *Escherichia coli* and least effective against *Vibrio cholera* [22]. Bovine serum albumin and chitosan coated silver nanoparticles showed good antibacterial activity against seven oral and nonoral bacterial strains are associated with the size and shape of the biomaterials [23].

Design surface with antibacterial nanomaterials are rapidly emerging as a primary component of the global mitigation strat-

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EVALUATION OF *C. ALBICANS* INDUCED WOUND HEALING ACTIVITY OF METHANOLIC LEAF EXTRACT OF *ANDROGRAPHIS PANICULATA*

Pattiyappan Sagadevan[1*], Suresh Natarajan[2], Ranjithkumar Rajamani[1], Chandar Shekar Bellan[1], Rathishkumar Sivaraman[1]

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ABSTRACT

To establish the wound healing activity of methanolic extract of *A. paniculata* two model were performed to evaluate the wound healing i.e., incision and excision model. In incision model the parameter which was carried out was breaking strength of wound skin. In excision model percentage wound concentration and period of epithelization was established for the extract. Reference stand drug was Framycetin sulphate cream ointment for comparison with other group. From the observation in both the model. Methanolic extract was found to have greater wound healing activity it terms of breaking strength in incision model and percentage wound concentration, period of epithelization was highest in excision model compared with group. In conclusion methanolic extract of *A. paniculata* better healing ablity.

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18-7-16
Coimbatore

From

Jansi. A
Ph.D Research scholar
Department of Zoology
Nirmala college for women
Coimbatore - 18

To

The Head of the Department
Department of Biotechnology
Kongu Nadu College of Arts and Science
Coimbatore

Respected Sir

I am doing Ph.D zoology (Aquaculture) in Nirmala college. My specialisation topic is Fish Immunology I would like to do the fish immune function tests from the blood of fish. I request you to permit me and support me to do the same.

Thanking You

Yours Faithfully
Jansi. A

Dr. Rosaline Mary 18.7.16.
Signature of the Guide

Dr. (Mrs.) ROSALINE MARY
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Biomolecular interaction and *in vitro* cytotoxicity of ruthenium complexes containing heterocyclic hydrazone. Is methanol a non-innocent solvent to influence the oxidation state of the metal and ligation of hydrazone?

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ABSTRACT

Two new stable ruthenium complexes, $[Ru^{III}(HL)Cl_2(PPh_3)_2]$ (**1**) and $[Ru^{II}(L)(CO)(PPh_3)_2]$ (**2**), were synthesized from the reaction of $[Ru^{III}Cl_3(PPh_3)_3]$ with thiophene-2-carboxylic acid (2-hydroxyl-benzylidene)-hydrazide (**H_2L**) in chloroform–methanol. Surprisingly, the same reaction performed by adding KOH to the reaction medium resulted in the exclusive formation of the bivalent ruthenium carbonyl complex **2**. Both complexes **1** and **2** were characterized by elemental analysis, EPR/NMR and single crystal X-ray diffraction study. From the DNA binding and quenching experiments, an intercalative mode of binding with DNA was identified. The DNA cleavage activity of the complexes, monitored using gel electrophoresis, showed significant damage of the plasmid DNA. Bovine serum albumin (BSA) binding capabilities analysed using absorption and emission spectroscopic methods showed a strong binding interaction of complexes **1** and **2** with BSA. The *in vitro* cytotoxicity studied against human breast cancer cell models (MCF-7 and MDAMB-453) showed that complex **1** possessed activity comparable to that of the standard positive reference cisplatin. The IC_{50} concentration of complexes treated with cancer cell models exhibited a significant increase in lactate dehydrogenase release and nitrite content in the culture medium. Overall, the trivalent ruthenium hydrazone complex **1** exhibited better activity towards biomolecules and cancer cells than complex **2**.

1. Introduction

Discovery of the anticancer metallodrug cisplatin and its covalent binding nature with DNA, but with serious limitations, provoked the search for new non-covalently binding other metal based pharmaceuticals with less toxicity. Among the non-covalent interactions, the intercalative binding of metallodrugs is considered to be strongly mutagenic and chemotherapeutic. Intercalation distorts the helical shape of DNA and causes the inhibition of replication enzymes [1]. Many metal complexes show significant *in vitro* anticancer activity, which is generally considered as being due to DNA binding. The probing of such biomolecular interactions of drugs, their cell permeability and cytotoxicity would afford valuable insight for the design of new biomolecular imaging probes [2–5].

In designing new metallodrugs, plentiful devotion has been focused on ruthenium based compounds because of their favourable *in vitro* and *in vivo* pharmacological profiles in different models, including platinum-resistant cell lines [6]. Interaction of ruthenium complexes with DNA would differ from that of platinum based drugs due to the different geometries they adopt [7]. Some ruthenium compounds bind more strongly, forming adducts that are more resistant to cell repair mechanisms [8,9]. Ruthenium drugs induce cancer cell death through interaction with human serum proteins and/or with mitochondria [10,11].

Ru(III) prodrugs in a hypoxic environment (characteristic of tumours) are reduced by various reductant molecules to Ru(II) active species which then attack the target cells. This "activation by reduction" is supported by many mechanistic studies [12,13].

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Growth, mechanism and properties of TiO_2 nanorods embedded nanopillar: Evidence of lattice orientation effect

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ABSTRACT

Worldwide researchers and scientists are taking efforts to develop novel structured highly crystallized nanomaterials to fabricate devices for various applications. In this report, we demonstrate the synthesis of self-originated single phase Titanium dioxide (TiO_2) nanorods embedded nanopillar on nanotent grain under simple hydrothermal method. Synthesized TiO_2 nanopillars are in single crystalline tetragonal crystal structure with rutile phase. Understanding the fundamental crystal nucleation and growth mechanism is more critical in the semiconducting oxide thin films with controlled size and morphological features. The growth mechanism of TiO_2 nanopillars on the surface of Fluorine doped Tin Oxide (FTO) substrate is explained in support of FESEM and AFM images. The optical emission properties are studied with photoluminescence spectroscopy.

1. Introduction

During past few decades, Titanium dioxide (TiO_2) is given considerable attention from researchers because of its broad applications in photovoltaic devices [1–3], sensors [4] and photocatalysis [5,6]. In photovoltaic devices, one-dimensional (1D) TiO_2 nanostructures such as nanowire, nanorod and nanotube are playing an insuperable role. TiO_2 1D nanostructures show significant efficiency than other dimensional TiO_2 nanostructures in dye-sensitized solar cells (DSSCs) [7,8] and photoelectrochemical cells [9] because those are offering a direct electric pathway for photo-generated electrons [10]. The single crystalline nature and phase of the materials are enhancing the electron transport rate [11]. In DSSCs, rutile TiO_2 has many advantages comparable to anatase phase; it includes a higher refractive index and better chemical stability [12,13]. From these reasons, it is imperative to identify the effect of novel structured 1D TiO_2 to enhance the photovoltaic efficiency. Conversely, the synthesis of single phase 1D TiO_2 nanostructure on a substrate remains a significant challenge [14]. Currently, many methods are available to synthesize 1D TiO_2 nanostructures. The solution-based approaches are more suitable for inexpensive mass production than vapour-phase methods. In those traditional solution-based deposition methods, a hydrothermal method is quite attractive, since it applies to the different type of substrates and it suppresses the fatal crystallographic

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4

Diversity and Distribution of Earthworms in Relation to Altitude and Soil Factors of Kollam District, Kerala State, India

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ABSTRACT

Kollam District, Kerala State, India, is bordered on the west by the Lakshadweep (Arabian) Sea, and on the east by the hills of western ghats. The district was broadly divided into three regions of coastal zone, midland and highland. Earthworms and soil were sampled from 38 stations located within these regions during February-April, 2013. There was a difference on the major soils of three regions. A significant difference existed between the three regions on mean values of soil temperature, moisture, sand, silt and clay. Positive correlations were observed between the density of earthworms and sand and calcium, and an inverse one between density and soil temperature and clay. The pH of the soil was near neutral to acidic, and majority of stations had sandy clay loam soils. A total of six families and twelve species of earthworms were sampled from different stations. The earthworms were either epigeics, endogeics or anecies, and two species of earthworms were exotic and ten natives. Their diversity and distribution in relation to soil and geographic factors were described. The Shannon diversity

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Research Article

STATUS AND DISTRIBUTION OF WILD GAUR (BOS GAURUS) IN NILGIRI NORTH DIVISION, NILGIRIS, INDIA

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ABSTRACT

The Gaur *(Bos gaurus)* is vulnerable category on Red list and Schedule I species as per Wildlife Protection Act (1972) in India, distribution extends eastward from India to the indo Chinese region. Gaur population status and distribution was studied In Nilgiri North Division (NND) especially in Coonoor Range from February 2014 to March 2015.Secondary sources i.e. Gaur conflict data's collected from forest department since 2011 to 2014. The study carried out in 10 villages in and around Coonoor Range.i.e. BIkkatty-Ammakal Village, Kokkalada Village, Chambray estate, Mellur Village, Kolakombai Estate, Thoormattam estate, Katteri Village, Gregmore Estate, Trooke Estate, Archadin Estate etc. From the present study 73 Direct sighting consists of Adult females Gaurs 37% followed by 20% adult males,15% sub adult female,11% sub adult male,10% juveniles and 7% calf's were recorded during the study period. 14 Black bulls Gaurs (+5 years) were solitary males consisting of 4.4%. Group size of Gaur consist of Medium mixed herd (n=38), mean group size 6.50 followed by Small herd mixed (n=23), group size 2.91 and Big herd (n=22), 8.14 were recorded. Regarding Male herd, Single individual consist of 22% and More than two herds together 72% was recorded. This area I consist of 38%, Area II 40% of gaurs and area III includes 22% of gaurs occupying this area. As a result of habitat thrashing, absence of predation and easy accessibility of food, climate change influence of Gaur interested in countryside villages.

INTRODUCTION

India has the largest population of gaur in the world and with its large network of protected areas (PA) is poised to play a significant role in the conservation of this large bovid. (Wilson and Reader, 1993). The gaur is listed as vulnerable species according to the 2002 international union for conservation of nature and natural resources (IUCN) Red Data list. The true home of the gaur is the chain of undulating hills dominated by dry deciduous forests in western Ghats (Krishnan, 1972). It is distributed in south and south-east Asia, from India to peninsular Malaysia, occurring in India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, China, Laos, Cambodia, Vietnam and Malaysia (Corbet & Hill, 1992). A bull Gaur may attain 6 foot 4 inches (195 cm) at the shoulder and may weigh up to 900 kg (Prater, 1980). Within India the western ghats are a major stronghold for gaur species In western Ghats including Nilgiris, Anamalais and cardamom hills and adjacent plateau. On the eastern sides its is found in the palani and dindugal hills, shandamangalam range, vellore border of Karnataka. The important gaur areas are Mudumalai and Anamalais in TamilNadu, Periyar and Parambikulam in Kerala, Bandipur, Nagarhole and Bhadra in Karnataka, Molem in Goa and Radhanagari in Maharastra. The review of literature clearly indicated lack of information of many aspects of the ecology of gaur (*Bos gaurus)* in Nilgiris. Hence the present study was conducted in Nilgiris with the primary objectives includes Gaur status countryside villages and their conflict issues, with special reference to Coonoor range, Nilgiri North Division, India.

Study Area

The Nilgiri Hills, located between 11010'-11030'N & 76025'-77000'E, are an off-shoot of the Western Ghats where the Eastern Ghats terminate. Human population consists of 37,983 covering of 88.7 Square kilometer are rural areas The geographical area of the Nilgiri District is 2,452km2, and the area covered by this report including forests in Kerala and the Coimbatore District in Tamil Nadu, is 3,000km2

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Removal of Acid Violet 19 Dye from Aqueous Solution by Adsorption onto Activated Charcoal and Polyaniline Coated Charcoal

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Abstarct: In this study, activated charcoal and polyaniline coated charcoal were used as adsorbents for the investigation of the adsorption isotherms of the Acid Violet 19 dye in aqueous solutions at various dye concentrations, contact time, pH and adsorbent dose. The results showed that the percentage removal of dye by Charcoal and Polyaniline coated charcoal increases with increase in agitation time and adsorbent dose. The extent of removal of dyes decreases with increase in initial concentration of dyes and acidic pH was favorable for the adsorption of this dye. The experimental data isotherms were analyzed using the Langmuir, Freundlich equations.

Keywords: Charcoal, Polyaniline coated charcoal, adsorption, dye concentration, pH, Langmuir and Freundlich isotherms.

I. INTRODUCTION

The pollution caused by industrial wastewater has become a common problem for most of the countries. Dyes are synthetic aromatic compounds which are embodied with various functional groups. They are widely used in textile, leather, paper, plastic, and other industries. Some of these dyes may degrade to produce carcinogens and toxic products [1]. Dyes can cause allergic dermatitis, skin irritation, cancer and mutation [2]. Textile industries consume the large volumes of water and chemicals for wet processing of textiles. The chemical reagents used are very diverse in chemical composition, ranging from inorganic compounds to polymers and organic products [3]. The presence of very low concentrations of dyes in effluent is highly visible and undesirable [4]. Commercially available activated carbons (AC) are usually derived from natural materials such as wood, coconut shell, lignite or coal, but almost any carbonaceous material may be used as precursor for the preparation of carbon adsorbents [5,6,7]. Because of its availability and cheapness, coal is the most commonly used precursor for activated charcoal production and can be used as adsorbents for dye removal [8, 9].

In the present work, adsorption of Acid Violet 19 dye onto charcoal and Polyaniline coated charcoal has been investigated and the obtained experimental data were analyzed using adsoption isotherms namely, Langmuir and Freundlich. The effect of initial dye concentration, adsorbent dose and effect of pH has been studied.

II. EXPERIMENTAL METHODS

A. Materials

i. Aniline (Merck) was doubly distilled 182-185 ºC (boiling point 184 ºC)
ii. Ammonium per di sulpate (sd fine chemicals) AR grade was used as received.
iii. Solvents DMSO, NMP, DMF, Acetone (Merck, AR grade), Formic acid was used as received.
iv. Activated charcoal and polyaniline coated charcoal
v. Acid violet 19 dye (Merck) was purchased and used as such.

B. Synthesis of Adsorbents

i) Chemical synthesis of Polyaniline (PANI)

Polyaniline powder was synthesized according to a procedure reported in literature after some modifications [10-12]. In a typical procedure, 5.0 g (0.054 moles) freshly distilled aniline dissolved in 250 ml of HCl 1M. The mixture was cooled to below 5oC by using an ice bath. 250 ml of a pre-cooled 0.3 M (NH4) 2S2O8 solution in HCl (1M) was slowly added under vigorous stirring to monomer solution over a period of 30 minutes. Since the reaction is highly exothermic (ΔH = -372 KJ mol-1), the reaction vessel was placed in an ice bath cooling system during the addition of the oxidant. After complete addition of the oxidant, the reaction mixture was left stirring for about two hours at low temperature (0-5o C) and left unstirred overnight at room temperature. The precipitated polymer (dark green powder) was filtered and washed with distilled water and dilute HCl solution until the washing liquid was colorless. In order to remove the oligomers and other non-polymeric impurities the precipitate was washed thoroughly with methanol and finally with distilled water. The polymer was dried at 50-60oC in an oven, powdered in a mortar and stored for processing. Based on the weight of the monomer used and the product polymer obtained, the polymerization yield was found about 80%.

ii) Synthesis of charcoal

Raw sawdust was completely immersed in 2N NaOH aqueous solution for a period of 8 h. Thereafter, it was washed with several times with distilled water to remove the lignine content and excess of NaOH and then dried. It was observed that a dark red solution was generated during this treatment , which indicate the removal of lignine from the adsorbent material. Sawdust was repeatedly washed with double distilled water till no red colouration was observed. It was then immersed in 0.2N sulphuric acid for a period of 8 h to remove traces of alkalinity and other impurities. The acid treated saw dust material was thoroughly washed with double distilled water to remove excess of sulphuric acid and other colouring materials till the wash water was colourless. After this, the treated sawdust adsorbent material was dried in the sunlight and stored for use as an adsorbent [13].

iii) Synthesis of Polyaniline coated charcoal

In order to make Polyaniline soluble in formic acid for coating and composite formation, the polymer was treated with 0.5M NaOH solution for 2 hours. Then it was washed with distilled water and dried in an oven at 60 C.0.50g of base treated Polyaniline, emeraldine base (EB) was dissolved in 50 ml of

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Co(II) complex of 2-amino-6-methylbenzothiazole: Synthesis, structure and biological evaluation

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Cobalt(II) complex of 2-amino-6-methylbenzothiazole has been synthesized and characterized by various physico-chemical methods. The ligand 2-amino-6-methylbenzothiazole acts as monodentate, neutral ligand with N as the donor site. The molecular structure of the title complex has been determined by single crystal X-ray diffraction studies. The Co(II) complex shows significant antioxidant activity against DPPH radical. The complex shows cytotoxicity with a IC_{50} value of 14.12 μ*M* against MCF-7 cell line. In addition, the complex shows good antimicrobial and anti-tuberculosis activities against various microbes and mycobacterium tuberculosis respectively. DNA binding of the title complex has been investigated by absorption spectroscopic technique, which reveals that the complex acts as minor groove binder. These results have been validated by molecular docking studies.

Keywords: Co-ordination chemistry, Cobalt, Benzothiazole, Magnetic properties, Antituberculosis activity, Molecular docking

Benzothiazoles are bicyclic ring systems with a thiazole ring fused with benzene. A number of 2-aminobenzothiazoles have been studied as central muscle relaxants and found to interfere with glutamate neurotransmission in biochemical experiments[1]. Benzothiazole derivatives have been studied and found to have various chemical and biological activities like antiviral[2], anticancer[3, 4], antibacterial, antimicrobial and fungicidal[5,6]. Some of the novel benzothiazole sulphonamides act as potent inhibitors of HIV-1-protease[7]. Benzothiazole derivatives are also reported as anti-leishmanial[8], anti-inflammatory[9], anticonvulsant[10], anti-diabetic[11], diuretic[12] and anti-proliferative[13] agents. 2-Aryl substituted benzothiazoles show antitumor activity while condensed pyrimidobenzothiazoles and benzothiazolo quinazolines show antiviral activity. Substituted 6-nitro and 6-aminobenzothiazoles have been reported to possess antimicrobial activity.

El-Shazly*et al.*[14] studied the reactions of 2-mercaptobenzothiazole with Cu(II), Ni(II) and Co(II) and the reaction with Co(II) produced a five coordinated polymeric type compound. Chaurasia *et al.*[15] studied complexes of the type, CoL_2X_2 where L = 6-methyl-2-aminobenzothiazole; X = -I,-NCS and –OAc. Bhagat *et al.*[16] synthesized 4-bromo-2-hydrazino-6-methylbenzothiazole and investigated its chelating tendency towards Fe^{2+}, Co^{2+}, Ni^{2+} at different *p*H. Maji *et al.*[17] synthesized and characterized chlorobis(acetonitrile)triphenylphosphino-2-(2-pyridyl)benzothiazole-N,N-ruthenium(II)chloride where in the ligand acts as N,N-didentate manner and Ru(II) ion is present in an N_4PCl co-ordination environment while PPh_3 and Cl are *trans* to each other. Chen *et al.*[18] synthesized and characterized new co-ordination polymers of Cd(II), Zn(II), Ni(II) metal ions with 2-amino-6-methylbenzothiazole and 5-nitroisophthalate as ligands. The structural analysis suggests that 2-amino-6-methylbenzothiazole acted as monodentate ligand and the carboxylate groups in 5-nitroisophthalate as monodentate and chelating bidentate. Abundant hydrogen bond interactions drive the formation of packing structure of the complexes. These complexes also display strong emission peaks from intraligand charge transfer. Joseph *et al.*[19] synthesized and characterized copper complexes of

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A NOVEL ENCRYPTION ALGORITHM FOR END TO END SECURED FIBER OPTIC COMMUNICATION

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Abstract: In the last decades, fiber optic communication becomes very popular because of its several advantages over conventional wired communication. Fiber optic communication provides the download speed of 100Mb/s with less delay and high uploading speed. Though fiber optic transmits large amount of data quickly over long distance, it is vulnerable to various security attacks. The fiber optic cable can be easily tapped. To provide end to end secure fiber optic communication, a novel encryption algorithm based on Advanced Encryption Standard (AES) is employed. It uses variable key cipher in which a sequence of sub keys of AES is created from the original key with feedback from prior cipher block and each sub block is encrypted using numerous sub keys. The proposed encryption algorithm is simulated and the performance is analyzed. The simulation results shows that the proposed method achieves high end to end security in fiber optic communication.

Keywords: Advanced Encryption Standard, Cryptography, Encryption, Fiber optic communication

1. Introduction

Fiber optic communication is a part of optical communication which transmits data using fiber optic cables. It transmits gigabits or more than gigabytes of data over long distances [1]. It is widely employed in various fields like military, government, personal use, Internet communication, etc. It carries various kinds of information like hospital images, audio, videos, patient records, bank account details, military or government confidential details and so on. Fiber optic communication has several advantages over conventional wired communication include low attenuation, high bandwidth, compact, less weight and zero interference [2]. The possible bandwidth of fiber optic cable is not completely used but still it transmits data in Gb/s speed. Fiber optic cables transmit data on an average of 100 kilometer while copper cable transmits upto 2 kilometer and the signal needs regeneration or boosting.

Fiber optic cable is a thin strand of glass or plastic which is used to transmit data from one place to other. As the cable is based on light, the data can be transmitted at the speed of light so that massive amount of data can be communicated in shorter time duration. The light signals use different colors of light as carriers of data. Every individual color of light holds several hues. A strand of fiber transmits equal amount of information as 1000 copper cable transmits. A fiber optic cable is shown in Figure. 1 which consists of five parts namely core, cladding, buffer coating, strength membrane and an outer jacket. The core is the center part of the cable which holds the thin strands of plastic or glass. It is responsible for carrying the data from one end to other end. The cable size is decided by the diameter of the core. The core is surrounded by the cladding which traps the light and reflects the light back to the core. The buffer coating is used to shield the cable from damages and environmental conditions.

During installation, the strength membrane protects the cable from excessive tension. The outer jacket is mostly orange in color which is used to defend the cable against contaminants. Since fiber optics is not metallic, it is not affected by interference like electromagnetic interference (EMI), radio frequency (RF) or lightning. It has no problems in grounding, shorting, or crosstalk of cables. Fiber optic cable transmits data using the principle of total internal reflection. As the fiber cables are light based, the data will be transmitted at the speed of light.

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The Aftermath of Relocation

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There is always a craze among Indians to go abroad but India is always their mother country, though it has its own draw backs. They are always treated as foreigners in an alien land who have gone there for the sake of living. Indians settled abroad undergo diverse problems like dislocation, quest for identity, lack of assimilation, racism and problems related to language, food adjustment, cultural differences etc. Women have an inborn tendency that if they go to the west they can always enjoy independence and freedom which are deprived to them in their mother country.

Indian-American authors like Divakaruni, have done justice through their novels by bringing forth the draw backs that are awaiting the emigrants in the newly found culture. Life in a foreign country is not as simple as what people have judged and framed in their mind. Divakaruni as a diasporic novelist at some point or the other would have certainly experienced all these identity issues which enabled her to portray all these characteristic features through her protagonists in her novels.

In order to represent the patriarchal society and also her longing to preserve the nostalgic memory of homeland enabled Divakaruni to start writing. She also heads an NGO organisation for women called MAITRI that renders counselling and shelter to battered and assaulted women. In order to express the experiences as well as internal struggles, emigrant authors often turn to narratives as an arrangement in which issues can be explored.

In *The Mistress of Spices* Divakaruni explores the plot within her novels in such a way that it becomes an amalgamation of both the eastern and the western cultures together which leads the protagonists to a state of identity dislocation. Laura Merlin in a review in *World Literature Today* says: "In this exuberant first novel, the award winning writer Divakaruni builds an enchanted story upon the fault line in American identity that lies between the self and the community. Addressing the immigrant experience in particular, she asks how to negotiate between the needs of each under the earth –moving stress of desire" (207). This novel is filled with characters who are negotiating and slowly navigating through the emigrant experience, and Divakaruni brilliantly "builds an enchanted story upon the fault line in American identity that lies between the self and the community" (207).

applied optics

Fabrication of a phase transmission holographic optical element in polycarbonate and its characterization

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The phase transmission holographic optical element in silver halide holographic emulsion, especially for holographic collimator sights, is fabricated and the desired diffraction efficiency is obtained with very high transmission. One of the main drawbacks of these holograms are that they become dark by being exposed under sunlight, and this darkness drastically reduces the visible transmission and diffraction efficiency of a holographic optical element, hence it is not suitable for weapon sight application. To overcome this problem, we transferred a holographic optical element with a reticle image from silver halide into polycarbonate by using copying, electroforming, and recombination techniques. The holographic optical element in polycarbonate has many advantages; the detailed method of fabrication, transfer, and its characterization are presented. The very interesting result of diffraction efficiency variation with angle obtained in polycarbonate is discussed.

OCIS codes: (090.0090) Holography; (090.2890) Holographic optical elements; (220.0220) Optical design and fabrication; (090.1970) Diffractive optics; (160.5335) Photosensitive materials.

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1. INTRODUCTION

A new approach is reported for the fabrication of transmission type phase holographic optical elements (HOE) especially for a holographic collimator sight (HCS) for small arms. Silver halide (AgH) holographic emulsion has been used for the fabrication of a transmission type hologram with a reticle image [1–5]. The HCS has advantages over other types of weapon sights in close-quarter combat [6–10] and also it is used as a crew optical alignment system [11]. The M/s L-3 EO-tech is a pioneer in manufacturing HCS for small arms [12–16] and HCS recent developments and improvements are reported [12,17,18]. We fabricated a high diffraction efficiency HOE of around 15–20% in AgH holographic ultra-fine grain commercially available photo material, but less than 5% diffraction efficiency of holograms are preferable in HCS due to its higher visible transmission. In our work, we fabricated a fairly good diffraction efficiency HOE of nearly 5% with 80% visible transmission (without antireflection coating) in AgH holographic emulsion. One of the main drawbacks of HOEs in AgH are that they tend to darken by being exposed under ambient light, known as the print-out effect. It drastically reduces both the diffraction efficiency and transmission of HOEs. Hence, we try to avoid such darkening problem; we fabricated the same kind of HOE in transparent polycarbonate (PC). First we transferred the hologram from AgH into a photoresist (PR) by the copying method [19–24]. The crucial and controlled wet chemical process will result in a high quality HOE in positive PR. The HOE in PR is once again transferred into PC by using electroforming and recombination techniques [25–28]. The poor transmission of HOE in PR is not suitable for HCS application. Hence, we fabricated HOE in high transmission PC for this specific application.

The study of PC as a substrate for holographic emulsion coating instead of the more commonly used glass substrate was reported [29]. The PC is one of the strongest and safest materials on the market. Its applications range from feeding bottles to the helmet visors of astronauts and for space shuttle windshields. The PC received their name [30] because they are polymers containing carbonate groups (—O—(C═O)—O—). The inflexibility and the lack of mobility prevent PC from developing a significant crystalline structure. This amorphous nature of the polymer allows a light transmitting ability nearly that of glass. Light weight, transparency, excellent toughness, thermal stability, high impact resistance, and optical properties make PC one of the most widely used engineering thermoplastics [31,32]. There are certain constraints to the use of PC, including limited chemical and scratch resistance, birefringence, and thermal expansion. However, there are a number of solutions to

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Original

Biosynthesis of PVA encapsulated silver nanoparticles

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Abstract

Green synthesis of metal nanoparticles is an important technique in the methods of eco-friendly nanoparticle production. The synthesis of silver nanoparticles was accomplished using *Ocimum sanctum* leaf extract at room temperature. These particles were then encapsulated with polyvinyl alcohol (PVA) polymer matrix. The presence of silver was confirmed by different characterization techniques such as UV–vis spectroscopy, Fourier transform infrared spectroscopy (FTIR) and X-Ray Diffraction (XRD). Scanning electron microscopic (SEM) images of the synthesized powder shows spherical shaped silver nanoparticles embedded in sponge-like polymer matrix. The energy dispersive X-ray analysis confirms the presence of elemental silver along with iron signal. Energy dispersive signal corresponding to elemental iron has been attributed to *O. sanctum* plant. The silver nanoparticles in PVA matrix thus obtained shows high antibacterial activity against gram positive *Staphylococcus aureus* (*S. aureus*) and gram negative *Escherichia coli* (*E. coli*) water borne bacteria. The inhibition zone against *S. aureus* and *E. coli* were also calculated.

Keywords: Silver nanoparticles; *Ocimum sanctum*; PVA; Antibacterial studies

1. Introduction

Research on nanoparticles is currently an area of intense scientific interest due to its wide range of applications (Abdulrahman, Krajczewski, Aleksandrowska, & Kudelski, 2015; Park, Lee, & Lee, 2016; Taylor, Coulombe, et al., 2013; Yahyaei et al., 2016). In spite of being the size of the ultra-fine particles individual molecules are usually not referred to as nanoparticles (Hewakuruppu et al., 2013). Nanoparticles form a bridge between bulk materials and atomic/molecular structures. Nanoparticles do not need to have constant physical properties, they may vary (Taylor, Otanicar, et al., 2013). The size dependent property such as quantum confinement can be observed in semiconductor particles, surface plasmon resonance is found in some metal particles and super magnetism is observed in magnetic materials (Taylor, Otanicar, & Rosengarten, 2012).

Nowadays, metallic nanoparticles are the focus of interest because of their huge potential in nanotechnology (Mody, Siwale, Singh, & Mody, 2010; Salunke, Sawant, Lee, & Kim, 2016). Metallic nanoparticles have been embraced by industrial sectors because of their applications in the field of electronic storage systems (Kang, Risbud, Rabolt, & Stroeve, 1996), biotechnology (Pankhurst, Connolly, Jones, & Dobson, 2003), magnetic separation and pre-concentration of target analysts, targeted drug delivery (Dobson, 2006; Rudge et al., 2001) and vehicles for gene and drug delivery. With a wide range of applications available, these particles have the potential to make a significant impact on society.

Silver nanoparticles have some advantages over other nanoparticles because they are reported to be non-toxic to human and most effective against bacteria, viruses and other eukaryarolitic micro-organisms at a very low concentration, without any known side effects (Chauhan, Gupta, & Prakash, 2012). Many efforts have been taken to incorporate silver nanoparticles into a wide range of medical devices, such as bone cement, surgical instruments, surgical masks (Valente, Gaspar, Antunes, Countinho, & Correia, 2013); however, it has also been shown that ionic silver in the right quantities is suitable in treating

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Novel report on single phase $BiFeO_3$ nanorod layer synthesised rapidly by novel hot-wall spray pyrolysis system: evidence of high magnetization due to surface spins

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Abstract This is the novel report on the rapid synthesis of single phase $BiFeO_3$ nanorods by novel hot wall assisted spray pyrolysis system. The deposition has been carried out in an indigenously fabricated system and the entire process is completed in 4 s time duration. The structural, morphological, optical and magnetic properties of $BiFeO_3$ nanorods have been studied in the work. The mechanism of growth of $BiFeO_3$ nanorods has been explained extensively. The magnetic studies carried out with SQUID-VSM results $BiFeO_3$ nanorods showing higher saturated magnetization in comparing with previous reports.

1 Introduction

Multiferroic materials have received considerable attention because of their potential applications [1] in the field of spintronics, sensors and new data storage devices [2–4]. Among the various types of multiferroic materials, $BiFeO_3$ (BFO) known as Bismuth Ferrite is one of the promising multiferroic material which have been investigated for many years. BFO is identified as only single-phase material that exhibits both ferroelectricity and antiferromagnetic orders (i.e., the magneto electric effect) well above room temperature (RT) [5]. At RT, it is in rhombohedrally distorted perovskite structure belonging to R3c space group having lattice parameters $a_r = 5.63$ Å, $\alpha_r = 59.35°$, [6] or hexagonal parameters $a_{hex} = 5.5769$ Å, $c_{hex} = 13.8531$ Å [7]. $BiFeO_3$ exhibits ferroelectric order with a high Curie temperature ($T_C \sim 810$ °C) and G-type antiferromagnetic order below Néel temperature ($T_N \sim 380$ °C) [8]. Ferroelectricity appears in pure BFO due to off centered distorted Fe^{3+} ions, caused by $6s^2$ lone pair of Bi^{3+} ions in its noncentrosymmetric rhombohedral structure. $BiFeO_3$ has canted spin structure that develop localized antiferromagnetism in the material [9]. Since, the BFO properties are strongly dependent on the particle size [10] and morphology [11] current research is focussed on the synthesizing and study of BFO nanostructures such as nanocubes [12], NRs [13], nanowires [14], nanotubes [15], nanoflowers [16], spheres [17] and cubes [18]. Among different BFO nanostructures, one dimensional BFO nanorods (NRs) are attractive because of their unique properties of two dimensional quantum confinement [19] and higher surface to volume ratio [20] which offers fundamental scientific opportunities for investigating its physical properties. Theoretical calculation has predicted that ferroic effects in NRs or nanowires would show giant magnetoelectric effects coupled with dramatic phase transition when its radii decreases [21]. In 2009, Fang et al. [22] tried first synthesis of One-dimensional (1D) NRs of BFO in powder form by template-free route via soft chemistry. The large parasitic phase of $Bi_2Fe_4O_9$ was observed in the NRs and

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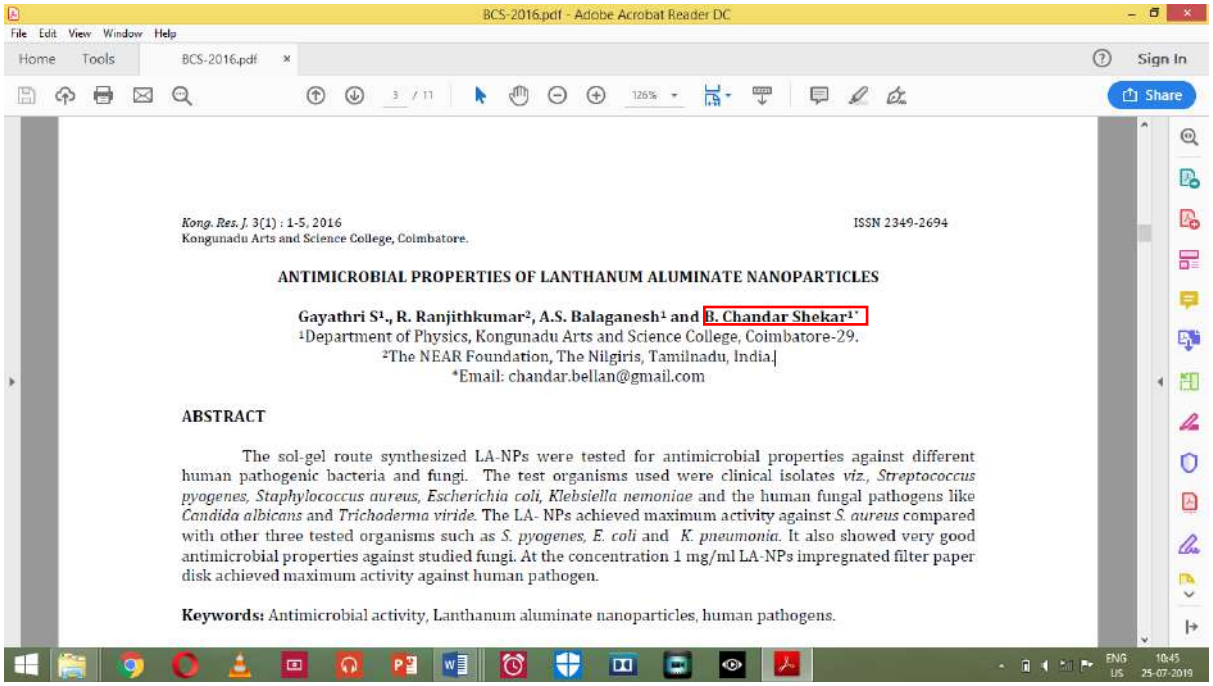
Research presentation highlights the value of the MoU between Kongunadu Arts and Science College, Coimbatore and The University of Wyoming, Laramie, USA.

Students and faculty from University of Wyoming and Kongunadu Arts and Science College presented an update on their water quality research. Secretary and Director of KASC, **Dr. C.A. Vasuki** in her Presidential address highlighted the importance of water management and Principal **Dr. V. Balasubramiam** inaugurated the event. This joint-research team led by **Dr. S. Binu Kumari** and scholar **M. Mohan Kumar** (Department of Zoology, KASC) collected and analyzed water quality of Sulur Lake, Coimbatore. **Dr. Ramesh Sivanpillai**, WYGISC, University of Wyoming (Laramie, USA) led the US team. Using Geographic Information Systems (GIS) he and his student **Ms. Mackensie Swift** analyzed seasonal and spatial patterns in the surface water quality. Team members gave an overview of their work along with the preliminary findings, and the benefits of the MOU between the two institutions. More than 100 KASC scholars, and staff and students from the departments of Zoology and Botany attended this meeting.



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ANTIMICROBIAL PROPERTIES OF LANTHANUM ALUMINATE NANOPARTICLES

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ABSTRACT

The sol-gel route synthesized LA-NPs were tested for antimicrobial properties against different human pathogenic bacteria and fungi. The test organisms used were clinical isolates *viz., Streptococcus pyogenes, Staphylococcus aureus, Escherichia coli, Klebsiella nemoniae* and the human fungal pathogens like *Candida albicans* and *Trichoderma viride.* The LA- NPs achieved maximum activity against *S. aureus* compared with other three tested organisms such as *S. pyogenes, E. coli* and *K. pneumonia.* It also showed very good antimicrobial properties against studied fungi. At the concentration 1 mg/ml LA-NPs impregnated filter paper disk achieved maximum activity against human pathogen.

Keywords: Antimicrobial activity, Lanthanum aluminate nanoparticles, human pathogens.

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DATA MINING ON CRUDE, PARTIALLY PURIFIED AND DOPED SILVER NANOPARTICLES OF TWO PLANT SPECIES AGAINST DENGUE VECTOR, *Aedes aegypti*

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A Study on Consumer Preference towards Organic Food Products in Coimbatore City

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Abstract: ***Organic food and cultivation is not new to India, but the green revolution which has changed the pattern of food consumption and cultivation for few decades. Organic food is becoming more and more popular, as People look for ways to live a healthier, pesticides-free, environmentally friendly, and sustainable lifestyle. The present study aims at analysing the factors affecting preference of consumers for organic food products. Using a well-structured survey of 550 respondents covering the Coimbatore city, Tamil Nadu. Suitable statistical tools have followed for analysis on consumer preference.***

Keywords: Organic Food, Consumer Preference, Consumption, Environment, pesticides- free, healthier.

I. INTRODUCTION

Organic cultivation and food is not new to India, But green revolution has changed the pattern of cultivation and consumption for few decades. Over the past decade consumption pattern of consumers have changed especially in food consumption because all consumer to eat organic food because of the consumers are start preferring to eat the organic food is good for health and its grows with use of organic manual and use natural resource, so consumers will shift to organic food items, and quality and safety in food attract consumer interest in organic food that is free from pesticides and chemical residues. Organic food is becoming more and more popular, as People look for ways to live a healthier, pesticides-free, environmentally friendly, and sustainable lifestyle. Organic food refers to crops or livestock that are grown on the farm without the application of synthetic fertilizers or pesticides, and without using genetically modified organisms.

Organic farming is carried out in at least 160 countries worldwide. Organic farming is a form of agriculture that relies on techniques such as crop rotation, green manure, compost, and biological pest control. Certified organic farming in the modern sense as understood in developed countries is only around 15 years old in India. India is as one of the world's most significant countries for organic agriculture. It ranks among the world's largest producers of rice, tea, fruits and vegetables, various spices, pulses, medicinal plants, and cashew nuts. Nearly 4.5 million hectares area is currently under certified organic farms.

II. STATEMENT OF THE PROBLEM

Growing consumers' concerns on food safety, health and environment in the recent decade has resulted increased demand for organic food across the world, including emerging economies such as India. An increase in consumer's demand for environmental and health quality has generated the movement of organic agriculture in terms of high-value products. Understanding consumer preferences is very necessary. So, the researcher is trying to portrait the consumer's preference towards organic food products in Coimbatore city.

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THE ROLE OF COLD STORAGE IN THE PROMOTION OF PERISHABLE EXPORTS IN INDIA- A STUDY

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ABSTRACT

The food supply chain in India is complex in nature, where perishable goods are handled by numerous small stake holders. Apt infrastructure required to support the perishable food market is still developing. The perishable nature of products makes it necessary to have temperature controlled hygienic storage facilities, efficient handling, reefer transportation and distribution networks. These requirements stand as pillars of strength for the perishable products supply chain. India's production of perishable fruits and vegetables is more compare to the demand of the same and it is ranked as the second largest producer of fruits and vegetables in the world. Hence the study focuses on the scope in the growth of Indian perishable exports by developing a strong cold storage network.

Keywords: Infrastructure, Reefer Transportation, Perishable, Demand, Supply Chain.

INTRODUCTION

In India, over the years, especially in the last 15 years, perishable logistics technology has advanced dramatically. Today, the industry has no problem bringing a product to a warehouse and delivering it within 24 hours without losing a degree (in temperature) from when the product was first picked up. Perishables trade is now using technology to perform testing on the dry ice and on the coolers to ensure the packaging is the best. With a middle-class consumer base due to reach an estimated 583 million by 2025. Perishables require chilled or frozen storage and transportation. The major reason behind the lack in perishable exports is cold storage facility. Hence the country has a compulsion to focus on expanding and upgrading cold chain process in the forthcoming years.

OBJECTIVES:

- To create awareness about the cold storage facilities among perishable product exporters in India
- To study about the overall export scenario of fruits and vegetables in India
- To examine the challenges faced by cold chain industry in India
- To offer suggestions to upgrade cold storage facilities in India

SCOPE OF THE STUDY

As India is considered to be the land of agriculture and the recent development in the agr based industries has opened a new stalk for the exporters to increase their exports. The study may b useful for the perishable product that is fruit and vegetable exporters to enhance the methods an techniques in warehousing the products which may lead to increase the volume of exports. As well a

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Wide band gap of Strontium doped Hafnium oxide nanoparticles for opto-electronic device applications – Synthesis and characterization

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ABSTRACT

Strontium doped HfO_2 nanoparticles (Sr-HfO_2 NPs) were synthesized by a simple co-precipitation method. FTIR and EDAX spectroscopy analysis shows stoichiometries compositions of HfO_2 NPs are pure. X-Ray

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Synthesis, characterization and antibacterial activity of hybrid chitosan-cerium oxide nanoparticles: As a bionanomaterials

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abstract

The hybrid chitosan cerium oxide nanoparticles were prepared for the first time by green chemistry

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Chitosan mediated enhancement of hydrolysable tannin in *Phyllanthus debilis* Klein ex Willd *via* plant cell suspension culture

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ABSTRACT

Phyllanthus debilis Klein ex Willd. is wild medicinal plant used in the traditional system of medicine. This plant has been actively used for hepatoprotection and to cure many diseases including jaundice and so on; which leads to complete extinction of this particular species. Therefore, the chitosan mediated cost effective cell suspension method has been developed for the production of hydrolysable tannin. The hydrolysable tannins are the main therapeutically active constituents with antioxidant, anticancer, and antimicrobial properties. An *in vitro* cell suspension culture was optimized by adding chitosan for production of hydrolysable tannin. According to the growth kinetics, a maximum biomass of 4.46 ± 0.06 g fresh cell weight and 1.33 ± 0.04 g dry cell weight were obtained from the optimal suspension medium consisted of MS medium + 0.5 mg L^{-1} BAP + 1.5 mg L^{-1} NAA. Chitosan was treated at the stationary phase which leads to the highest accumulation of hydrolysable tannin compared to the untreated control. Hydrolysable tannin was observed and compared using HPLC at the Rt of 4.91 in both chitosan treated and untreated cells. This is the first ever report where use of chitosan has been done to enhance the production of the hydrolysable tannin in *P. debilis* using cell suspension culture technique.

1. Introduction

Plants are the primary sources of medicinally important compounds. Intensifying our knowledge of secondary metabolites and their values has been increased the industrial demand of therapeutically useful bioactive compounds. To meet this demand, a proficient system is necessary to produce secondary metabolites on a large scale. Currently, the traditional harvesting of plant materials is not cost-effective, because it requires large areas for cultivation which is exposed to natural disasters [1]. Despite advancements in synthetic chemistry for the production of bioactive metabolites in industry, we still depend upon plant sources for a number of secondary metabolites because some natural compounds have a complex structure and cannot be easily chemically synthesized on an industrial scale [2].

Especially, plant cell suspension culture is an efficient system, which has been used for the mass production of various secondary metabolites under *in vitro* conditions [3]. However, plant cell cultures cannot produce adequate quantities of the required bioactive compounds. So variety of biotic and abiotic elicitors were used to enhance the production of secondary metabolites from plant cell cultures. In general, the elicitors can be divided into biotic and abiotic. Biological products such as plant growth hormones, yeast extract, fungal or microbial cell wall preparations, polysaccharides, proteins and fatty acids are used as biotic elicitors, while those without a biological origin, such as ultraviolet light, metal ions, and detergents were used as abiotic elicitors [4–6].

There are many plant derived compounds which have wide scale of biological activities. Especially, there is a great interest in polyphenols, which have been studied for many years and are still vital domain of research because of their prospective use in medicine. Polyphenols are large class of substances, over 8000 compounds, from those with simple structure (*e.g.* Phenolic acids) to the polymeric substances like tannins [7,8]. Hydrolysable tannins are secondary metabolites belonging to the family of "vegetable tannins" which have been broadly studied for more than 200 years. Vegetable tannins are characterized by being water soluble, and

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RESEARCH ARTICLE

BIOSYNTHESIS OF POLY-β-HYDROXYBUTYRATE AND DISTRIBUTION OF *phbC* GENE IN LACTOBACILLUS PLANTARUM.

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poly-β-hydroxybutyrate, *Lactobacillus, phbC* gene, bioplastics.

Abstract

Accumulation of synthetic plastics in the environment has become a worldwide problem. Polyhydroxy alkanoates (PHA) are biodegradable plastics, an alternative to petroleum-based synthetic plastics. In this investigation, the best known PHA, poly-β-hydroxybutyrate (PHB) accumulating strains of *Lactobacillus plantarum* were isolated from various food and environmental samples using MRS agar medium. Among the 31 isolates, 22 strains were identified as *Lactobacilli* by comparing the biochemical profile with *Lactobacillus plantarum* MTCC6160. The *L. plantarum* strains were confirmed with 16S rRNA identification method and 11 among the 22 *Lactobacillus* strains were revealed the characteristic band at 735 bp. The partially amplified product was sequenced and the comparison of the sequence in NCBI BLAST obtained 94% similarity with the strain, *L. plantarum* IMAU70089. The isolated strains of *L. plantarum*was subjected to PHB production using nitrogen limited minimal medium (NLMM).The inclusion bodies were stained with Sudan Black B and the organism was also plated on Nile blue A medium, revealed the presence of a lipid material, which was confirmed as PHB by the analysis of molecular fragments by FTIR spectroscopy in comparison with reference material. In addition, the existence of *phbC* gene (578 bp) was identified, which encodes the enzyme, PHB synthase for accumulating PHB. This investigation confirmed that 1 mg of the cell dry weight constitutes the maximum of 40.4 µg of PHB. This study revealed that *L. plantarum*has been recognized as a good candidate for PHB.

Introduction:-

Synthetic plastics produced from the petrochemical source are non-degradable and cause waste disposal problems leading to environmental pollution (Muller et al., 2001). Polyhydroxyalkonoates and their co-polymericderivativeshave emerged as very attractive substitutes for synthetic plastics due to their complete

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PERMISSION LETTER

From

K.Keerthana,

II MSc Biotechnology,

Dr.N.G.P. Arts and Science College,

Coimbatore.

To

The Secretary and the Director,

Kongunadu Arts and Science College,

G.N.Mills,

Coimbatore.

Respected Sir,

Sub: - Analysing of Project Sample-regarding.

As a part of my M.Sc project work, I want to check Anti-Cancer activity for two samples in your esteemed college. Kindly accept my sample and process the same. In this regard, it will be more helpful for my project work.

Thank you Sir,

Date: 21.02.2017

Place: Coimbatore

Yours faithfully,

K.Keerthana

L. Nivetha

Signature of Class Advisor:

21/2/17

Forwarded & Sanctioned.

Signature of Project Guide:

21/02/17

Signature of HOD:

21/02/17

Possibly after 10 days,

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Original Research Paper

Physical and optical properties of HfO_2 NPs – Synthesis and characterization in finding its feasibility in opto-electronic devices

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abstract

HfO_2 nanoparticles (HfO_2 NPs) with different precursors (NaOH, H_2O, ethanol) were synthesized by a simple co-precipitation method. FTIR and EDX spectroscopy analysis shows the Stoichiometries composition of HfO_2 NPs. X-ray diffraction pattern analysis revealed that the as prepared and calcined HfO_2 NPs are respectively amorphous and polycrystalline nature. TEM analysis confirms that the morphology of the calcined HfO_2 NPs is spherical in shape with less agglomeration. The crystallite size was evaluated to